



AutomotiveSPICE & CMMi

Fiat Auto Policy

20 March 2007

Introduction

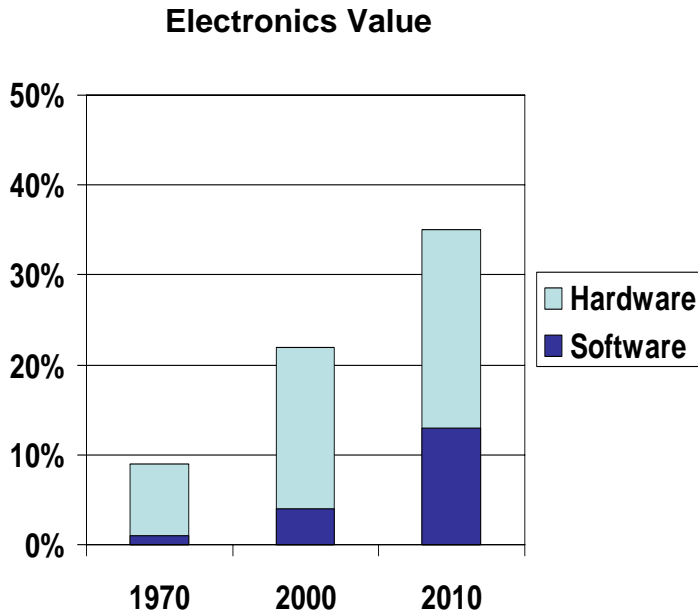
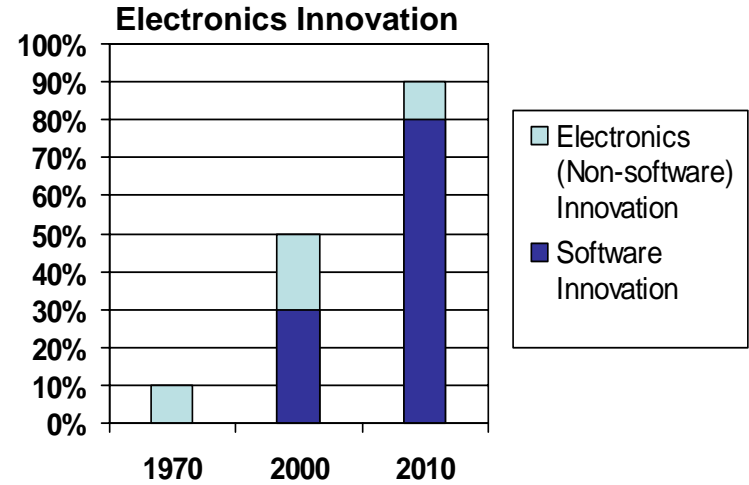


- ✓ Software Methodologies used in Fiat Auto
- ✓ Software Project Management
- ✓ SPICE Assessment: Fiat Auto Experience
- ✓ Automotive SPICE Assessment : Fiat Auto Policy
- ✓ Automotive SPICE Assessment: Fiat Auto Scope
- ✓ CMMi: Fiat Auto Policy

Increasing Software Complexity in Automotive Industry



It is estimated that 90% of innovation by 2010 will be electronics related, and 80% of that is in the area of software. Even conservative estimates place the software innovation fraction between 60-70%. [1], [2]



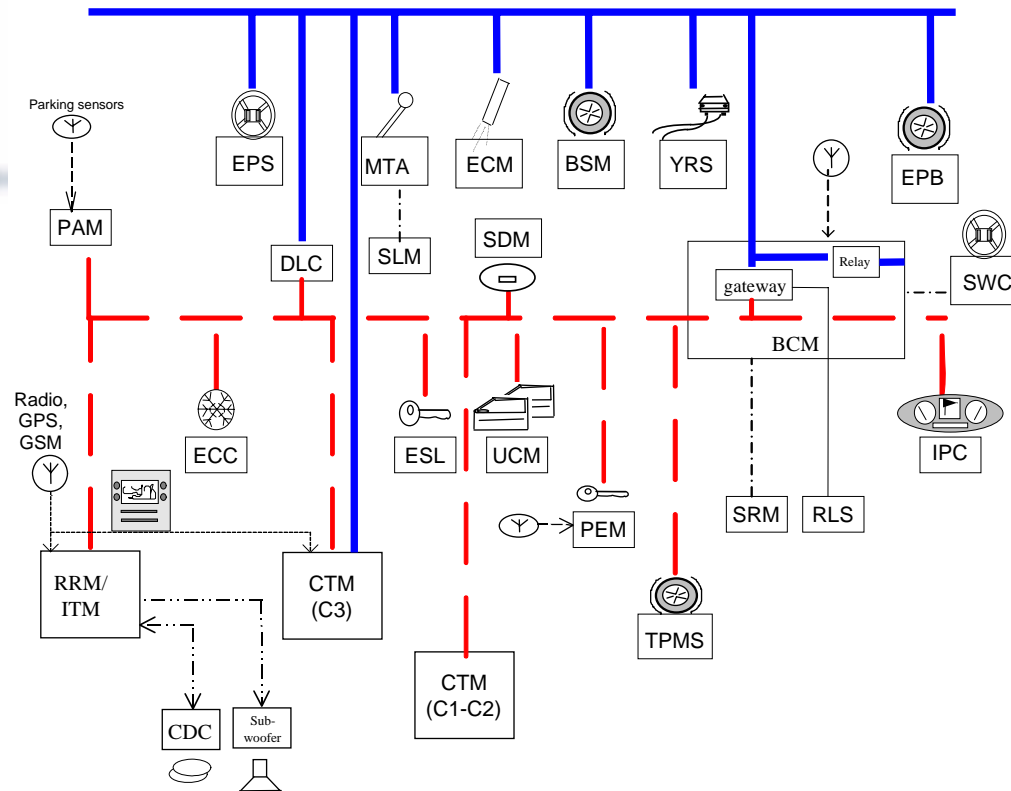
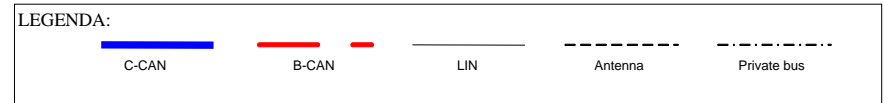
The value of electronics and software is expected to grow to 35-40% of the vehicle value by 2010 [3], [4]. It is innovation that drives the increase in vehicle electronic and Software content.

Source: [1] -Reuse of Software in Distributed Embedded Automotive Systems, Audi 2004, [2] - Embedded Automotive Electronics Symposium, Peugeot, June 23, 2004, [3] - Roland Berger, Automotive Engineering 2010, [4] – Minatec 2003

Increasing Software Complexity in Automotive Industry



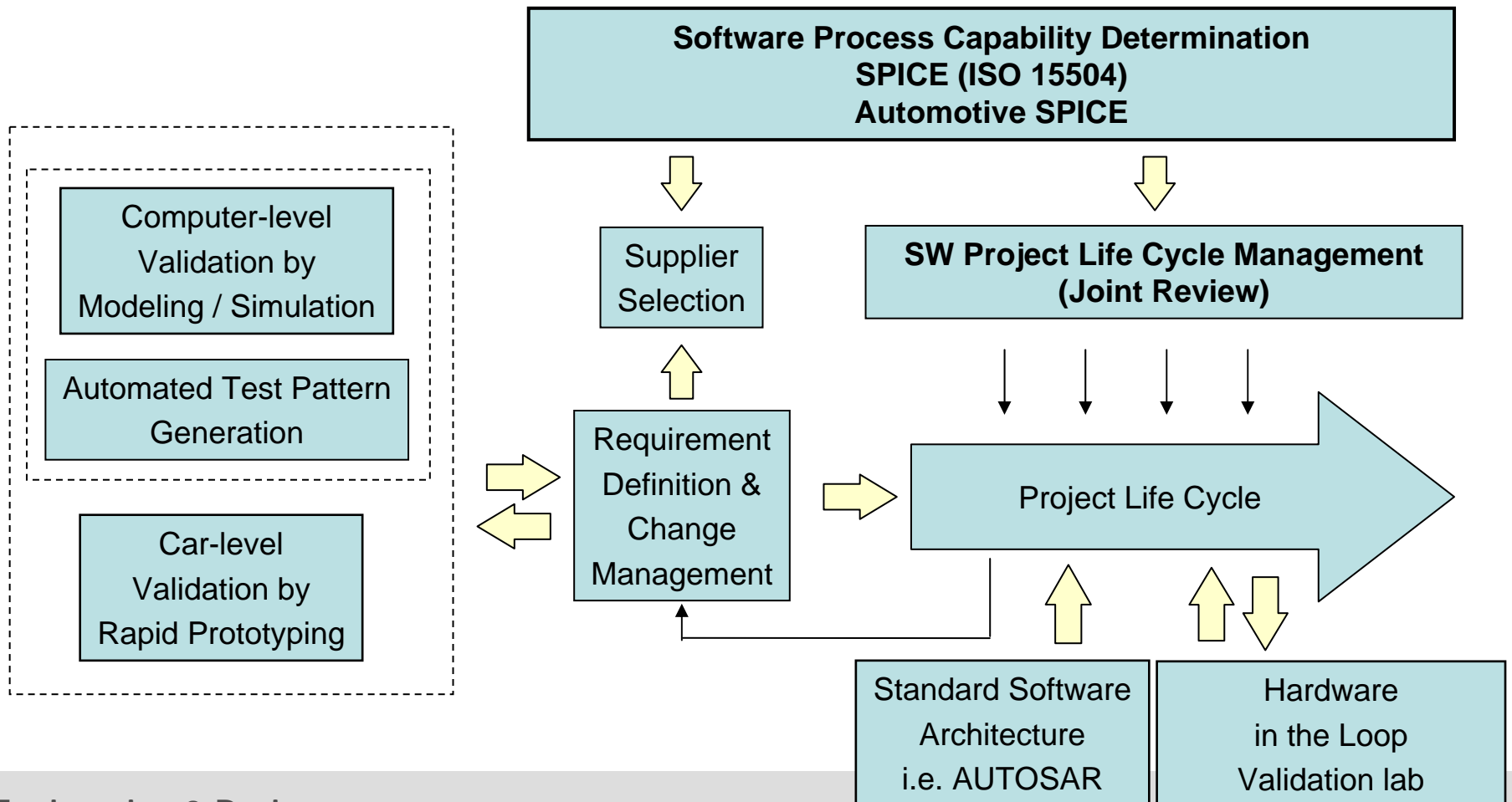
As the electronics & software elements of a car now **must be integrated to create new capabilities**, it is important to look at the **sum of all electronics systems** in the car not just individual elements!



Software Methodologies - Overview



Fiat Auto has developed and applied some methodologies to manage different aspects concerning Embedded Systems and Software



Software Project Life Cycle Management (Joint Review)

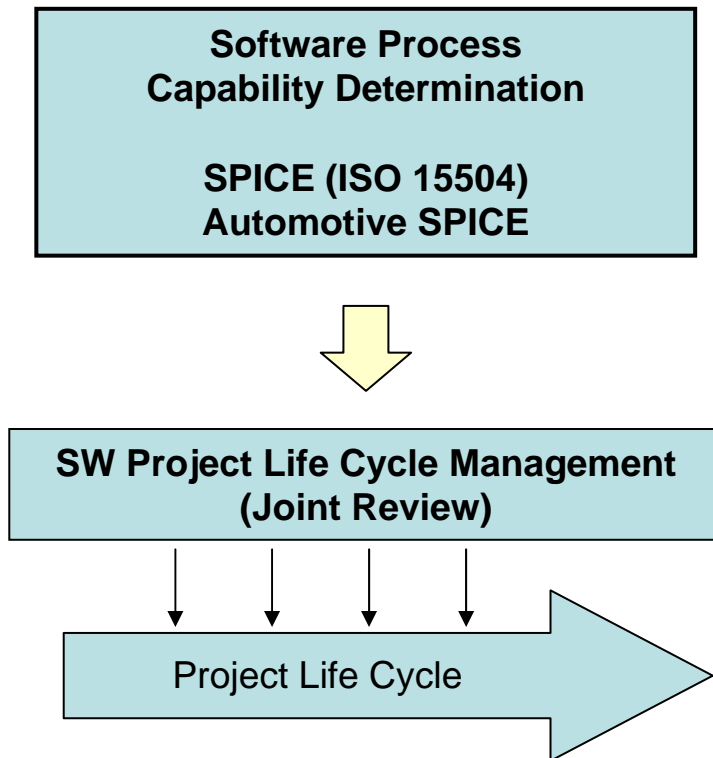


In order to manage the software development, some Joint Review are organized during the project life cycle.

The effort dedicated to joint review is based on SPICE or AutomotiveSPICE assessment results.

The main purpose of Joint Reviews is to monitor some critical characteristics of the software development process, in order to:

- Prevent problems
- Analyse risks
- Manage the requirement changes
- Manage the technical changes
- Assure the product quality
- Assure the project time to market
- Control the development costs



Software Project Life Cycle Management (Joint Review)



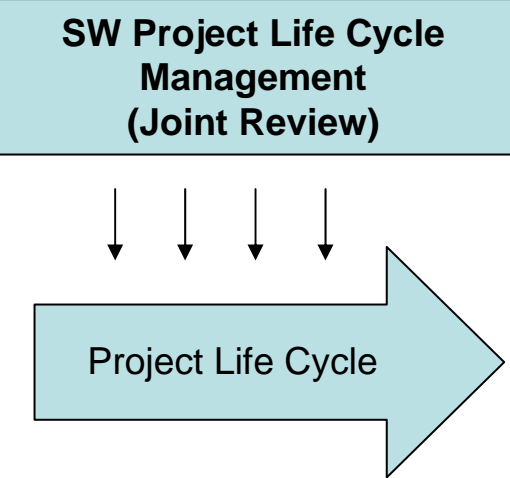
Fiat Auto has identified the following joint review typologies:

Conceptual Review:

Verify if all Fiat Auto software requirements are **known and agreed** by Suppliers. During this review, the Suppliers shall describe how they will **organize the project**, both from technical and management point of view.

Architectural Review:

- 1) Verify if the design chooses could **assure** the project **development, validation and maintainability**.
- 2) Analyze the **technical chooses** (i.e.: micro, OS, MISRA rules, etc.)
- 3) Analyze the **software architecture**



Process Review:

- 1) Verify the process used by Supplier to **release software**.
- 2) Verify how First Tier **manage sub-contractor** (i.e.: the Second, Third, ... Tiers)

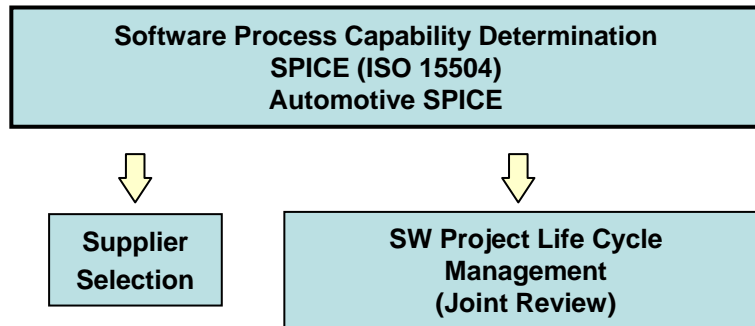
Implementation Review:

- 1) Verify if technical chooses described in previous reviews are **really implemented**.
- 2) Manage eventual **problems** and **mitigate risks**.
- 3) Manage **change requests**
- 4) Lesson learning (also from other project).

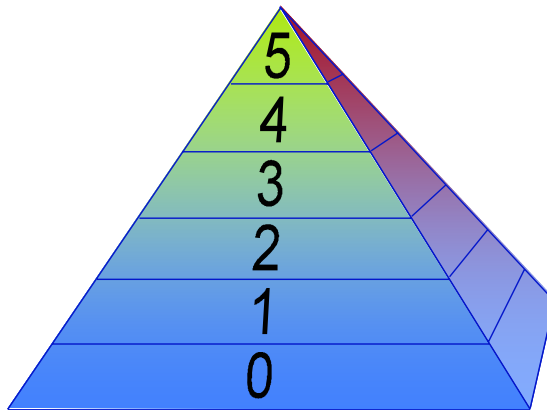
Testing Review:

- 1) Analyze the **tools** used to verify software.
- 2) Analyze the **test procedures**
- 3) Analyze **test reports**
- 4) Analyze the **corrective actions** used to solve eventual problems

SW Process Capability Determination: Main Reasons and Goals



Optimizing
Predictable
Established
Managed
Performed
Incomplete



- To **improve the FIAT Auto selection supplier process**, based on supplier “software capability”
- To set up a methodology supporting the **management of software** projects and suppliers
- To **analyze a “capability” and a “risk”** level for each software supplier
- To **identify the weak and the strong areas** of the supplier’s software development process
- To require suppliers to **improve some areas** of the software development process

SW Process Capability Determination: Fiat Auto Assessment History



■ **Phase 1 (2000 – 2003):**

- Selection of the ISO/IEC 15504 (SPICE) Assessment Methodology (July 2000)
- Definition of a First Assessment Scope (October 2000)
- 15 ISO/IEC 15504 (SPICE) assessments between 2001 and 2003

■ **Phase 2 (End 2003):**

- Analysis of results and assessment scope
- Definition of a “Minimum” and an “Expected” capability profile”
- Assessment Scope re-definition (December 2003)

■ **Phase 3 (2004 – 2005):**

- From 2004 assessment is a standard activity to evaluate Supplier’s software capability, during the supplier selection phases too.
- 12 ISO/IEC 15504 (SPICE) assessments during 2004 and 2005

■ **Phase 4 (From January 2006):**

- Fiat Auto requires that every Supplier shall be assessed (ISO/IEC 15504 (SPICE) or Automotive SPICE) in order to participate at sourcing phase (the requirement is stated in the RFQ).

SPICE assessment: Assessment Partner



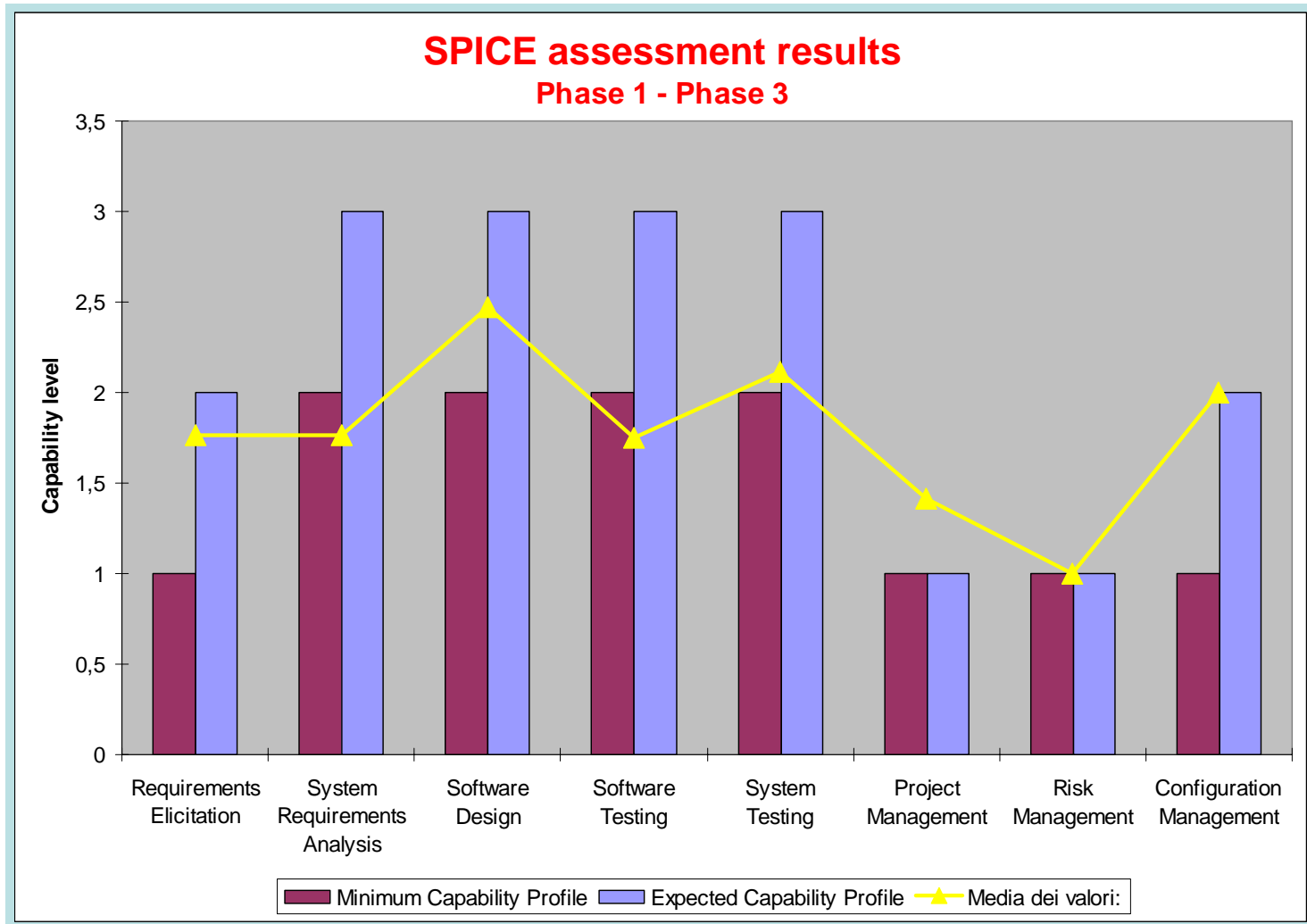
System & Software Evaluation Center – ISTI CNR

The Center performs *third-party* evaluation and certification of *processes* and *products* in the area of Information Technology

- Software Product Evaluation [ISO/IEC 9126 & 14598]
- Software Product Evaluation and Certification according to defined requirements and standards
- Software Process Assessment & Improvement [ISO/IEC 15504, SPICE]

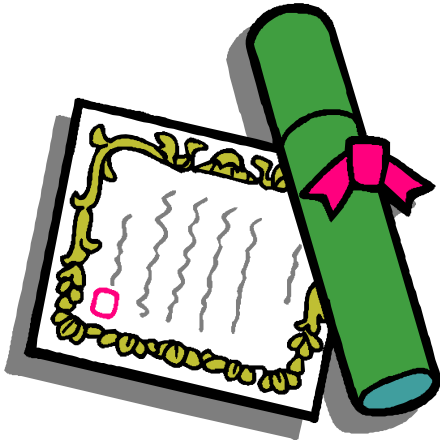
- Fiat Auto worked with ISTI-CNR in order to **choose SPICE methodology** and to **define the assessment scope**.
- The assessments **have been done by ISTI-CNR** in order to guarantee an unbiased analysis.
- **ISTI-CNR is, currently, the Fiat Auto consultant** about SPICE and AutomotiveSPICE methodologies.

SPICE assessment: Average results





- Each Supplier that develops, modifies, maintains or produces electronic equipment based on software, shall be compliant to process capability profiles **in order to be part of the FIAT Auto software supplier group.**
- The assessment scope shall be **compliant with Fiat Auto Assessment scope** (see “Assessment Scope” chart).
- The process capability levels shall be **compliant with “Minimum” or “Expected” profiles** (see “Capability Level Profiles” chart).
- The assessment report **shall be relevant** to the Department / Office / Company that will actually be in charge of the software development



- The assessment results provided **shall be recent** (not more than three years old)
- The assessment **shall be repeated** - at least - **every three years**
- The assessment **shall be performed** by an **external, independent (third party) organization.**
- The assessors in **the assessment team must be qualified** according to an internationally recognized assessor qualification scheme.

Fiat Auto Automotive SPICE Assessment Scope



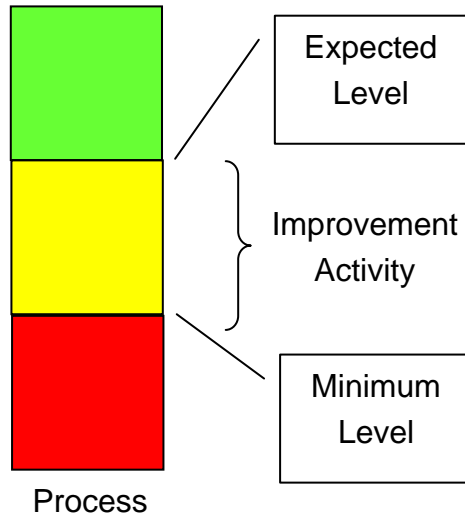
Engineering Process Group
ENG.1 Requirements Elicitation
ENG.2 System Requirements Analysis
ENG.5 Software Design
ENG.8 Software Testing
ENG.10 System Testing

Management Process Group
MAN.3 Project Management
MAN.5 Risk Management
Support Process Group
SUP.8 Configuration Management

Notes:

- 1) This scope defines the minimum of processes to be assessed.
- 2) Further process may be evaluated individually, if necessary
- 3) Based on Automotive SPICE 2005

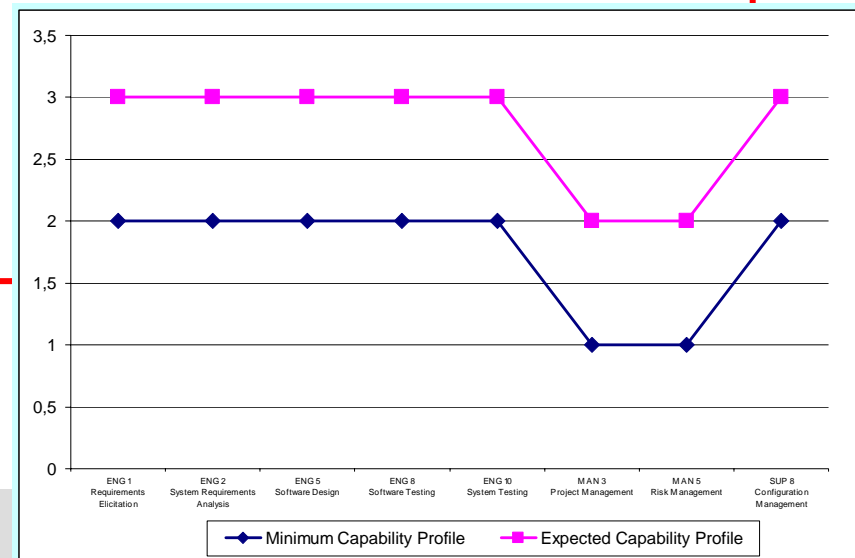
Capability Profiles



- Fiat Auto has established for each process a “**minimum**” level and an “**expected**” level
- The “expected level” is the **level requested** by Fiat Auto
- A process shall reach – at least – the “minimum level”: **less than this level the assessment is not conform** to Fiat Auto requirements.
- If a process is assessed greater than “minimum level” but “less than expected level”, it is necessary to **plan an improvement activity**.

❑ The complete assessment scope defines two “capability profiles”:

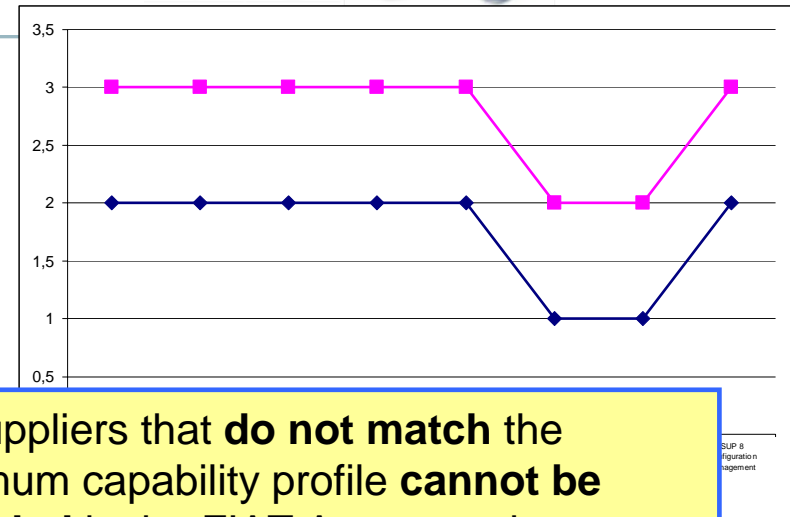
- “Expected capability profile”
- “Minimum capability profile”



Capability Level Profiles



Fiat Auto Assessment Scope Process	Minimum Capability Profile	Expected Capability Profile
ENG.1 Requirements Elicitation	2	3
ENG.2 System Requirements Analysis	2	3
ENG.5 Software Design	2	3
ENG. 8 Software Testing	2	3
ENG.10 System Testing	2	3
MAN.3 Project Management	1	2
MAN.5 Risk Management	1	2
SUP.8 Configuration Management	2	3



→ Suppliers that **do not match** the minimum capability profile **cannot be included** in the FIAT Auto sourcing phase.

→ Suppliers that match or are above the minimum capability profile but do not meet the expected capability profile can participate in the FIAT Auto sourcing but are **requested to improve their software process** in order to match the expected capability profile.

→ Suppliers that match or are above the expected capability profile **can participate** in the FIAT Auto sourcing.

Maturity Level Required: 2

Process Name	Maturity Level
REQM Requirements Management	2
PP Project Planning	2
PMC Project Monitoring and Control	2
SAM Supplier Agreement Management	2
MA Measurement and Analysis	2
PPQA Process and Product Quality Assurance	2
CM Configuration Management	2

Evaluation Schema:

- 1) The assessment results provided **shall be recent** (not more than three years old)
- 2) Software Capability certification will be required as **mandatory for all new Fiat Auto sourcing**
- 3) The assessment report **shall be relevant to the Department/Office/Tier2** that will actually be in charge of the software development
- 4) The assessor organization **has to be known and accepted by Fiat Auto**

Improvement activities



Fiat Auto can require a Process Improvement if

- The assessed capability profile doesn't meet the expected one
- The Supplier is not able to demonstrate the achieving of minimum or expected capability profile

- ✓ Supplier shall define a plan in order achieve the improvement required.
- ✓ The plan (activities + time scheduling) has to be agreed with Fiat Auto.
- ✓ After the improvement activities, Supplier shall demonstrate the achievement of capability profiles requested by Fiat Auto
- ✓ A new assessment or a “delta”-assessment is required to analyze the improvement.



Thank you

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- Backup

Automotive SPICE: Assessment Scope (minimum) - (1/2)



Process	Description
ENG.1 Requirements Elicitation	The purpose of the Requirements elicitation process is to gather, process, and track evolving customer needs and requirements throughout the life of the product and/or service so as to establish a requirements baseline that serves as the basis for defining the needed work products.
ENG.2 System Requirements Analysis	The purpose of the System requirements analysis process is to transform the defined customer requirements into a set of desired system technical requirements that will guide the design of the system.
ENG.5 Software Design	The purpose of the Software design process is to provide a design for the software that implements and can be verified against the software requirements
ENG.8 Software Testing	The purpose of the Software testing process is to confirm that the integrated software meets the defined software requirements.







Automotive SPICE: Assessment Scope (minimum) - (2/2)

Process	Description
ENG.10 System Testing	The purpose of the System testing process is to ensure that the implementation of each system requirement is tested for compliance and that the system is ready for delivery.
MAN.3 Project Management	The purpose of the Project management process is to identify, establish, plan, co-ordinate, and monitor the activities, tasks, and resources necessary for a project to produce a product and/or service, in the context of the project's requirements and constraints.
MAN.5 Risk Management	The purpose of the Risk management process is to identify, analyze, treat and monitor the risks continuously.
SUP.8 Configuration Management	The purpose of the Configuration management process is to establish and maintain the integrity of all the work products of a process or project and make them available to concerned parties.

AutomotiveSPICE Assessment Management



Steps	What	Who
Pre-Assessment	<ul style="list-style-type: none"> • Information request • Information analysis 	<ul style="list-style-type: none"> • Assessors • Supplier
Assessment	<ul style="list-style-type: none"> • In field analysis • Document analysis • Process analysis 	<ul style="list-style-type: none"> • Assessors • Supplier
Result Analysis	<ul style="list-style-type: none"> • Discussion • Agreement 	<ul style="list-style-type: none"> • Assessors • Supplier • Fiat Auto
Eventual Improvement	<ul style="list-style-type: none"> • Actions to improve processes 	<ul style="list-style-type: none"> • Supplier