

9° Automotive SPIN Italy Workshop

Milan (Italy), December 1 2011

MASP (Metrics in Automotive Software Projects)



**Purpose, Scope & State-of-
the-art**

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- ✓ **G1.** Introduce the 'metrication' issue in Automotive projects
- ✓ **G2.** Present the **MASP** project
- ✓ **G3.** Show current status and next steps





- **Introduction**
 - A needed premise
 - What happened...
- **The MASP Project**
 - State-of-the-art: 5W's
 - Current status
 - Next steps
- **Conclusions & Prospects**
- **Q&A**



*You cannot **control** what you
cannot **measure** but...*

You cannot **measure what you
cannot **define** but...**

You cannot **define** what you
don't **know**...



2009-06

ENGINEERING
AUTOMOTIVE SPIN ITALIA
3rd Workshop Automotive SPIN Italia
Milano, 4 giugno 2009
Top Metrics for SPICE-compliant projects
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2010-05

ENGINEERING
AUTOMOTIVE SPIN ITALIA
7th Automotive SPIN Italy Workshop
Pisa, May 21st 2010
COSMIC
A new method for measuring software functional size
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2011-02

ENGINEERING
AUTOMOTIVE SPIN ITALIA
8th Automotive SPIN Italy Workshop
Milano, February 17 2011
The Metric Cards
A Balanced Set of Measures
ISO/IEC 15504 compliant
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MASP

2011-04

Management Process Group (MAN)	
MAN.1	Organizational alignment
MAN.2	Organization management
A	MAN.3 Project management
	MAN.4 Quality management
A	MAN.5 Risk management
A	MAN.6 Measurement



Engineering Process Group (ENG)	
A	ENG.1 Requirements elicitation
A	ENG.2 System requirements analysis
A	ENG.3 System architectural design
A	ENG.4 Software requirements analysis
A	ENG.5 Software design
A	ENG.6 Software construction
A	ENG.7 Software integration
A	ENG.8 Software testing
A	ENG.9 System integration
A	ENG.10 System testing
	ENG.11 Software installation
	ENG.12 Software and system maintenance

Supporting Process Group (SUP)	
A	SUP.1 Quality assurance
A	SUP.2 Verification
	SUP.3 Validation
A	SUP.4 Joint review
	SUP.5 Audit
	SUP.6 Product evaluation
A	SUP.7 Documentation
A	SUP.8 Configuration management
A	SUP.9 Problem resolution management
A	SUP.10 Change request management

The Acquisition Process Group (ACQ)	
	ACQ.1 Acquisition preparation
	ACQ.2 Supplier selection
A	ACQ.3 Contract agreement
A	ACQ.4 Supplier monitoring
	ACQ.5 Customer acceptance
A	ACQ.11 Technical requirements
A	ACQ.12 Legal and administrative requirements
A	ACQ.13 Project requirements
A	ACQ.14 Request for proposals
A	ACQ.15 Supplier qualification

Resource & Infrastructure Process Group (RIN)	
	RIN.1 Human resource management
	RIN.2 Training
	RIN.3 Knowledge management
	RIN.4 Infrastructure

Operation Process Group (OPE)	
	OPE.1 Operational use
	OPE.2 Customer support

Supply Process Group (SPL)	
A	SPL.1 Supplier tendering
A	SPL.2 Product release
	SPL.3 Product acceptance support

Process Improvement Process Group	
	PIM.1 Process establishment
	PIM.2 Process assessment
A	PIM.3 Process improvement

Reuse Process Group (REU)	
	REU.1 Asset management
A	REU.2 Reuse program management
	REU.3 Domain engineering

A Automotive-SPICE

not included in ISO/EC 15504

HIS (VW, Audi, BMW, Porsche, D&C)

FIAT

FORD



The 'Metrication' issue

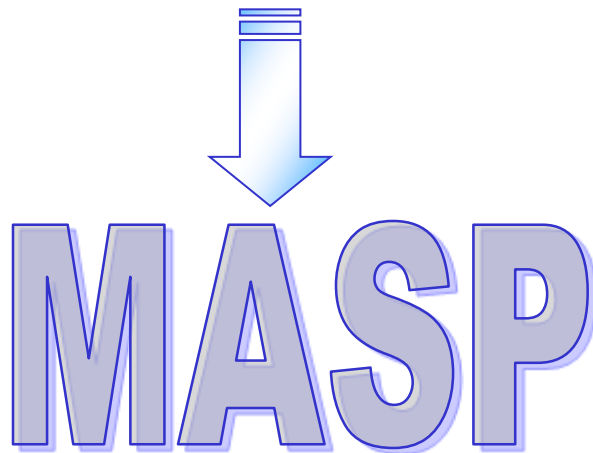
- ✓ Started a discussion within the Automotive SPICE Assessors & Improvers Working Group (ASAI) in mid-2009
- ✓ Nowadays MAN.6 process is not included in typical A-SPICE appraisals, losing a plenty of information about project monitoring that MAN.3 cannot assure and provide

The 'Metric Cards' document

- ✓ www.semq.eu/pdf/top10-metrics.pdf

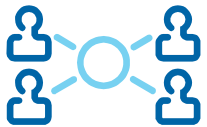
What about Automotive?

- ✓ Need to be more domain-focused
- ✓ Expression of interest for a new WG



3.6 SDR – Software Defect Rate

Measure Name	SDR – Software Defect Rate	ISO/IEC 15504	MAN.3 MAN.4
Purpose	To measure the quality of software product/item in terms of number of defects against its product size unit.		
Entity	Product	Attribute	Defectability
SLC phase where applied	Release phase		
Unit of Measure(s)	Defect <i>NOTE 1:</i> there are several ways and criteria for classifying defects, E.g. by severity/priority, or by typology, by origin, etc. <i>NOTE 2:</i> "a problem which, if not corrected, could cause an application to either fail or to produce incorrect results" (ISO/IEC 20926:2003 Software engineering -- IEPUG 4.1 Unadjusted functional size measurement method -- Counting practices manual)		
Measurement Scale	Ratio		
Counting rule	To calculate the ratio between the number of defects (delivered or discovered) and its product size (according to the product size unit used in the project monitoring). <i>NOTE:</i> for benchmarking purposes, it is suggested to split the values (both in the upper and lower part of the formula) according to the nature of the requirements originating them (functional; non-functional). If not done, the risk is to obtain higher values than expected.		



• Expression of Interest

- ✓ Kick-off meeting: April 2011
- ✓ 26 people expressed their interest in participating to MASP
- ✓ 12 people actively working on Metrics Cards

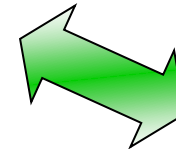
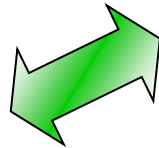
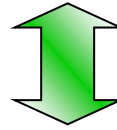
• The current working group participants

- ✓ Luigi **Buglione** (Engineering.IT – *coordinator*)
- ✓ Concetta **Argiri** (TXT Group)
- ✓ Roberto **Bagnara** (Univ. Parma/Bugseng Srl)
- ✓ Marina **Borghi**
- ✓ Demetrio **Cortese** (IVECO)
- ✓ Domenico **Di Leo** (Univ. Napoli – Federico II)
- ✓ Lorenzo **Falai** (Resiltech)
- ✓ Mario **Fusani** (CNR-ISTI)
- ✓ Giuseppe **Lami** (CNR-ISTI)
- ✓ Leonardo **Ricci** (Magnetis Marelli)
- ✓ Francesco **Rossi** (Resiltech)
- ✓ Isabella **Ruocco** (Magnetis Marelli)



The MASP project

The way we're working (When, Where & How)



2011-04

2011-12



2012-06





Measure Name	OCC - Memory occupation	ISO/IEC 15504	ENG.6
Purpose	To track project progress by ROM and RAM occupation in order to document resources consumption and monitor consumption targets.		
Entity	Resource	Attribute	Maintainability
SLC phase where applied	Implementation		
Unit of Measure(s)	Kbyte		
Measurement Scale	Ratio		
Counting rule	To calculate the ratio between the memory occupied and the overall memory available (ROM, RAM)		
Formula	$OCC = \frac{\sum_0^n var}{SIZE}$		
Responsible for Gathering Data	<ul style="list-style-type: none"> • Software developer 		
Gathering frequency	<ul style="list-style-type: none"> • At each software development 		

MEC - Metric Cards		
Id	Title	ISO/IEC 15504
CDRE	Company Defect Removal Efficiency	ENG.8, ENG.10
RDR	Rule Deviation Rate	ENG.5, ENG.6
SDR	Software Robustness Distribution	ENG.5, ENG.6
ENC	Engineering non Conformance	SUP.1
IFC	Information Flow Complexity	ENG.6
PSM	Product Software Modification	ENG.6, MAN.3
REI	Reliability Index	MAN.3, MAN.5
RES	Requirement Stability	ENG.1, ENG.4
WPU	Work Product Usage	PA2.2, PA3.2, PA4.2, PA5.2
CRE	Change Request Effort	MAN.3, SUP.10
OCC	Memory Occupation	ENG.6
CBO	Avg of Coupling Between Objects	SUP.1
CTA	Class Type Attributes	SUP.1
EXC	External Calls	SUP.1
CC1	McCabe Cyclomatic Complexity	ENG.5, ENG.6
SFIN	Structural fan-in	ENG.5, ENG.6
SFOUT	Structural fan-out	ENG.5, ENG.6



• The Value of Measurement

- ✓ Measurement is not a primary, but a support process in most known SPI models (e.g. CMMI, ISO/IEC 15504, etc.). It's not part of Project Management process but a process aside (e.g. MA in CMMI; MAN.6 in ISO/IEC 15504-2, etc.)
- ✓ Measurement must be not a cost, but an investment; measure its ROI in projects, moving from the savings from better estimates during the short-mid term

• Some basic criteria...

- ✓ GQM (Goal-Question-Metric) or some of its variants (GQ(I)M, V-GQM...) represents a starting point for determining measures
- ✓ The '5Ws+H' rule from journalism is a common-sense series of criteria for setting up a measurement program: part of such information (what, why, who, when, where, how) should be part of the 'metric cards' in order to consistently adopt measures across different teams and organization(s)

• The Metrics Cards

- ✓ Each 'metric card' should contain a series of not ambiguous information about the '5Ws+H'
- ✓ Link each measure to 1+ processes, trying to prioritize those ones than can be used jointly in a supply chain logic (more informative value at the same operative cost)
- ✓ The selection of a balanced set of measures across multiple viewpoints and measurable entities can help in having a more affordable and real picture of the organization
- ✓ Measure few, measure well: the [BMP technique](#) can help in this!

• The MASP project

- ✓ A new Automotive SPIN Italy working group [Apr-2011; May/June 2012]
- ✓ Current progress: c.a. 60%
- ✓ To-Do: **(1)** refine current cards; **(2)** add few new cards; **(3)** balanced set; **(4)** write a final A-SPIN document; **(5)** validate measures



Thanks for your attention!
Grazie per la vostra attenzione!