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**What drives SPI? Results of a survey in the
global Philips Organization**

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Structure of the presentation:

- Objectives of the survey
- Survey demographics, structure and background
- Results of the survey
- Conclusions

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Objectives of the survey

Answers to questions:

- What is the current situation regarding SPI in Philips, e.g. CMM levels)?
- What are targets and what are drivers for SPI?
- Which metrics are used in the software groups?

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Survey demographics - 1

Continent	Number of software groups
Europe	32
Asia	8
America	9
Total	49

Distribution of responding software groups over the continents

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Survey demographics - 2

CMM- level	Numbers of software groups	Cumulative percentage
1	20	Ca 40
2	13	Ca. 67
>= 3	13	Ca. 93
Missing	3	
Total	49	

Numbers of software groups on the different CMM levels

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Structure of the survey

- Attempted and achieved SPI targets
- Improvement drivers of SPI programs
- The role of measurement and metrics

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Background of the survey - 1

SPI targets (Philips SPI Steering Committee, 2003):

- Increase predictability
- Reduce defects
- Increase productivity
- Reduce lead time
- Improve cooperation
- Improve staff motivation
- Increase reusability

Questions:

- attention aimed at a target?
- improvement established regarding a target?

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Background of the survey - 2

SPI improvement drivers (from literature):

- Commitment related (e.g. business, engineering, development)
- Goal Orientation related (e.g. sense of urgency, business-SPI goals, confidence)
- Resources related (e.g. availability of engineers, training, tooling)
- Project related (e.g. improvement targets, use of framework, visibility of intermediate project results)

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Results of the survey-1

Average scores of improvement targets on different CMM levels

Improvement target	Attention spent			Performance realised		
	cmm1	cmm2	cmm345	cmm1	cmm2	cmm345
increase predictability	3,92	4,11	4,45	2,75	3,22	3,64
reduce defects	3,5	3,67	4,27	2,42	3,33	2,82
increase productivity	3,33	2,33	3,18	2,67	2	2,82
reduce lead time	3,08	2,67	2,82	2,33	1,89	2,09
improve cooperation	3,08	2,89	2,36	2,58	2,11	2,73
improve staff motivation	2,25	2,67	2	2,25	2,67	2,55
increase reusability	1,92	2	2,09	1,75	2	1,73

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Average scores of improvement targets on different CMM levels

Two targets that get more then average *attention* in the Philips software groups:

- Increase predictability
- Reduce defects

Only with regard to the target:

- Increase predictability

the *performance obtained* was above average

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Results of the survey-2

Average scores of improvement drivers on different CMM levels

Improvement driver	all	cmm1	cmm2	cmm345
commitment of engineering management	4,09	3,83	4	4,73
commitment of development staff	3,82	3,75	3,89	4
sense of urgency	3,51	3,5	3,33	3,5
commitment of business management	3,40	3,42	3,56	3,64
availability of qualified SPI resources	3,36	3,25	3,11	4
availability of engineers time for SPI	3,33	3,33	3,56	2,91
clear relation between SPI goals and business goals	3,24	2,83	3,78	3,36
clear and quantifiable improvement targets	3,19	2,83	3,22	3,64
use of accepted framework such as CMM	3,18	2,92	3,56	3,73
confidence in SPI results	3,07	3	2,78	3,45
visibility of intermediate results	2,96	3,08	2,89	3,18
proper tooling to support the processes	2,93	2,67	3,11	3,09
sufficient investment in SPI training	2,89	2,5	2,33	3,64
cooperation other engineering disciplines	2,58	2,25	2,78	2,45
integration of SPI in general improvement activities	2,44	1,92	2,89	2,45

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- ### Average scores of improvement drivers on different CMM levels
- Significant scores:
- Commitment category:
 - Commitment of engineering management
 - Goal orientation category:
 - Clear relation between SPI goals and business goals
 - Clear and quantifiable targets
 - Resources category:
 - Sufficient investment in SPI training
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Results of the survey-3

Percentage of software groups on the different CMM levels
having in place three aspects of measurement

Aspects of measurement	all	cmm1	cmm2	cmm345
SPI program	69,6%	45,0%	84,6%	92,3%
Formal measurement program	51,1%	26,3%	38,5%	100,0%
SW process database	47,8%	25,0%	30,8%	100,0%

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Software groups on the different CMM levels having in place aspects of measurement

- Software groups that perform on higher levels than CMM level 2 have extreme high scores on the three aspects of measurement
- However, even a quite high percentage of software groups on the lower CMM levels are active with in particular:
 - A formal SPI program (highest scores)
 - Formal measurement program
 - SW process database

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Results of the survey-4

actual usage of metrics on the different CMM levels

Metrics	all	cmm1	cmm2	cmm345
actual effort spending	82,2%	57,9%	100,0%	100,0%
lead time	71,1%	57,9%	69,2%	92,3%
Size	68,9%	63,2%	53,8%	92,3%
schedule metrics	44,4%	21,1%	38,5%	84,6%
staff competence level	44,4%	31,6%	38,5%	69,2%
staff attrition	43,2%	31,6%	53,8%	50,0%
fault density pre-release	37,8%	31,6%	7,7%	76,9%
test coverage % requirements related	35,6%	42,1%	15,4%	46,2%
fault density post-release	33,3%	21,1%	15,4%	69,2%
fault severity distribution	33,3%	31,6%	7,7%	61,5%
cumulative failure profile	33,3%	31,6%	7,7%	61,5%
test coverage % code related	28,9%	26,3%	15,4%	46,2%
re-use metrics	18,2%	15,8%	23,1%	16,7%
mean time to failure	13,3%	15,8%	0,0%	23,1%
time to spec	13,3%	10,5%	23,1%	7,7%
requirements metrics	13,3%	10,5%	7,7%	23,1%
cyclomatic complexity	0,0%	0,0%	0,0%	0,0%

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- ### Actual usage of metrics on the different CMM levels
- Regarding all software groups, only 3 metrics have a score => 50%:
 - Actual effort spending
 - Lead time
 - Size
 (→ little consensus about metrics that should be used)
 - However: regarding software groups on the higher levels 10 metrics have a score => 50%
 - (→ more consensus about metrics that should be used)
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Results of the survey-5

Collected data from two perspectives

Data	all	cmm1	cmm2	cmm345
data are reliable at holding level	39,0%	23,5%	27,3%	69,2%
are data validated	41,9%	23,5%	23,1%	84,6%

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Quality of collected data

- Mainly at the higher CMM levels a quite high percentage of software groups are convinced of the quality of the data collected
- Remarkable is the lack of data quality in the lower level software groups, in particular regarding the statement of a large number of these groups, that they have in place a formal SPI program and measurement program (see table: results of the survey-3)

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Results of the survey-6

Software groups that evaluate their projects

Percentages of project evaluations	Number of software groups
0 - 25 %	8
25 - 50 %	7
50 - 75 %	8
75 - 100 %	26
Total	49

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Software groups that evaluate their projects

- Formal project evaluations seem to be a normal way of working:
 - A quite high number of the software groups (26 out of 50) are doing evaluations in more than 75% of their software projects
 - A very strong increase of project evaluations has been found in software groups that perform on the higher CMM levels!

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Results of the survey-7

Usage of metrics

	all	cmm1	cmm2	cmm345
metrics guide SW development	69,8%	52,9%	61,5%	100,0%

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Usage of metrics

- In average two thirds of software groups do use metrics
- CMM level 1 software groups show a surprisingly high percentage
- CMM level 3, 4, 5 software groups all use metrics!

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Conclusions

- The usage of metrics by CMM level 2 and level 3,4,5 software groups is clearly in line with their SPI objectives
- CMM level 2 software groups focus more on project management metrics. Level 3, 4, 5 groups add to this product metrics
- Software groups on higher levels are making significantly more use of metrics
- Most important drivers for SPI are 'commitment' drivers, in particular 'engineering management commitment' drivers

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