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The global and independent source
of data and analysis for the IT industry

IMPROVE YOUR ESTIMATION MATURITY

USING FUNCTIONAL SIZE MEASUREMENT AND INDUSTRY DATA

IT Confidence 2017, Beijing

20th September 2017

Harold van Heeringen, ISBSG President

INTRODUCING ME

- Drs. Harold van Heeringen, Senior Consultant ADM Benchmarking at METRI.
  - International Software Benchmarking Standards Group (ISBSG) – President
  - Netherlands Software Metrics Association (NESMA) – board member
  - Common Software Measurement International Consortium (COSMIC) - Dutch representative in the International Advisory Council (IAC)
  - Dutch Association for Cost Engineers (DACE) – working group parametric analysis
  - ICEAA trainer of CEBoK chapter 12: Software Cost Estimation
  - Speaker at many conferences on software measurement, estimation and benchmarking

OVERVIEW

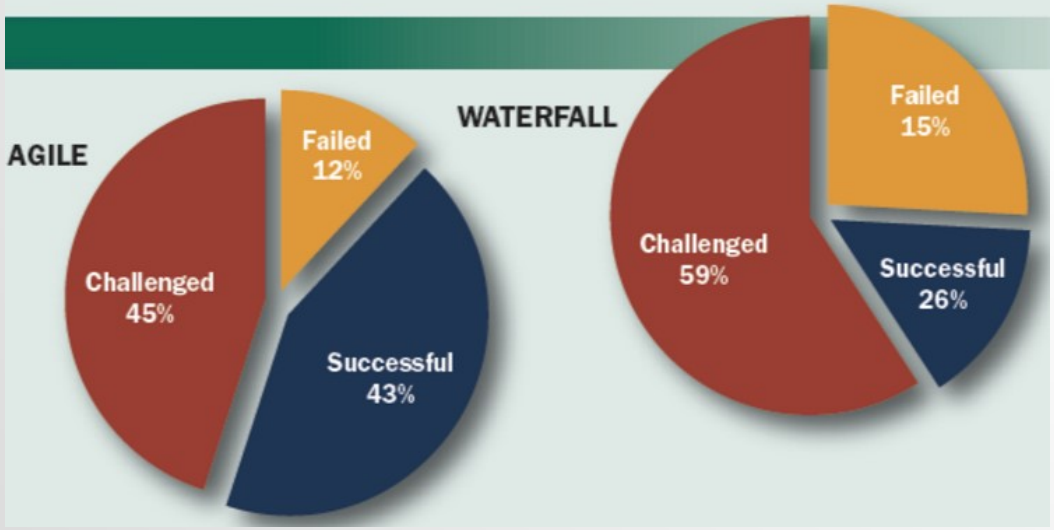
- Software Industry estimation maturity
- Results of low maturity estimation processes
- Estimation Maturity Model
- Formal Sizing: Function Point Analysis (FPA)
- Software estimation using function point analysis (FPA)
- ISBSG Historical data
- Example Estimate

SOFTWARE PROJECT SUCCESS RATES

MODERN RESOLUTION FOR ALL PROJECTS

	2011	2012	2013	2014	2015
SUCCESSFUL	29%	27%	31%	28%	29%
CHALLENGED	49%	56%	50%	55%	52%
FAILED	22%	17%	19%	17%	19%

The Modern Resolution (OnTime, OnBudget, with a satisfactory result) of all software projects from FY2011–2015 within the new CHAOS database. Please note that for the rest of this report CHAOS Resolution will refer to the Modern Resolution definition not the Traditional Resolution definition.



Over time, the number of successful software projects remains low!

About 30% is successful

About 50% is challenged (overruns, not delivering full value)

About 20% Fails!

Agile projects perform better, but still 59% Challenged and 15% Fails!

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US SOFTWARE PROJECTS CA. 2016

- As can be seen schedule delays and cancelled projects are distressingly common among all forms of software in 2016. This explains why software is viewed by most CEO's as the **least competent and least professional form of engineering** of the current business world.

	Table 1: Outcomes of U.S. Software Projects Circa 2016			
	Application Types	On-time	Late	Canceled
1	Scientific	68.00%	20.00%	12.00%
2	Smart phones	67.00%	19.00%	14.00%
3	Open source	63.00%	36.00%	7.00%
4	U.S. outsource	60.00%	30.00%	10.00%
5	Cloud	59.00%	29.00%	12.00%
6	Web applications	55.00%	30.00%	15.00%
7	Games and entertainment	54.00%	36.00%	10.00%
8	Offshore outsource	48.00%	37.00%	15.00%
9	Embedded software	47.00%	33.00%	20.00%
10	Systems and middleware	45.00%	45.00%	10.00%
11	Information technology (IT)	45.00%	40.00%	15.00%
12	Commercial	44.00%	41.00%	15.00%
13	Military and defense	40.00%	45.00%	15.00%
14	Legacy renovation	30.00%	55.00%	15.00%
15	Civilian government	27.00%	63.00%	10.00%
	Total Applications	50.13%	37.27%	13.00%

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IMPACT

- Deliver too late: losing business.
- Fail/stop: loss of time, money, business and still no solution for the problem that needed to be solved.
- Waste of resources that could have been deployed successfully otherwise.

Failing IT projects cost the Dutch government 7 billion USD per year

Projects > 10 million USD only 7% succeeds.

In total, only 30% of IT projects are successful.

These are tax dollars and one of the reasons the whole country was in recession for years.

'Falende ICT kost overheid miljarden'

25-04-2014 11:42 | Door Pim van der Beek | Er zijn 41 reacties op dit artikel | Permalink

'De Nederlandse overheid raakt elk jaar vier tot vijf miljard euro kwijt aan ict-projecten die mislukken. Vooral met de grote technologieprojecten gaat het mis. Van die projecten - vanaf een budget van 7,5 miljoen euro - slaagt maar 7 procent. Van alle projecten bij elkaar is 30 procent succesvol.' Dat zei hoogleraar beleidsinformatica en directeur van Venture Informatisering Adviesgroep nv (VIAgroep) Hans Mulder tijdens de eerste bijeenkomst van de tijdelijke ICT-Comissie van de Tweede Kamer die onderzoek doet naar ict-projecten binnen de overheid.

Volgens Mulder mislukt ruim een derde van de grote projecten (36 procent) zodanig dat het nieuwe systeem nooit in gebruik wordt genomen en ruim de helft (57 procent) wordt betwist. Dat betekent bijvoorbeeld dat het butget wordt overschreden, de ict-oplossing te laat wordt opgeleverd of anders wordt dan aanvankelijk was gepland. Van alle projecten bij elkaar faalt een kwart en wordt 46 procent betwist.

Het gaat volgens Mulder om ruwe schattingen. Hij ziet de situatie wel verbeteren, tien jaar geleden ging de Rekenkamer volgens hem nog uit van schattingen van zo'n zes miljard euro per jaar. Ook vinden er meer ict-trajecten plaats in vergelijking met de situatie zo'n tien jaar geleden.

'Kleinere projecten in plaats van doormodderen'

Volgens Mulder is de verspilling van overheidsgeld aan ict vergelijkbaar met andere Europese landen. 'Als er een top-tien zou zijn van redenen waarom projecten falen, dan gaan de eerste drie over mensen en niet over de technologie zelf', aldus Mulder. 'Zo loopt de communicatie en het management eerder mis als er meer partijen bij zijn betrokken. De projecten van de overheid zijn per definitie groot, omdat die vaak voor veel burgers bestemd zijn.'

'De projecten zijn ook echt ingewikkeld en leveranciers onderschatten dat nogal eens', legde hij de kamer-commissie voor. Mulder pleit onder andere voor kleinere projecten. 'Die zijn ook makkelijker te stoppen als het misloopt. Bij grote projecten moet de overheid vaak doormodderen', zei hij volgens persbureau ANP.

bekijk reacties (41) | print | stuur door

Dé cloud bestaat niet.

Dé cloud bestaat niet. Advertorial

Sogeti geniet het vertrouwen van top 500 organisaties, waaronder PostNL. Sogeti helpt ook u graag met concrete cloudoplossingen. Van een stapsgewijze aanpak tot de meest vergaande cloud-only strategie. Ontdek dat dé cloud niet bestaat. Bezoek de Sogeti Cloud Cases.

REASONS

- Many people think the main reason is poor project management.
- This may be true to some point…
- However, an important reason is also: **Low Estimation Maturity!**

- Low estimation maturity result in poor (optimistic) estimates
- Poor estimates result in optimistic expectations:
  - Team too small
  - Duration too short
  - Budget too low

- **Low estimates result in disaster !!**

- **And the industry even enforces this by selecting the cheapest proposal, not the most realistic one!**

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LOW INDUSTRY MATURITY IN SOFTWARE ESTIMATION

- **Software industry: low maturity in performance measurement and estimation**
- Estimation and Performance Measurement processes are not targeted to software development and/or maintenance. Mostly financial metrics are used to measure performance.
- Organizations **don't know the size of their applications** and of their software portfolio.
- Organizations **don't know** if the **cost** spent on AD and AM is in line with industry averages.
- Organizations **don't know** their **productivity.**
- Organizations **don't know** their **time-to-market.**
- Organizations **don't know** their **cost efficiency.**
- Organizations **don't know** the **quality** of their software products.
- Result: Organizations don't know their **capability** compared to industry peers when it comes to **productivity, time-to-market, cost efficiency and quality**. They are not able to understand where they need to improve and not able to control process improvement.

RESULTS

- Organizations don't know their **capability** compared to industry peers when it comes to productivity, time-to-market, cost efficiency and quality. **They are not able to understand where they need to improve and not able to control process improvement**.
- But Application Development is becoming more and more important for organizations as delivering new software functionality fast becomes more and more a driver for business. **Increasing performance is sometimes crucial for survival!**

SOFTWARE ESTIMATION MATURITY

- **Software industry: low maturity**
  - Low estimation maturity
  - No or little formal estimation processes → 'expert estimates'
  - No or little use of historical data → 'experience'
  - Customers chose suppliers based on price, not reality
    - Immature project estimation techniques results in low estimates
    - Unrealistic optimism results often in complete failure!

- **Lots of schedule and cost overruns**
  - Standish Chaos reports: Many projects fail or are at least unsuccessful
  - No learning of mistaken, failing over and over again

- **Low customer satisfaction rates**
  - In Europe: only slightly higher than the financial sector

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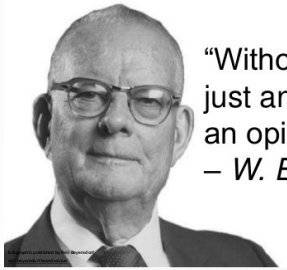
RESULTS OF LOW ESTIMATION MATURITY



"Without data you're just another person with an opinion."
– W. Edwards Deming

- **Many projects are not estimated in a professional way**
  - Only expert estimates, no use of estimation models / historical data
  - No use of standards, instead unstandardized methods like Story Points.
  - No use of data based on standards.
- **Underestimation results in bad planning**
  - Development team too small
  - Duration too short
  - Unrealistic milestones
  - Project management with no grip on the project
  - Extra management attention, more meetings
  - Stress in the team → bad quality → more effort
  - Bad software, low maintainability, hard and costly to adapt to the changing world.

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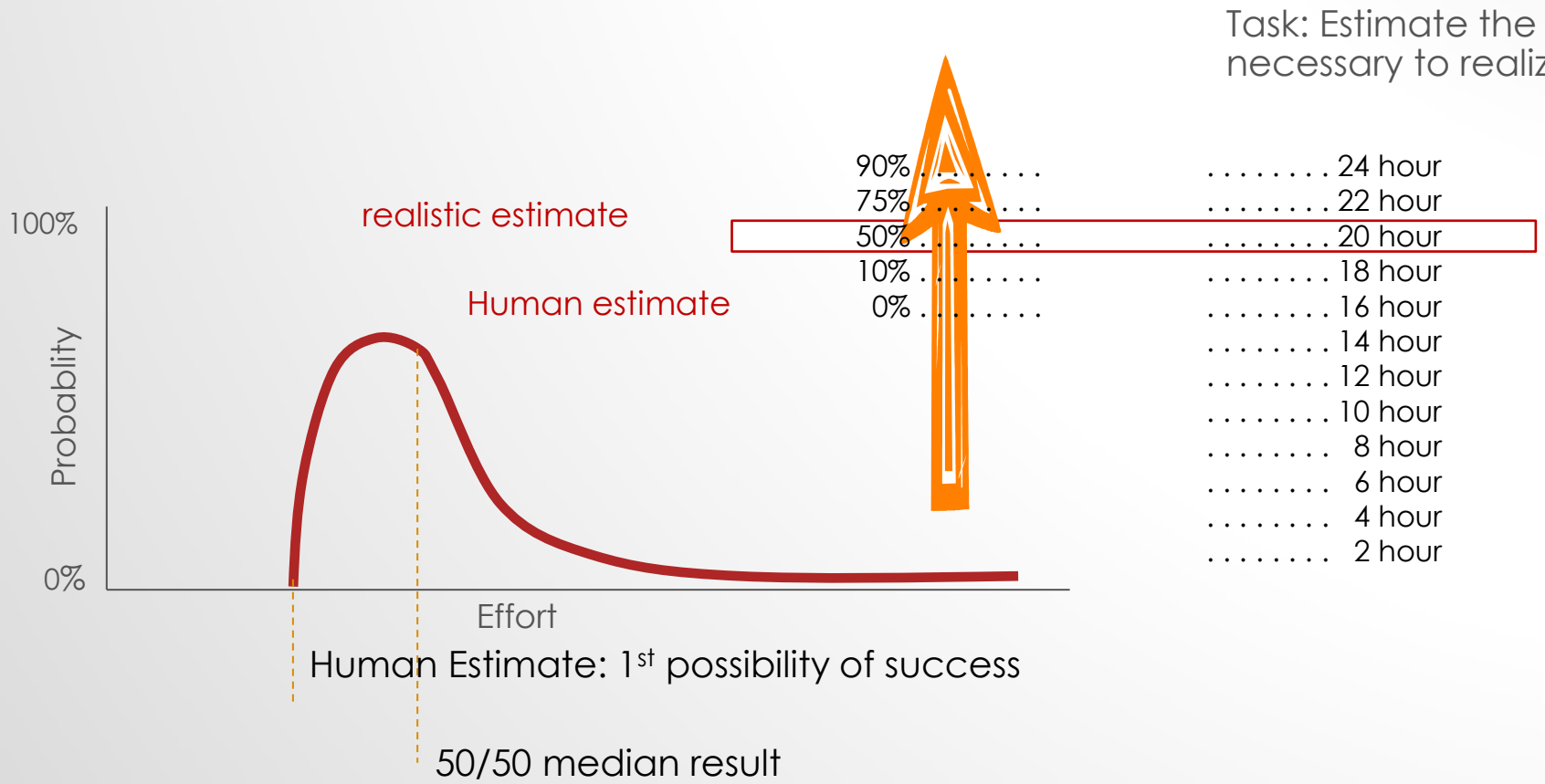
HUMAN/EXPERT ESTIMATES

- Humans ae optimistic by nature
- Experts estimates are on average 30% optimistic!



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REALISTIC ESTIMATES

A realistic estimate is one of the most important **conditions** for a successful project.

The estimate is the basis for:

- Business case;
- Planning;
- Proposal (outsourcing: fixed price / date);
- Financial result of the project… and the organization;
- Claiming and releasing of resources;
- Alignment between IT and business / customer;
- Progress reports / dashboards;
- The feeling of the team and the stakeholder.

Without a realistic estimate, the project is **likely to fail**!

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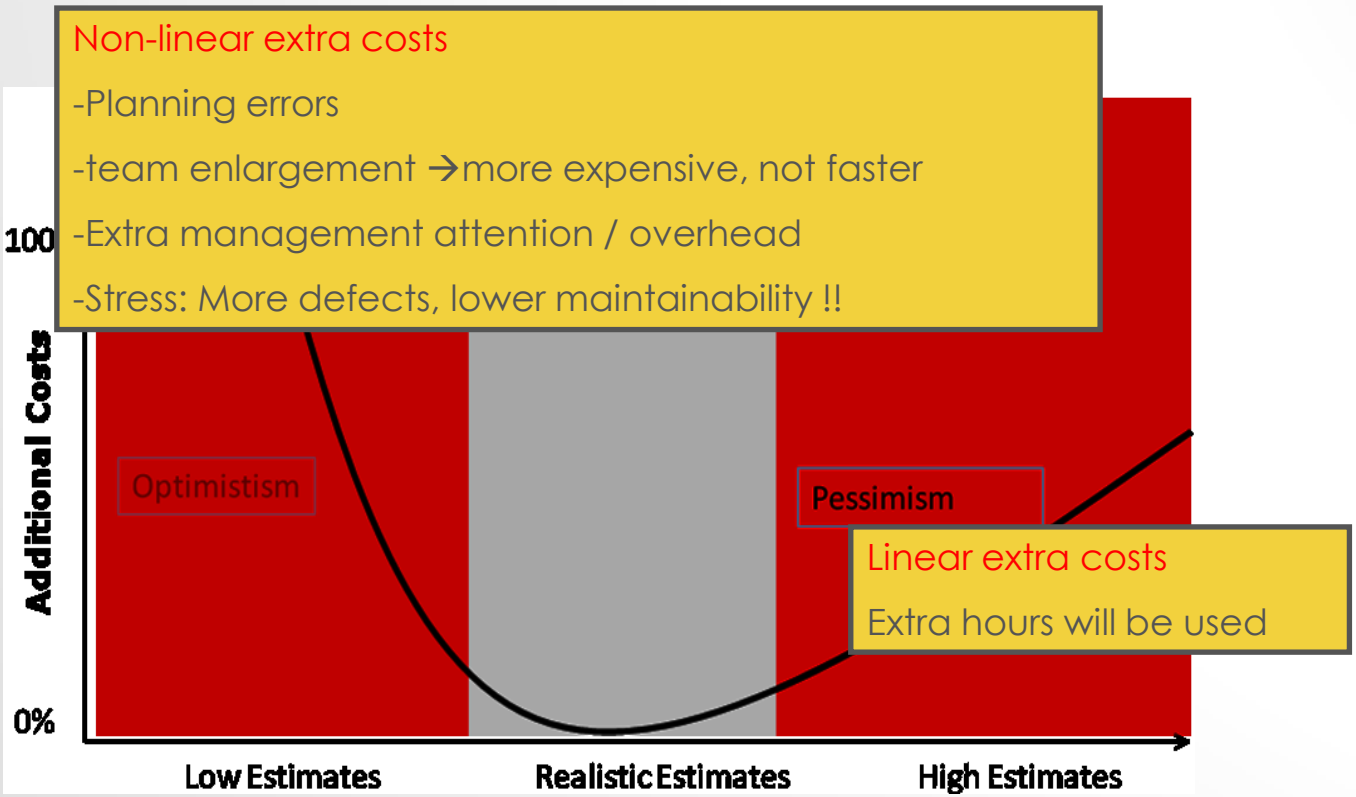
LOW/HIGH ESTIMATES



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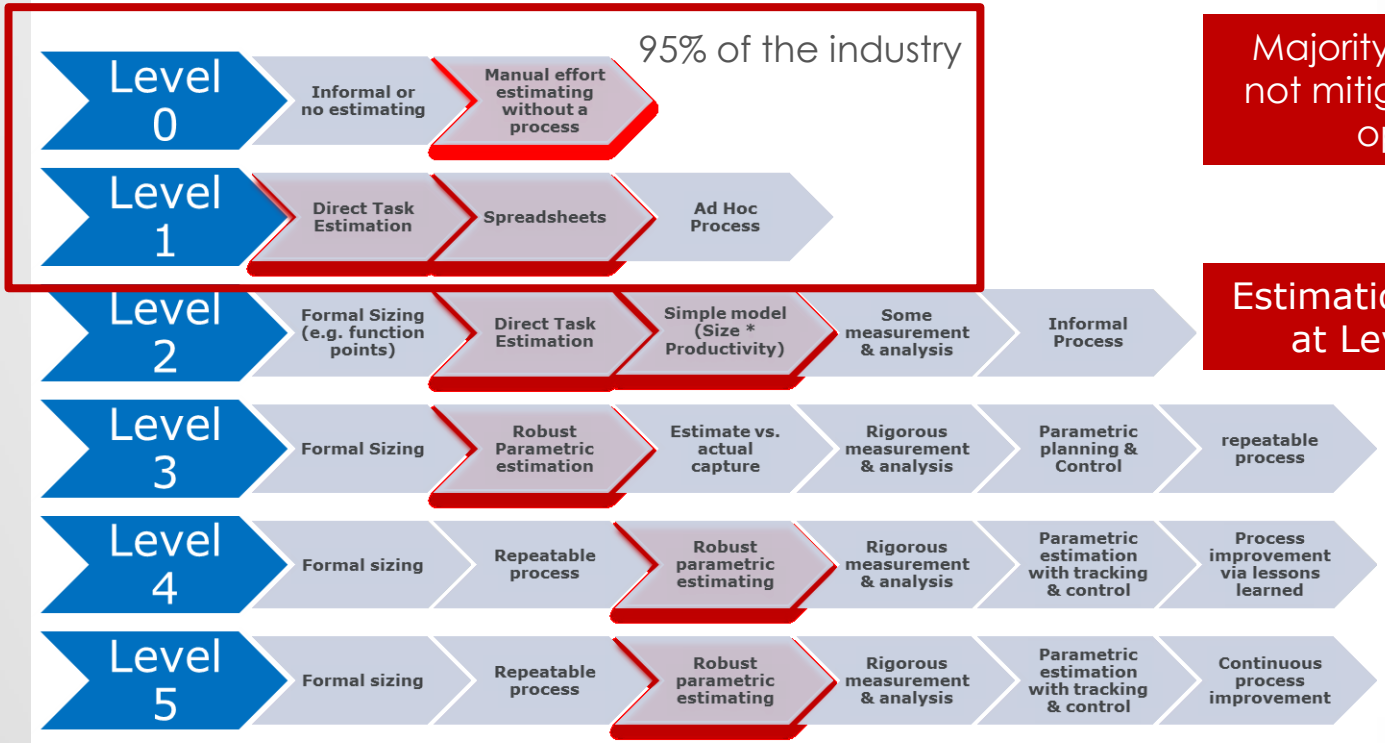
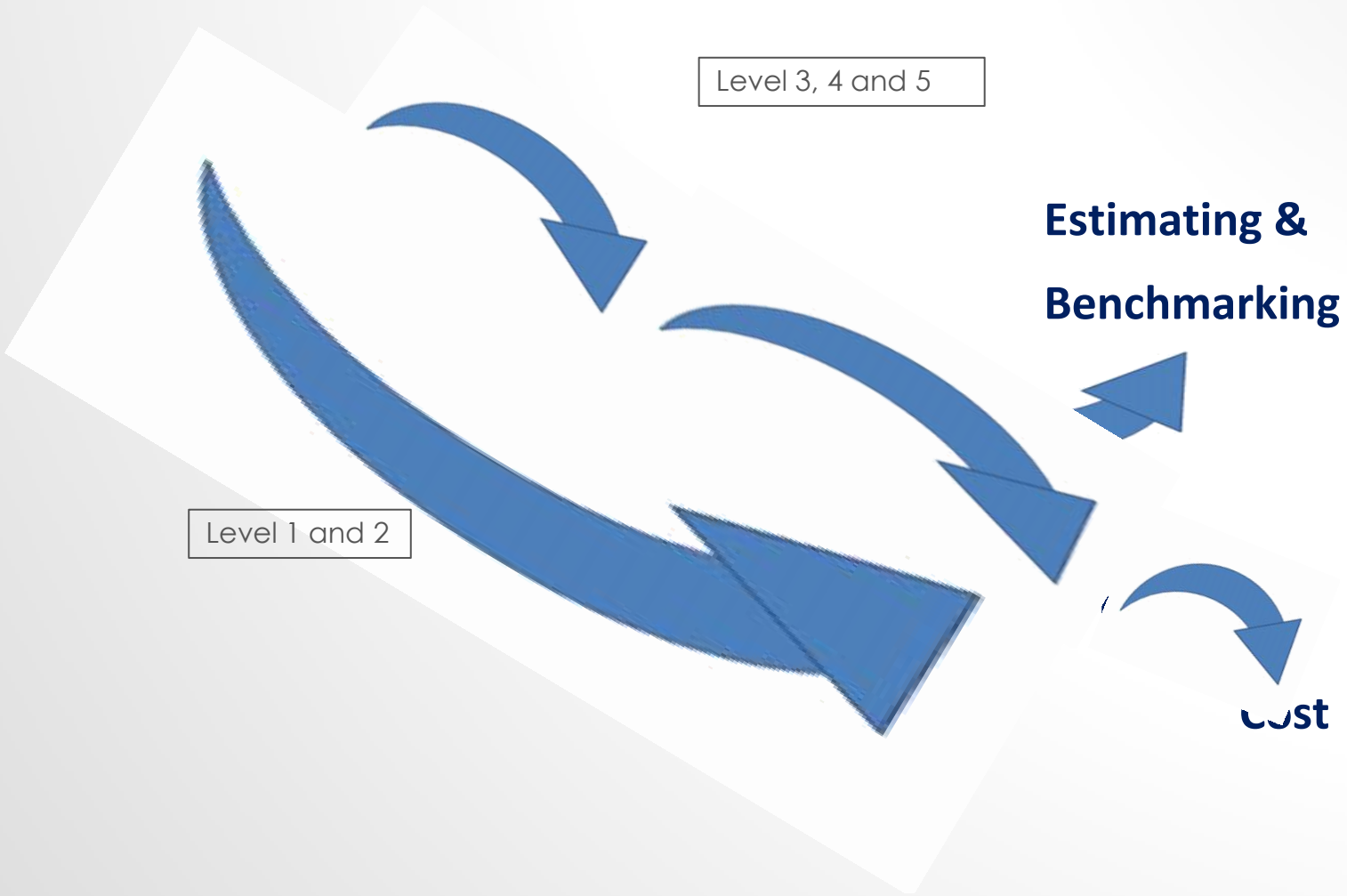
ESTIMATION MATURITY MODEL*



Majority of software projects are not mitigated for bias, resulting in optimistic estimates.

Estimation Bias Mitigation Begins at Level 2, Solid at Level 3

2 WAYS TO ESTIMATE



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LEVEL 1 AND 2 ESTIMATES: HUMAN (EXPERT) ESTIMATES

- Bottom-up , assign effort hours to work items, based on expert knowledge and experience
- Humans are optimistic! Always! Even when they know they are!
- **Advantages:**
  - Always possible to do and relatively easy;
  - Experts 'see the bears'.

Result: expert estimates are optimistic, on average 30% underestimation.

- **Disadvantages:**
  - Forgotten activities (e.g. testscript reviews. …);
  - No good foundation of the estimate, very subjective, not based on data;
  - 'Easy' to push back: 'That's too expensive. Can't you do it faster?'
  - The expert is not going to de all the work (who will ?);
  - How expert is the expert? (projects are unique);
  - Experts don't take into account duration, team size, etc.;
  - Experts don't assess the reality value, no real use of history.

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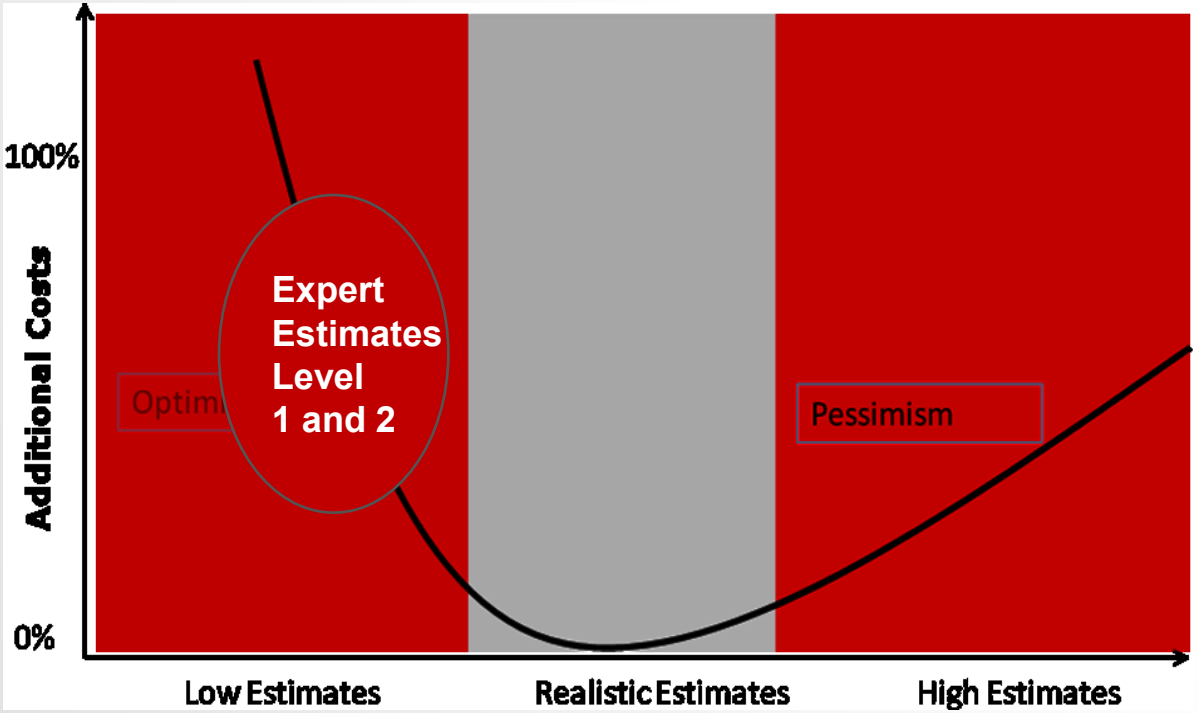
EXPERT ESTIMATES: LEVEL 1 AND 2 MATURITY



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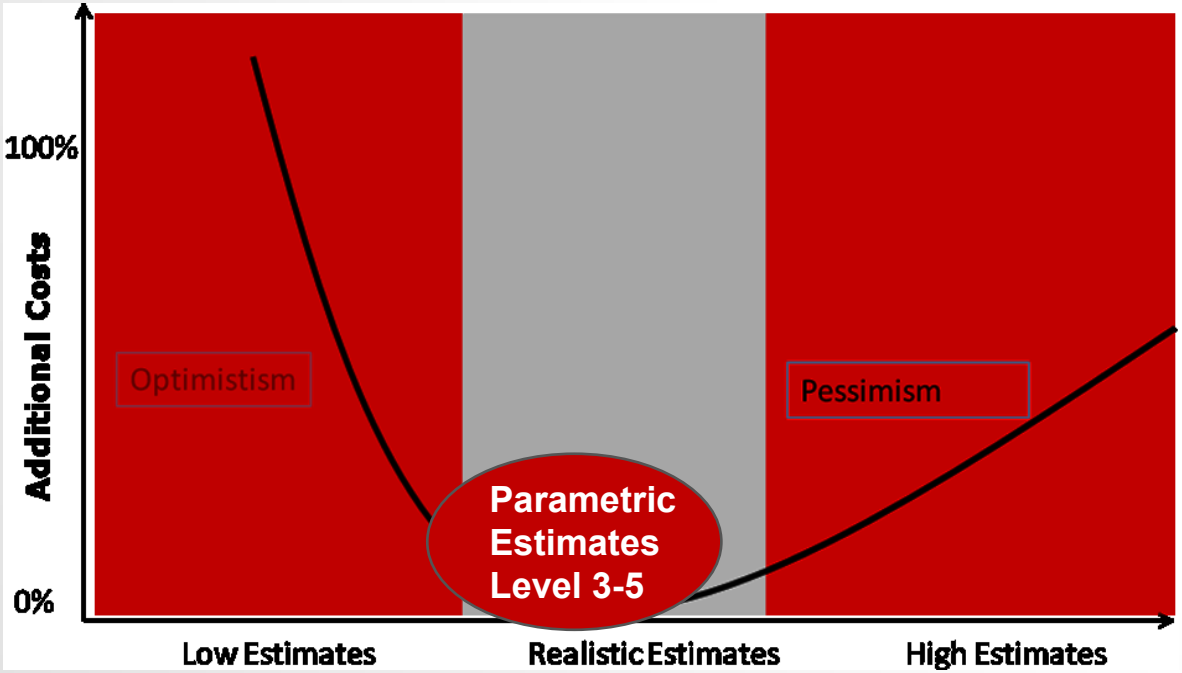
PARAMETRIC ESTIMATES: LEVEL 3,4 AND 5 MATURITY



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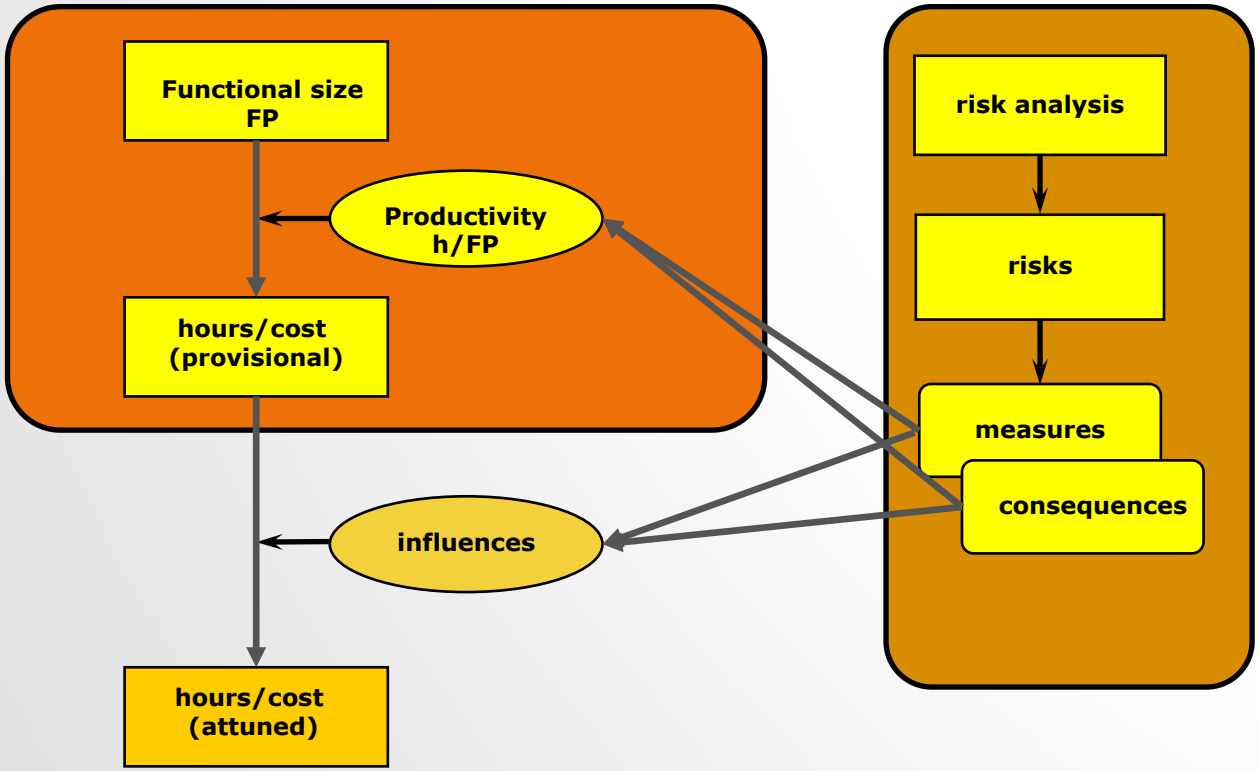
BASIC PARAMETRIC ESTIMATION MODEL



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FUNCTIONAL SIZE MEASUREMENT

- **Functional** - What the software should be able to do (functionality)
- **Size** - expressed in a number
- **Measurement** - based on an objectively described method

- Functional Size Measurement Standard: ISO/IEC 14143
- Something intangible like software functionality becomes a physical number that can be used for calculation and estimation!

nesma

ISO/IEC 24570:2005

INTERNATIONAL FUNCTION POINT USERS GROUP

ISO/IEC 20926:2009

COSMIC

ISO/IEC 19761:2011

FUNCTION POINT ANALYSIS (FPA)

- Can be used early in the project, when functional requirements are known
- Independent of technical implementation. 500 FP Mobile app = 500 FP Legacy Cobol system
  - Just as a 20 m^2 glass wall = 20 m^2 brick wall
  - Effort to realize the software depends on **productivity**
  - Cost depends on **productivity** and **labor rates**.
- Independent of the systems requirements
- **Objective, verifiable, repeatable, defensible measurement !!**
- More function points means more functionality: value!
- Functional size is the basis for **objective software metrics**:
  - Productivity (Hours spend per FP)
  - Cost Efficiency (Money spend per FP)
  - Time to Market (FP per calendar month)
  - Quality (Defects per 1000 FP)

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INTERNATIONAL SOFTWARE BENCHMARKING STANDARDS GROUP (ISBSG)

- **Independent and not-for-profit;**
- Full Members are non-profit organizations, like China SPI, NESMA, IFPUG, Beijing Kexin Science and Technology Ltd, JFPUG, GUFPI-ISMA, FiSMA, and Swiss-ICT.
- Grows and exploits two open repositories of software data (.xls):
  - New development projects and enhancements **(> 8000 projects**);
  - Maintenance and support **(> 1200 applications**).
- **Everybody can submit project data**
  - Questionnaire on the site / on request (.xls) / online
  - Anonymous
  - Free benchmark report in return
- China SPI is the exclusive data collection and analysis partner of ISBSG in China!

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ISBSG DATA

>8000 rows in Excel, Easy to analyze.

>250 data fields (columns) per project

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D&E Release April 2016

7518 rows

	Rating	Rating	Software Age	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping
ISBSG Project ID	Data Quality Rating	UFP rating	Year of Project	Industry Sector	Organisation Type	Application Group	Application Type	Development Type	Development Platform	Language Type	Primary Programming Language	Count Approach
10046	B	B	2015	Communication	Telecommunications	Business Applicatio	Customer relationsh	Enhancement	Multi	3GL	Java	IFPUG 4+
10109	B	B	2015	Insurance	Insurance;	Business Applicatio	Workflow support &	New Developmen	PC	4GL	.Net	NESMA
10169	B	B	2015	Insurance	Insurance;	Business Applicatio	Workflow support &	Enhancement	PC	4GL	Oracle	NESMA
10305	B	B	2015	Communication	Telecommunications	Business Applicatio	Customer relationsh	Enhancement	Multi	3GL	Java	IFPUG 4+
10317	B	B	2015	Government	Government;	Business Applicatio	Business Applicatio	Enhancement		4GL	.Net	NESMA
10469	B	B	2015	Communication	Telecommunications	Business Applicatio	Stock control & orde	Enhancement	Multi	3GL	Java	IFPUG 4+
10665	B	B	2015	Communication	Telecommunications	Business Applicatio	Stock control & orde	Enhancement	Multi	3GL	Java	IFPUG 4+
10762	B	B	2015	Communication	Telecommunications	Business Applicatio	Customer relationsh	Enhancement	Multi	3GL	Java	IFPUG 4+
10940	B	B	2015	Insurance	Insurance;	Business Applicatio	Workflow support &	Enhancement	PC	3GL	Java	NESMA
11118	B	B	2015	Communication	Telecommunications	Business Applicatio	Logistic or supply pl	Enhancement	Multi	3GL	Java	IFPUG 4+
11230	B	B	2015	Insurance	Insurance;	Business Applicatio	Electronic Data Inte	Enhancement	PC	3GL	Java	NESMA
11318	B	B	2015	Communication	Telecommunications	Business Applicatio	GEO Information M	Enhancement	Multi	3GL	Java	IFPUG 4+
11737	B	B	2015	Communication	Telecommunications	Business Applicatio	Workflow support &	Enhancement	Multi	3GL	Java	IFPUG 4+
11990	B	B	2015	Insurance	Insurance;	Business Applicatio	Electronic Data Inte	New Developmen	PC	3GL	Java	NESMA
12928	B	B	2015	Insurance	Insurance;	Business Applicatio	Workflow support &	Enhancement	PC	4GL	.Net	NESMA
13120	B		2015	Service Industry	Art , Events , Ticketi	Business Applicatio	Document manager	Re-development	PC	3GL	Java	COSMIC
13137	B	B	2015	Communication	Telecommunications	Business Applicatio	Workflow support &	Enhancement	Multi	3GL	Java	IFPUG 4+
13372	B	B	2015	Insurance	Insurance;	Business Applicatio	Web-based Applica	New Developmen	PC	4GL	.Net	NESMA
14138	B	B	2015	Insurance	Insurance;	Business Applicatio	Workflow support &	Enhancement	PC	3GL	Java	NESMA

EXAMPLE

- **ROM Estimate of a 500 FP Java project.**
  - Data Quality: A or B
  - Year of Project > 2012
  - Project Type: Enhancement
  - Primary Programming language: Java
  - Count approach: Nesma or IFPUG

- Further refinement, for instance:
  - Size category
  - Methodology
  - Industry
  - Application type
  - Team size
  - Time pressure (duration)
  - …

	PDR (hours/FP)
Number of projects	166
Minimum	4,2
Percentile 10%	5,3
Percentile 25%	6,8
Median	7,8
Percentile 75%	9,4
Percentile 90%	10,2
Maximum	15,3
Average	7,9

Example: 500 FP Java project ROM Estimate

Reality Zone:
Low (P25): 500 * 6,8 = 3400 hours
Likely(Median): 500 * 7,8 = 3900 hours
High (P75): 500 * 9,4 = 4700 hours

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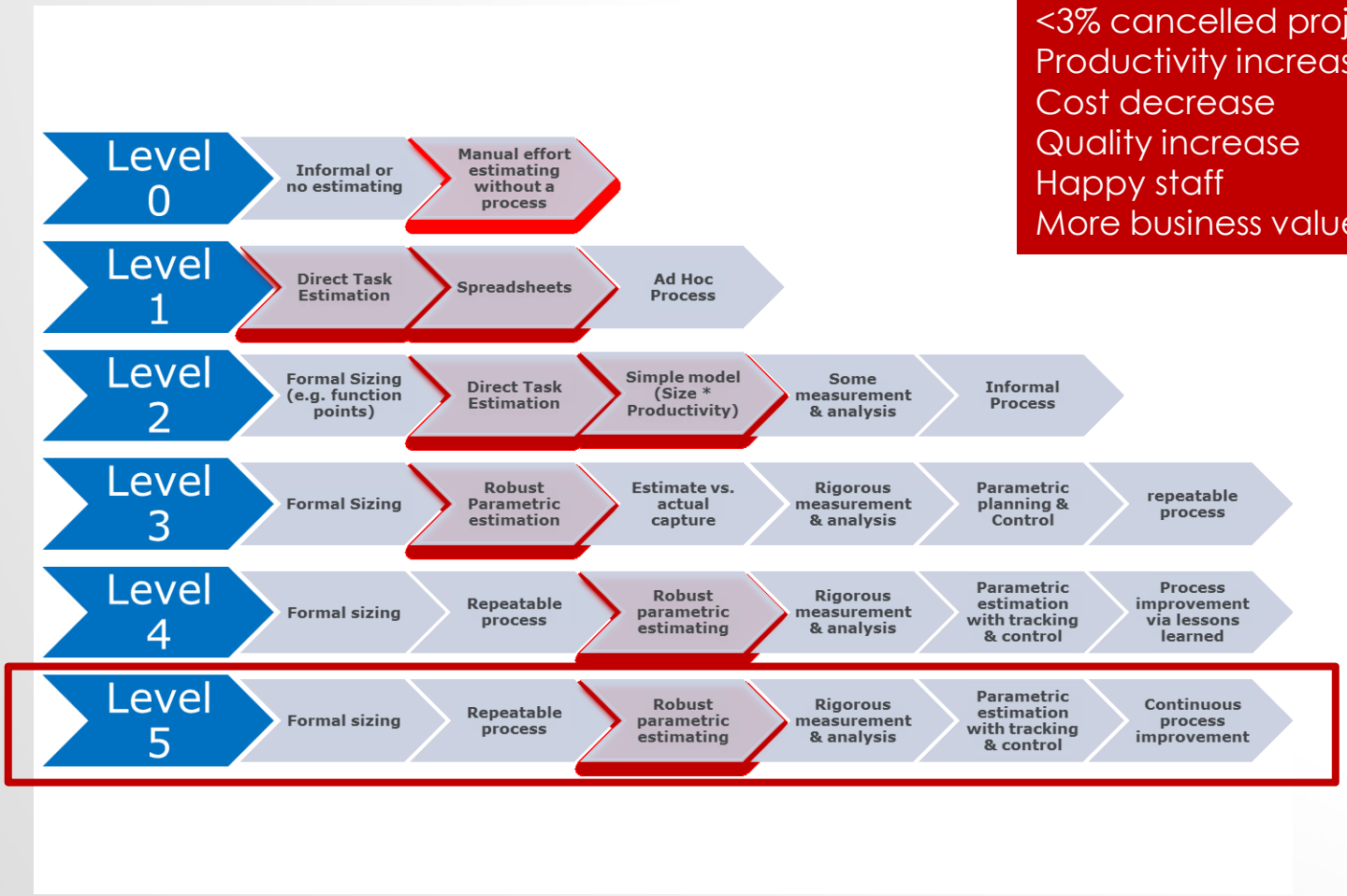
PARAMETRIC ESTIMATION IN PRACTICE

- Parametric Estimation is carried out by a number of 'more mature' organizations:
  - Global software service providers, e.g. HP, IBM, Capgemini, Cognizant, HCL, TechMahindra, et cetera. They need to understand their capabilities and to be able to estimate fixed **price/fixed duration projects** accurately.
  - 'More mature' companies and governments that have implemented an '**Estimate and Performance Measurement**' or '**Supplier Performance Measurement**' process in order to understand their (and their suppliers') capabilities in order to improve, e.g. many banks, governments, insurance companies, telecom providers.
- Agile project estimation is still needed! Measure the functional size of the backlog and estimate which functionality will be ready at which point in time.
- Next to estimating, performance measurement and benchmarking of completed projects is another main advantage of measuring functional size.
- Use Price/FP in contracting reduces the risk of failures significantly:
  - The supplier takes the risk for the price and gets an incentive if he improves productivity (higher margin)
  - The customer takes the risk for the scope of the project.

LEVEL 5 BENEFITS

Project Success rate >80%
<3% cancelled projects
Productivity increase
Cost decrease
Quality increase
Happy staff
More business value! Corporate success!!



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THANK YOU!

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