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# AN ANALYSIS OF THE COSMIC PROJECTS

IN THE ISBSG DATABASE

IWSM conference Beijing, 19 September 2018

Harold van Heeringen, ISBSG president

#### INTRODUCING ME

Drs. Harold van Heeringen,

- 20 years experience in IT, 15 years in software measurement and metrics
- ISBSG President
- METRI Senior Consultant ADM Benchmarking
- NESMA board member International cooperation and partnerships
- COSMIC Dutch representative in the International Advisory Council (IAC)
- ICEAA trainer of CEBoK chapter 12: Software Cost Estimation
- sCEBoK initiator and module developer
- Dutch Association for Cost Engineers (DACE) working group parametric analysis
- Speaker at many conferences on software measurement, estimation and benchmarking



#### President@isbsg.org





#### **TOPICS ADDRESSED**

- International Software Benchmarking Standards Group (ISBSG)
- ISBSG data
- Example of using the data
- Available COSMIC data
- COSMIC measured projects in the repository vs IFPUG projects
- Conclusions





The ISBSG (International Software Benchmarking Standards Group) is a notfor-profit organisation. Our mission is to help YOU and your organisation improve the planning and management of your IT software projects. For more information, Contact Us



AGILE

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Presenting the 2018 Release of the ISBSG Development & Enhancement Data

The ISBSG Data Repository now contains more than



We're counting down to the IT Confidence Conference

Join us in Mexico City for the 2018 IT Confidence Conference. 10th September – 14th September

#### INTERNATIONAL SOFTWARE BENCHMARKING STANDARDS GROUP (ISBSG)

- Independent and not-for-profit organization based in Australia
- Full Members are non-profit organizations, like Nesma, IFPUG, FiSMA, China SPI, GUFPI-ISMA, JFPUG, AMMS, Swiss-ICT and commercial organizations Galorath, Kexin Science, Leda-MC
- Bronze member: COSMIC
- Grows and exploits two repositories of software data:
  - New development projects and enhancements (> 8250 projects, releases and sprints)
  - Maintenance and support (> 1100 applications)
- Everybody can submit project data
  - Questionnaires on the site, online or Excel data files
  - Anonymous
  - Free benchmark report in return



#### Productivity Benchmark - Overall Comparison



#### **ISBSG MISSION**

- Mission: "To improve the management of IT resources by both business and government, through the provision and exploitation of public repositories of software engineering knowledge that are <u>standardized</u>, verified, recent and <u>representative of current technologies</u>"
- All ISBSG data is
  - validated and rated in accordance with its quality guidelines
  - current
  - representative of the industry
  - independent and trusted
  - captured from a range of organization sizes and industries



#### INDUSTRY MATURITY

- 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 software development and maintenance 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-tomarket, cost efficiency and quality. They are not able to understand where they need to improve and not able to control process improvement.



#### USAGE OF THE ISBSG DATA

- Data is submitted to the ISBSG from many different IT and metrics practitioners and organizations. These people and organizations have an interest in benchmarking, themselves, or wish to support the world's only "open" repositories of IT project data.
- The ISBSG software metrics data can be used to assist you to improve your maturity, predictability and decision making:
  - Software Project Estimation (and releases / sprints)
  - Benchmarking
  - Contracting
  - Supplier Performance Measurement
  - Agile team Estimation & Performance Measurement
  - Project control
  - Sourcing advice and management
  - Standards compliance
  - Budget support
  - etc.



#### ISBSG DATA D&E REPOSITORY

8261 rows in Excel, Easy to analyze,250 data fields (columns) per project

D&E Corporate Release February 2018	8261 rows									1.				
	Rating	Rating	Soltware Age	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Major Grouping	Sizing	Sizing
ISBSG Project ID 💐	Data Quality Rating	UFP rating	Year of Project	Industry Sector	Organisation Type	Application Group	Application Type	Development Type	Developmen t Platform	Language Type	Primary Programming Language	Count Approach	Functional Size	Relative Size
10178	A		2005	Medical & Health	Medical and Health Care;	Business Application	Catalogue/registe	New Developmer	Multi	3GL	Java	COSMIC	826	M2
10687	A		2003	Communication	Media;	Business Application	Extranet application	Re-development	Multi	4GL	ASP	COSMIC	55	S
10733	A		2006	Banking	Banking;	Business Application	Financial transacti	New Developmer	Multi	3GL	Java	COSMIC	270	M1
10863	A		2008	Manufacturing	Aerospace / Automotive;Comp	Real-Time Application	Software for mach	New Developmer	PC	4GL	.Net	COSMIC	1384	L
11311	A		2010	Construction	Building Automation;	Business Application	GUI for Protocol;P	Enhancement	Multi	3GL	С	COSMIC	51	S
11641	A		2010	Education	Education Institution;Research;	Business Application	Catalogue/registe	Re-development	PC	3GL	Java	COSMIC	791	M2
11647	A		2006	Service Industry	Post/mail services;	Business Application		New Developmer	<sup>-</sup> Multi	3GL	Java	COSMIC	748	M2
11788	A		2003	Insurance	Insurance;	Business Application	Electronic Data Int	New Developmer	PC	3GL	Visual Basic	COSMIC	838	M2
11802	A		2001	Insurance	Insurance;	Infrastructure Software	Operating system	New Developmer	PC	3GL	Java	COSMIC	279	M1
11924	A		2000	Manufacturing	Manufacturing;	Real-Time Application	Msg.Switch/cel ph	New Developmer	MR	3GL	С	COSMIC	142	M1
11976	A		2008	Banking	Banking;	Business Application		New Developmer	1 Multi	3GL	C#	COSMIC	228	M1
12056	A		2007	Government	Government	Business Application	Catalogue/registe	New Developmer	Multi	3GL	C#	COSMIC	368	M2
12367	A		1999	Manufacturing	Manufacturing;	Real-Time Application	Msg.Switch/cel ph	New Developmer	nt	3GL	С	COSMIC	8	XXS
12596	A		2003	Insurance	Insurance;	Business Application	Online analysis ar	Enhancement	MF	3GL	PL/I	COSMIC	28	XS
12636	A		2008	Communication	general public (mobile phone e	Business Application	Instant Messaging	New Developmer	PC	3GL	Java	COSMIC	98	S
13229	A		2005	Service Industry	Transit Corporation;	Business Application	IP Contact Centers	New Developmer	PC	4GL	Visual Basic	COSMIC	1670	L
14002	A		2005	Medical & Health	Medical and Health Care;	Business Application		New Developmer	<sup>-</sup> Multi	3GL	C#	COSMIC	216	M1
14335	A		2011	Manufacturing	Aerospace / Automotive;	Mathematically-Intensiv	Mathematical mod	Re-development	PC	3GL	C#	COSMIC	456	M2
14345	A		2009	Education	Education Institution;Electricity,	Business Application	Content managem	New Developmer	PC	3GL	Java	COSMIC	114	M1
14883	A		2001	Electronics & Con	Computers & Software;	Infrastructure Software	Graphics & publis	New Developmer	PC	3GL	Java	COSMIC	79	S
14937	A		2003	Insurance	Insurance;	Business Application	Financial transacti	New Developmer	PC	3GL	Java	COSMIC	678	M2
15330	A		2004	Medical & Health	Medical and Health Care;	Business Application	Document manag	New Developmer	1 Multi	3GL	C#	COSMIC	966	M2
15358	A		2005	Insurance	Insurance;	Business Application	Customer billing;	New Developmer	<sup>-</sup> Multi	3GL	C#	COSMIC	320	M2
15531	A		2013	Government	Government	Business Application	Identity Card Emis	Re-development	Multi	4GL	Visual Basic	COSMIC	186	M1
15680	A		2008	Government	Government	Business Application	Catalogue/registe	New Developmer	Multi	3GL	Java	COSMIC	643	M2
15852	A		2011	Electronics & Con	Computers & Software;	Infrastructure Software	Operating system	New Developmer	MR	3GL	Java	COSMIC	156	M1
16032	A		2001	Insurance	Insurance;	Infrastructure Software	Operating system	New Developmer	PC	3GL	Java	COSMIC	143	M1
16465	A		2002	Communication	Communications;	Real-Time Application	Software for mach	Enhancement	MR	3GL	С	COSMIC	42	S
16783	A		2005	Insurance	Insurance;	Business Application	Electronic Data Int	New Developmer	Multi	3GL	Java	COSMIC	10	XS
16971	A		2003	Insurance	Insurance;	Business Application	insurance quotation	Re-development	PC	4GL	Visual Basic	COSMIC	2090	L
17798	A		2006	Medical & Health	Medical and Health Care;	Business Application	Catalogue/registe	New Developmer	' Multi	3GL	C#	COSMIC	160	M1



#### **EXAMPLE OF USING THE DATA FOR ESTIMATION**



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# EXAMPLE USE OF THE DATA: ESTIMATE LANDING ZONE

- Selection:
  - Data Quality: A or B
  - Year of Project > 2012
  - Project Type: Enhancement
  - Primary Programming language: Java
  - Count approach: COSMIC
- The landing zone may be in this case:
  - Low: 6.8 h/CFP
  - Likely: 7.8 h/CFP
  - Max: 9.4 h/CFP
- Further refinement may be possible,
- for instance:
  - Size category
  - Development methodology
  - Industry
  - Application type
  - ...

	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





# COUNTRY OF ORIGIN FULL DATASET

#### **Project origin**

**Country of origin** 

Projects have been contributed from 26 different countries.



Demographics				
Country of origin	Projects	Percentage		
Countries	N	%		
United States	2142	26,1%		
Spain	1106	13,5%		
Australia	847	10,3%		
Japan	841	10,3%		
Netherlands	798	9,7%		
Finland	599	7,3%		
France	471	5,7%		
India	324	4,0%		
Canada	315	3,8%		
Denmark	172	2,1%		
China	163	2,0%		
Brazil	154	1,9%		
United Kingdom	91	1,1%		
Other	169	2,1%		
Total	8192	100%		



#### INDUSTRY SECTOR FULL DATASET



Demographics				
Industry sector	Projects	Percentage		
Industries	N	%		
Communication	1627	23,4%		
Insurance	1232	17,7%		
Manufacturing	835	12,0%		
Government	790	11,4%		
Banking	563	8,1%		
Medical & health care	513	7,4%		
Financial	433	6,2%		
Electronics / computers	192	2,8%		
Service industry	190	2,7%		
Wholesale / retail	135	1,9%		
Utilities	79	1,1%		
Professional services	63	0,9%		
Other	297	4,3%		
Total	6949	100%		



#### PROJECT TYPE FULL DATA SET



Demographics				
Development type	Projects	Percentage		
Types	N	%		
Enhancement	5574	67,5%		
New development	2563	31,0%		
Re-development	102	1,2%		
Other	16	0,2%		
Total	8255	100%		



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#### TEAM SIZE FULL DATA SET



Team size	Projects	Percentage
Catergories	N	%
1 to 2	359	14,3%
3 to 4	436	17,3%
5 to 9	753	29,9%
10 to 14	282	11,2%
15 to 19	138	5,5%
20 to 40	297	11,8%
41 to 100	196	7,8%
101+	54	2,1%
Total	2515	100%







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ΕO

4

5

7

EQ

3

4

6

COSMIC FSM

NB: CFP per functional process >2, no limit!





#### COSMIC PROJECTS PER YEAR





# COSMIC PROJECTS PER PROGRAMMING LANGUAGE





# INDUSTRY SECTOR COSMIC PROJECTS





#### **PROJECT SIZE**



Demographics				
Product size IFPUG	Projects	Percentage %		
Catergories	N			
0 to 9 (XXS)	171	3,4%		
10 to 29 (XS)	363	7,3%		
30 to 99 (S)	1570	31,6%		
100 to 299 (M1)	1675	33,7%		
300 to 999 (M2)	907	18,2%		
1000 to 2999 (L)	257	5,2%		
3000 to 8999 (XL)	27	0,5%		
9000 to 17999 (XXL)	3	0,1%		
18000 or more (XXXL)	0	0,0%		
Total	4973	100%		



Demographics				
Product size COSMIC	Projects	Percentage %		
Catergories	N			
0 to 9 (XXS)	32	7,0%		
10 to 29 (XS)	45	9,9%		
30 to 99 (S)	140	30,8%		
100 to 299 (M1)	137	30,1%		
300 to 999 (M2)	79	17,4%		
1000 to 2999 (L)	22	4,8%		
3000 to 8999 (XL)	0	0,0%		
9000 to 17999 (XXL)	0	0,0%		
18000 or more (XXXL)	0	0,0%		
Total	455	100%		



#### SIZE DIFFERENCE PER INDUSTRY SECTOR





#### SIZE DIFFERENCE PER PROGRAMMING LANGUAGE





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# PROJECT DELIVERY RATE (H/FP) DIFFERENCE PER PROGRAMMING LANGUAGE





#### SIZE RANGE VS PDR

COSMIC PDR (h/FP)







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#### AGILE PROJECTS

COSMIC PDR (h/FP) 140.0 120.0 100.0 80.0 Total 60.0 40.0 20.0 0.0 XXS XS M1 M2 S L



IFPUG/Nesma PDR (h/FP)

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#### C# ANALYSIS





#### CHINA SPI MEMBER BENEFITS

 China SPI members get a 20% discount on data licenses, corporate subscription and other ISBSG products, such as special analysis reports.



#### **ISBSG Reports**

The ISBSG analyses the data in its repositories to produce analysis reports that will be useful to people across a range of IT roles including: CIOs; PMOs; Project Managers; Scope Managers; Business Analysts; Outsource negotiators; Bid managers and so on.

NOTE: All prices are shown in AUD.

10 Take-Aways From the Reifer Agile Report Format: Downloadable file Updated: 2013	\$135.91
A Quantitative Analysis of Agile Methods Format: Downloadable file Updated: 2013	\$1,352.27
Agile Methodology Analysis Reports – Value Pack Format: Downloadable files	\$2,048.90
Agile Software Quality – A Quantitative Analysis Format: Downloadable file Updated: 2013	\$1,352.27
Early Lifecycle Software Estimation Format: Downloadable file Updated: 2005	\$873.51
Government and Non-Government Software Project Performance Format: Downloadable file Updated: 2011	\$873.51
Management Report Pack – Option 1 Format: Downloadable files	\$1,721.07
Management Report Pack – Option 2 Format: Downloadable files	\$1,721.07
Managing Your Maintenance & Support Environment (2012 Update) Format: Download file Updated: 2012	\$873.51
Metrics Analyst / Cost Engineers Report Pack Format: Downloadable files	\$1,721.07
Outsourcing, Offshoring, Inhouse – How do they compare? Format: Downloadable file Updated: 2007	\$873.51



# CONCLUSIONS

- There are fundamental differences between the counting principles of Nesma/IFPUG and COSMIC. When using data to estimate or benchmark a project measured in COSMIC, be careful to use COSMIC data only.
- Although a dataset of 500 COSMIC projects is good enough for basic analysis, more data is needed. If you have data, please submit to ISBSG! <u>http://isbsg.org/data-collection-questionnaires/</u>





#### **THANK YOU!**



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