3rd International Symposium on Search Based Software Engineering
September 10 – 12,
Szeged, Hungary

Ten Years of SEARCH BASED SOFTWARE ENGINEERING
A Bibliometric Analysis

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"**quantitative analysis** and statistics to describe **patterns of publication** within a given **field or body of literature**"

http://www.ischool.utexas.edu/~palmquis/courses/biblio.html

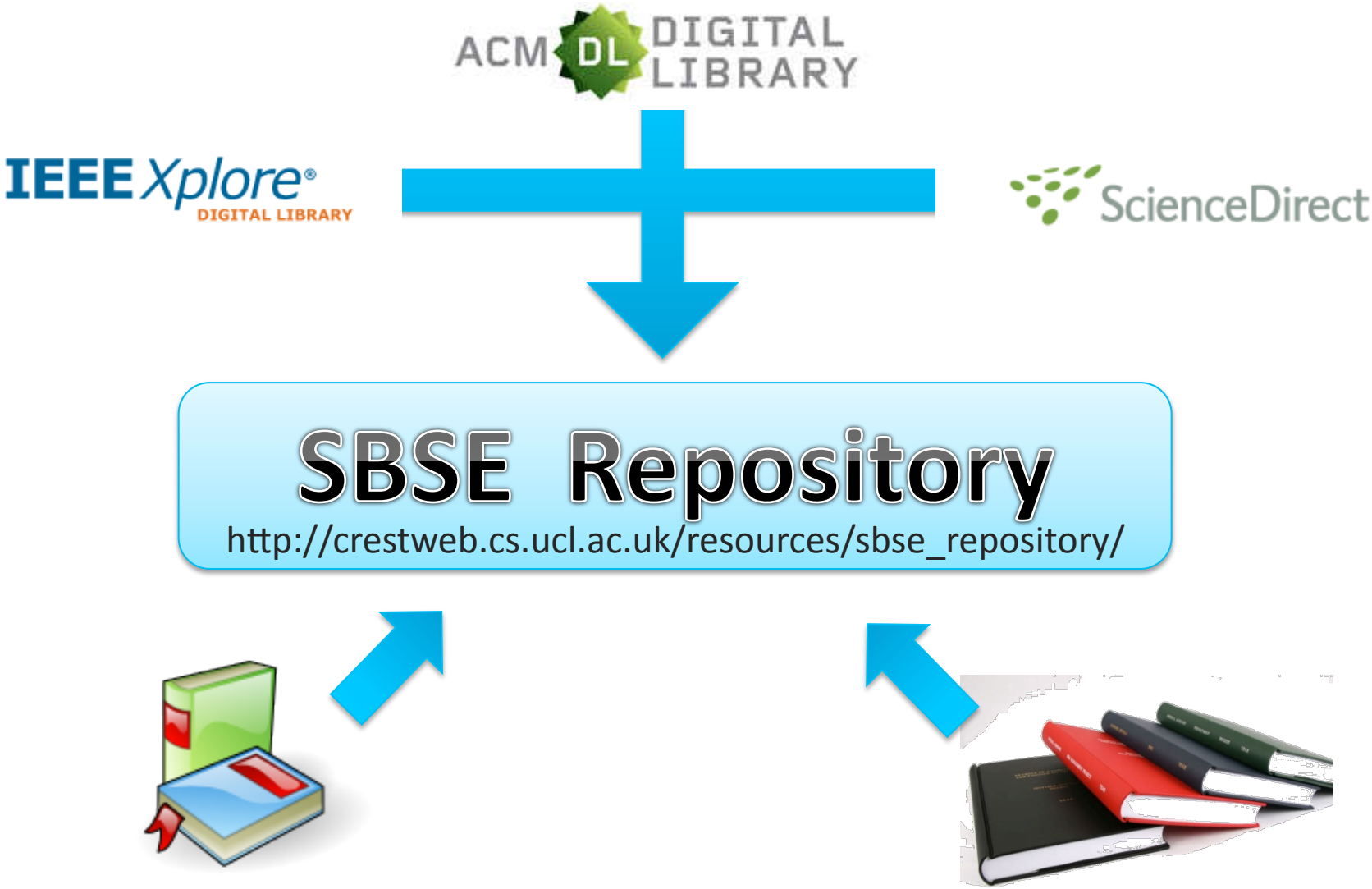
A Bibliometric Analysis

SBSE as a Field

Community Recognition

SBSE as a Field

Identification of topics



Publication Data

Ten Years of

SEMINAL

- Workshop on Software Engineering using Metaheuristic INnovative ALgorithm

IST

- Special issue on the approach
- One paper coined the term SBSE

Categories

Publications

Sources

Authorship

Collaboration

Categories

Publications

Sources

Authorship

Collaboration

Publications

#Publications

Year	Quantity	%	Growth
2001	24	3.24%	-
2002	30	4.05%	25.00%
2003	37	5.00%	23.33%
2004	45	6.08%	21.62%
2005	54	7.30%	20.00%
2006	61	8.24%	12.96%
2007	83	11.22%	36.07%
2008	127	17.16%	53.01%
2009	126	17.03%	-0.79%
2010	153	20.68%	21.43%
2001-2010	740	100%	-

Analysis

SBSE continuously grows since 2001

2010 is the year with most publications

#Publications

Year	Quantity	%	Growth
2001	24	3.24%	-
2002	54	7.30%	125.00%
2003	91	12.30%	68.52%
2004	136	18.38%	49.45%
2005	190	25.68%	39.71%
2006	251	33.92%	32.11%
2007	334	45.14%	33.07%
2008	461	62.30%	38.02%
2009	587	79.32%	27.33%
2010	740	100.00%	26.06%

Analysis

SBSE continuously grows since 2001

2010 is the year with most publications

More than half works in the last 3 years

2010 raised cumulative amount in 26%

Authors	Title	Scopus
McMinn, Phil	Search-based software test data generation: a survey	209
Wegner, J., Baresel, A. and Sthamer, H.	Evolutionary test environment for automatic structural testing	162
Michael, C., McGraw, G. and Schatz, M.	Generating software test data by evolution	158
Harman, M.	Reformulating software engineering as a search problem	90
Harman, M. and Jones, B.	Search-based software engineering	82
Harman, M. et al.	Testability transformation	77
Li, Z., Harman, M. and Hierons, R.	Search algorithms for regression test case prioritization	75
Harman, M.	The current state and future of search based software engineering	72
Mitchell, B. and Mancondris, S.	On the automatic modularization of software systems using the bunch tool	71
Dolado, J.	On the problem of the software cost function	71
Cohen, M. et al.	Constructing test suites for interaction testing	69
Tonella, P.	Evolutionary testing of classes	67
Greer, D. and Ruhe, G.	Software release planning: An evolutionary and iterative approach	65
Bagnall, A., Rayward-Smith, V. and Whittley, I.	The next release problem	63
Canfora, G. et al.	QoS-aware replanning of composite Web services	54

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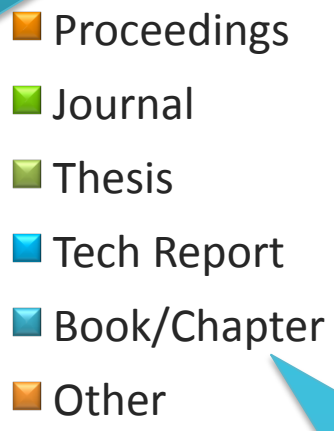
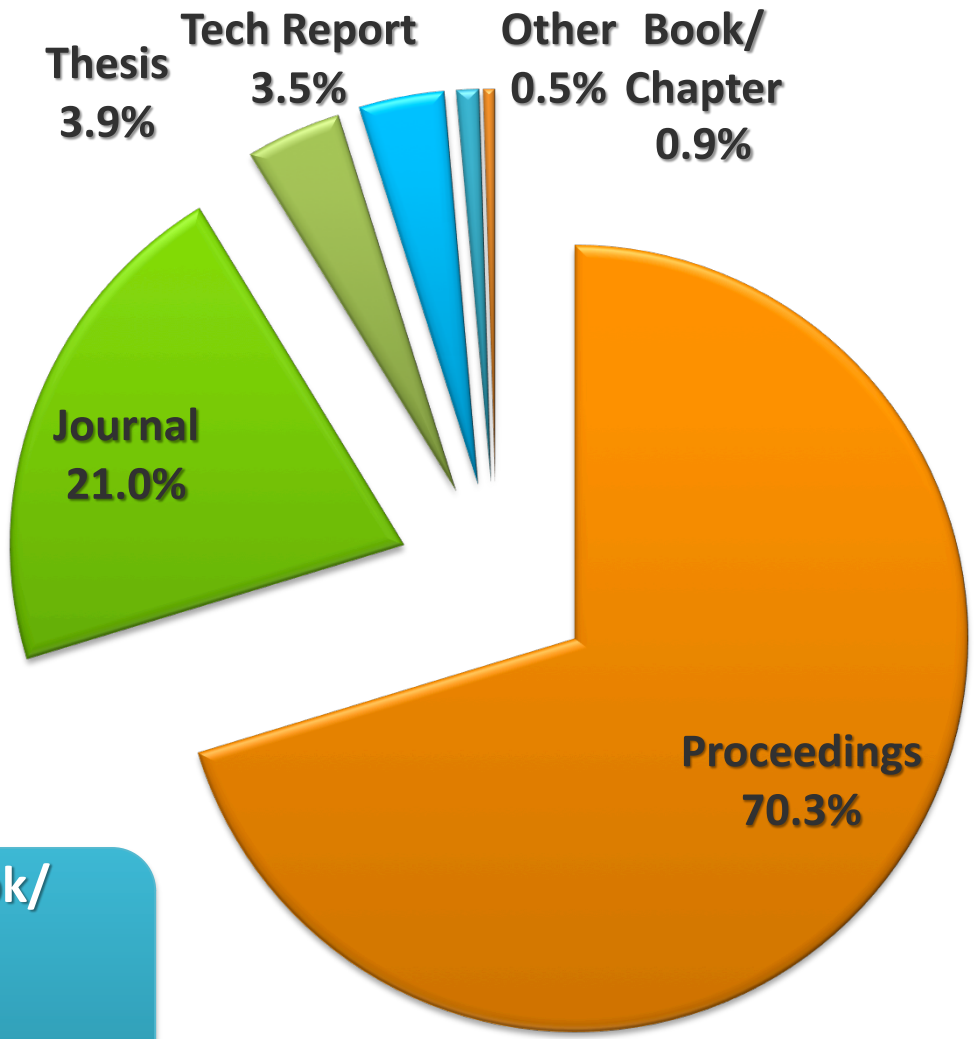
Sources

Publication Type

More Proceedings than Journal papers just like Computer Science





Not much book/ chapter just like Computer Science

Journal Ranking

Journal	#	%
Information and Software Technology	23	16.43%
Journal of Systems and Software	12	8.57%
IEEE Transactions on Software Engineering	10	7.14%
Computers and Operations Research	7	5.00%
Software Testing, Verification and Reliability	5	3.57%
Applied Soft Computing	4	2.86%
IEEE Transactions on Reliability	4	2.86%
Information Sciences	4	2.86%
Journal of Software Maintenance and Evolution	3	2.14%
Requirements Engineering	3	2.14%

Analysis

SE journals, including the top 3

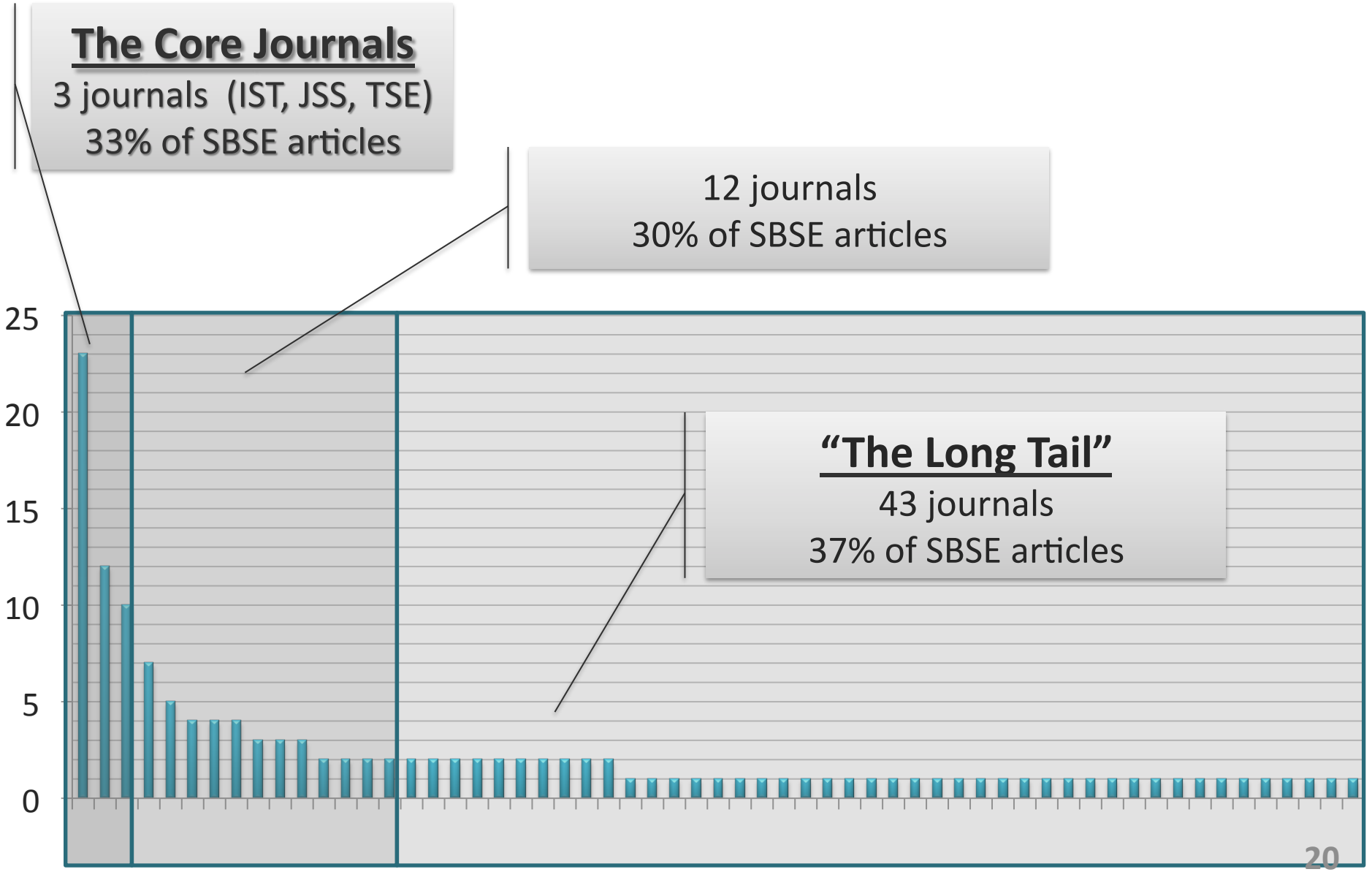
Crossdisciplinarity of SBSE: Operations Research, Computacional Inteligence journals

Bradford's Law of Bibliometric

In a ***scientific field***, the journals that published its articles may be grouped in ***three groups***, each groups with roughly ***1/3 of the articles***.

The relations among the number of venues in each goups is to be $1:n:n^2$

Bradford's Law on SBSE



Authorship

Analysis

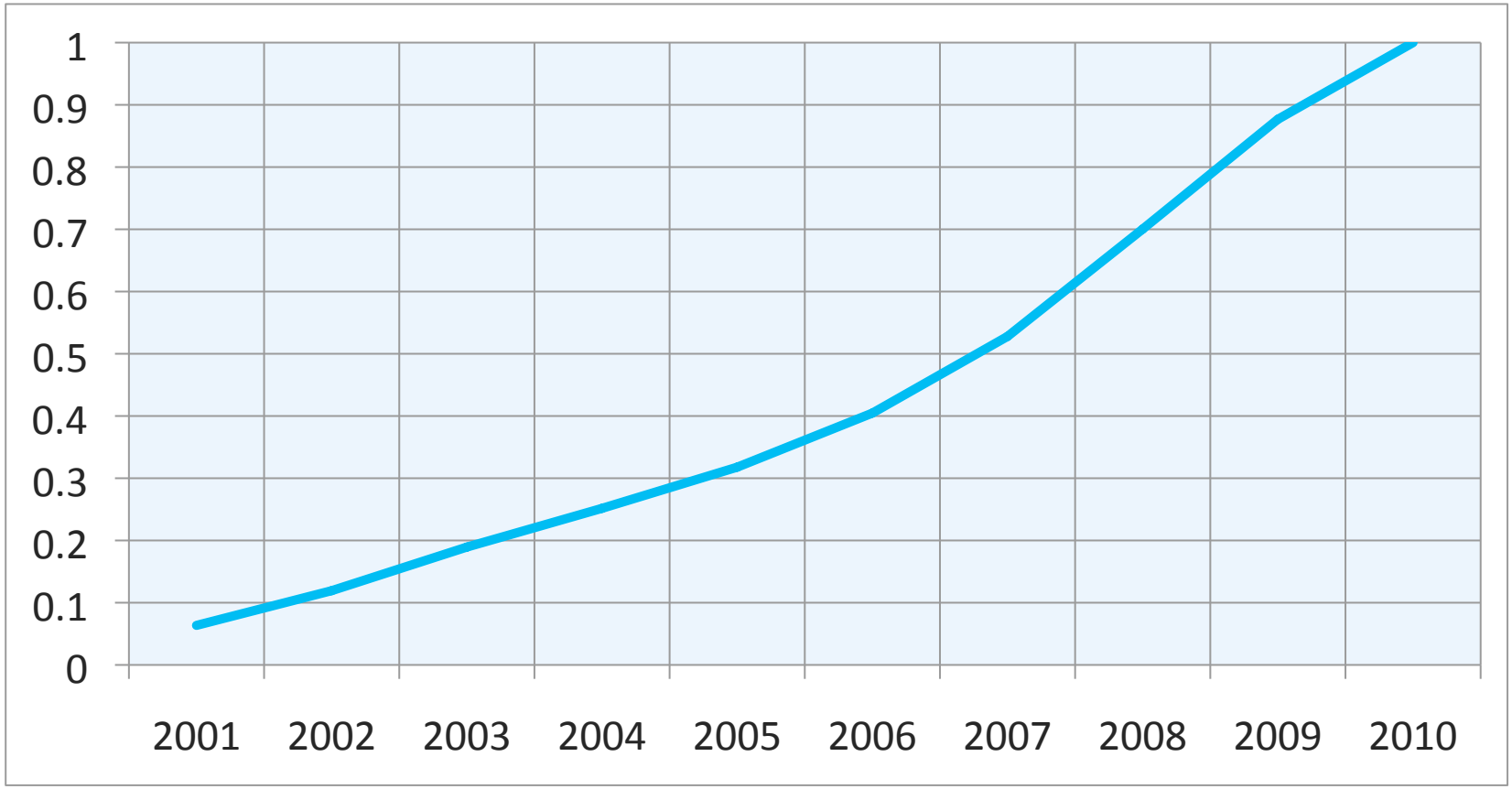
Increase in the number of new SBSE authors

2008-10 have high increase rates of "new"

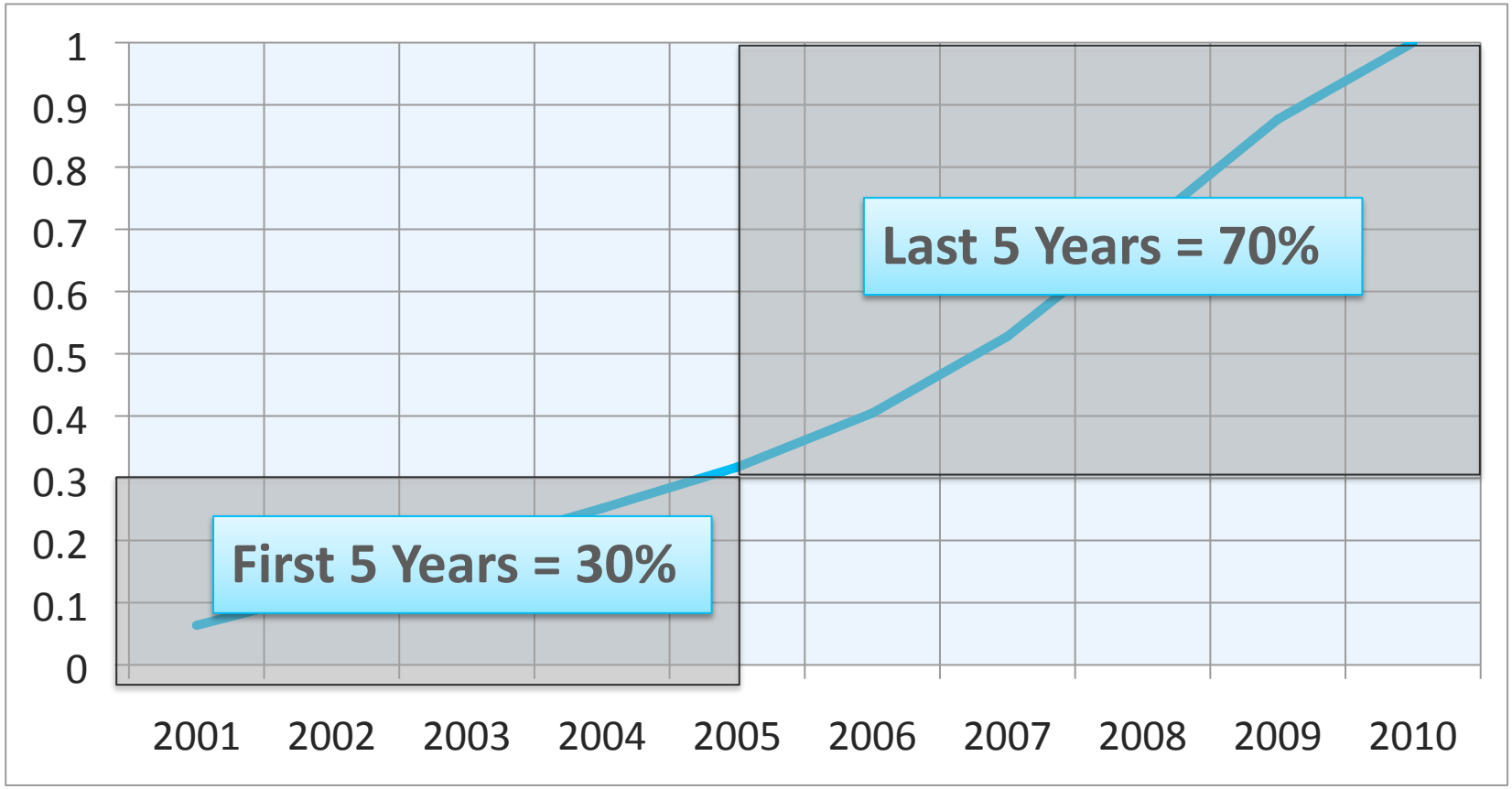
Increase in the number of active SBSE authors

Relative participation of new authors

Year	New	%	Active	New/ Active
2001	49	6.36%	49	1.00
2002	43	5.58%	60	0.72
2003	54	7.00%	83	0.65
2004	48	6.23%	87	0.55
2005	51	6.62%	100	0.51
2006	67	8.69%	116	0.58
2007	95	12.32%	162	0.59
2008	133	17.25%	230	0.58
2009	136	17.63%	236	0.58
2010*	95	12.32%	168	0.57
2001-2010	771	100%	-	-



Cumulative Authors



Cumulative Authors

Author	Works	%
Mark Harman	86	11.15%
Xin Yao	27	3.50%
John Clark	24	3.11%
Robert Mark Hierons	24	3.11%
Andrea Arcuri	20	2.59%
Joachim Wegener	20	2.59%
Massimiliano Di Penta	20	2.59%
Phil McMinn	19	2.46%
Giuliano Antoniol	18	2.33%
Enrique Alba	16	2.08%
Andre Baresel	14	1.82%
Francisco Chicano	14	1.82%
Günther Ruhe	12	1.56%
Shin Yoo	12	1.56%
Spiros Mancoridis	12	1.56%
Stefan Wappler	12	1.56%
Per Kristian Lehre	11	1.43%

Analysis

Most prolific author in +10% of works

From 2nd onwards, regular distribution

10/15 most cited works have prolific authors

8/10 most cited works have prolific authors

Lotka's Law of Bibliometric

In a *scientific field*, the number of authors that have *published n works is* roughly expected to be $1/n^2$ of the number of author that have *published 1 work*.

Additionaly, as a result, the number of authors with 1 publication is to be about 60%.

Lotka's Law in SBSE

Authors with	Expected Lotka's value	Actual SBSE value
1 work	60%	61%
2 works	15%	16%
3 works	7%	8%
4 works	3.5%	3.2%
10 works	0.6%	0.5%
20 works	0.15%	0.39%

Collaboration

Analysis

Authors	1	2	3	4	5+
Works	87	230	209	101	40
%	13%	34.5%	31.3%	15.2%	6%

2 and 3 authors per paper are the major groups

Collaborative rate: 87%; Computer Science: 86%

Year	External	%	Outside Univ	%
2001	1	4.17	6	25
2002	3	10	7	23.33
2003	4	10.81	6	16.22
2004	8	17.78	8	17.78
2005	6	11.54	3	5.77
2006	7	11.67	8	13.33
2007	12	14.46	9	10.84
2008	22	17.89	16	13.01
2009	20	15.38	17	13.46
2010*	6	6.82	6	6.82
2001-10	59	11.34	86	11.10

Analysis

2 and 3 authors per paper are the major groups

Collaborative rate: 87%; Computer Science: 86%

Rates of colllaborations

External, Internal, Outside University

CONCLUSIONS

- SBSE as a Field
- Recent SBSE development
- SBST, Test Data Generation
- SBSE in journal beyond SE
- Publication patterns similar to Computer Science
- Cooperations in SBSE

ssbse

symposium on search based software engineering

ssbse2011 September 10-12, Szeged, Hungary

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