



New trends in tracking research output, collaboration and performance

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Trends in scholarly research

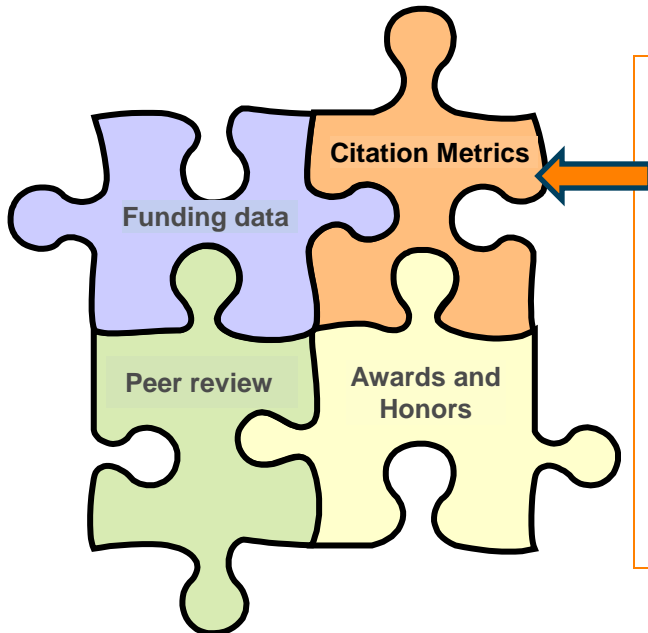
- Challenges faced by research community are multiple and complex
- Competition for government research funding *increasing*
- Accountability:
 - Research spending
 - Demonstrating return on investment (ROI)
- PR Personnel responsible:
 - Advertisements
 - Publish journals
 - Recruitment events and community outreach programmes
- Require variety of statistics to support their message

Result: Institutions seek objective data on research performance, for data-based decision making

The Research Assessment “Need”:

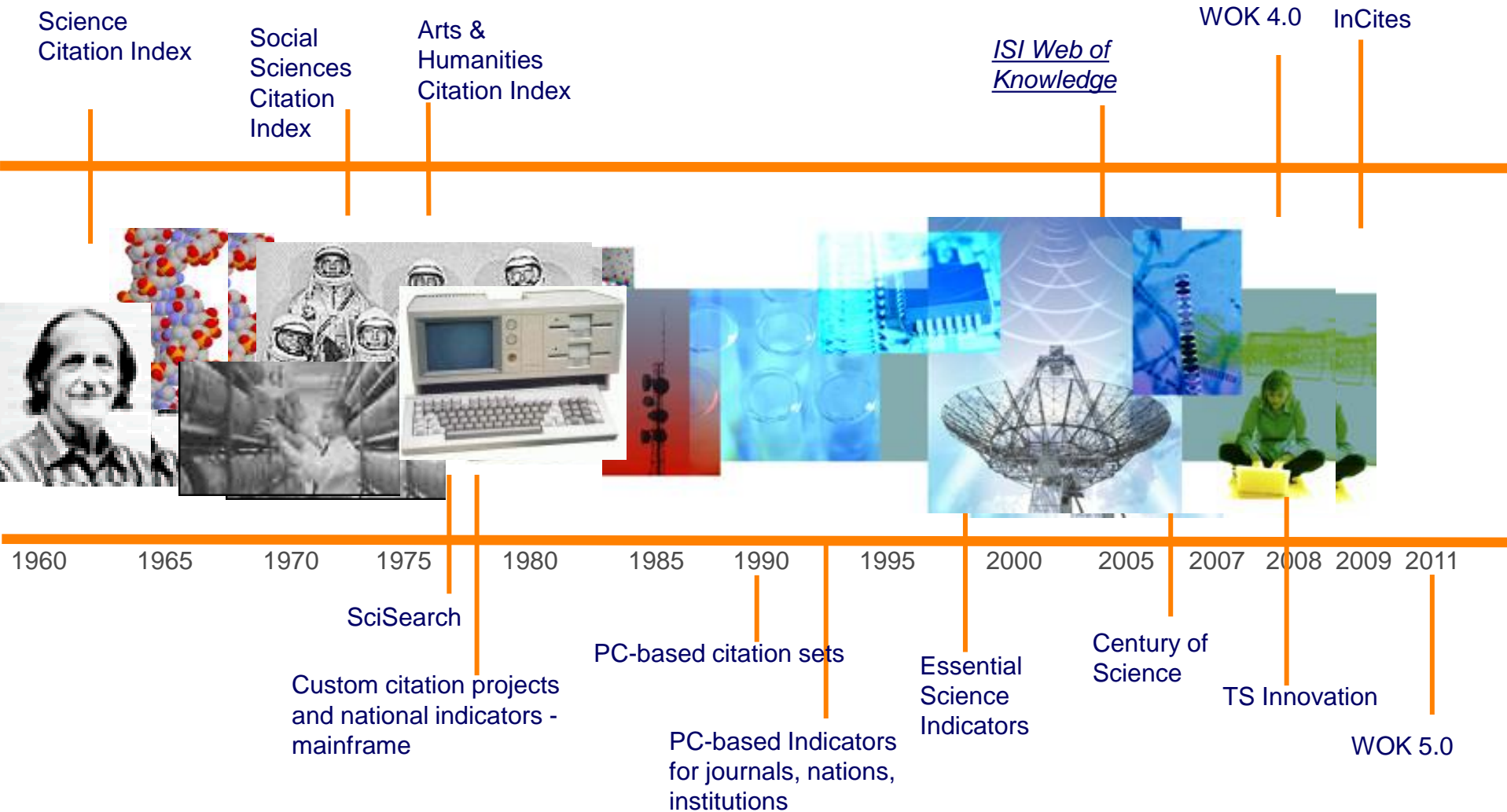
Objective Information for both Institution and Individual to Reveal Influence/Success and Support Decision-making

- Communicating the “success” of research can be complicated, multi-faceted, with subjective factors included.
- Therefore reliable, objective information is extremely valuable in research evaluation exercises.



- We know that a “Citation” to published work is an acknowledgement of an intellectual debt to that work, evidence of its influence.
- “Bibliometrics” or “citation metrics” have become ***a critical piece of research assessment exercises.***

Thomson Reuters Web of Science(formerly ISI) has been the authority on citation data for over 100 years.



Web of Science – the Thomson Reuters Data Foundation

- *an unmatched data source*: The gold standard citation resource, used by over 6,500 institutions in more than 100 countries
- Covers over 53 million research papers from 12,000 high impact journals, thousands of conference proceedings and books in the fields of Science, Social Science, Arts and Humanities
- Indexes all cited references (60 million in 2012) and presents them as a separate index: Cited reference search with a total 1.300 million cited references
- Selected content using unbiased, time tested and detailed journal selection processes: Every subsequent edition, every paper, every author and every address
- ***Unmatched retrospective depth of citation data – that which would be required to assess research published over a 30 year career.***
- *Web of Science* is also the source of the *Impact Factor* -- the most widely accepted indicator of journal performance

Evaluating Citation Impact of Individual Paper

- *Many factors play a role: year of publication, document type, subject area and journal*
- *Normalised indicators are needed to level playing field and compare researchers with one another.*
- **Types of Metrics:**

Relative Impact/ Bench-marking	Journal actual/expected citation rate
	Category actual/ expected citation rate
	Percentile in category and mean percentile
	% papers in top 10% of their field
	% papers in top 1% of their field
	Aggregate Performance Indicator
Productivity	# papers
Total influence	# citations
Efficiency	Avg. citation rate
	Percent of papers cited

BENCHMARK INDIVIDUAL PAPER AGAINST GLOBAL AVERAGES

Times Cited	Journal Expected Citations	Category Expected Citations	Journal Actual/Expected Citations	Category Actual/Expected Citations	Percentile in Subject Area	2011 Journal Impact Factor	Publication Year	Subject Area View Ranking	Document Type View Ranking	First Author View Ranking	Journal View Ranking	Document Title
50	5.94	8.64	8.42	5.79	3.12	0.36	2001	VETERINARY SCIENCES	ARTICLE	DE VOS, V et al.	ONDERSTEPOORT JOURNAL OF VETERINARY RESEARCH	The epidemiology of tuberculosis in free-ranging African buffalo (<i>Syncerus caffer</i>) in the Kruger National Park, South Africa

Articles published in this journal from 2001 have been cited 5.94 times

This paper has received $50/5.94=8.42$ times the expected citations for this journal

This paper has received $50/8.64=5.79$ times the expected citations for this subject category

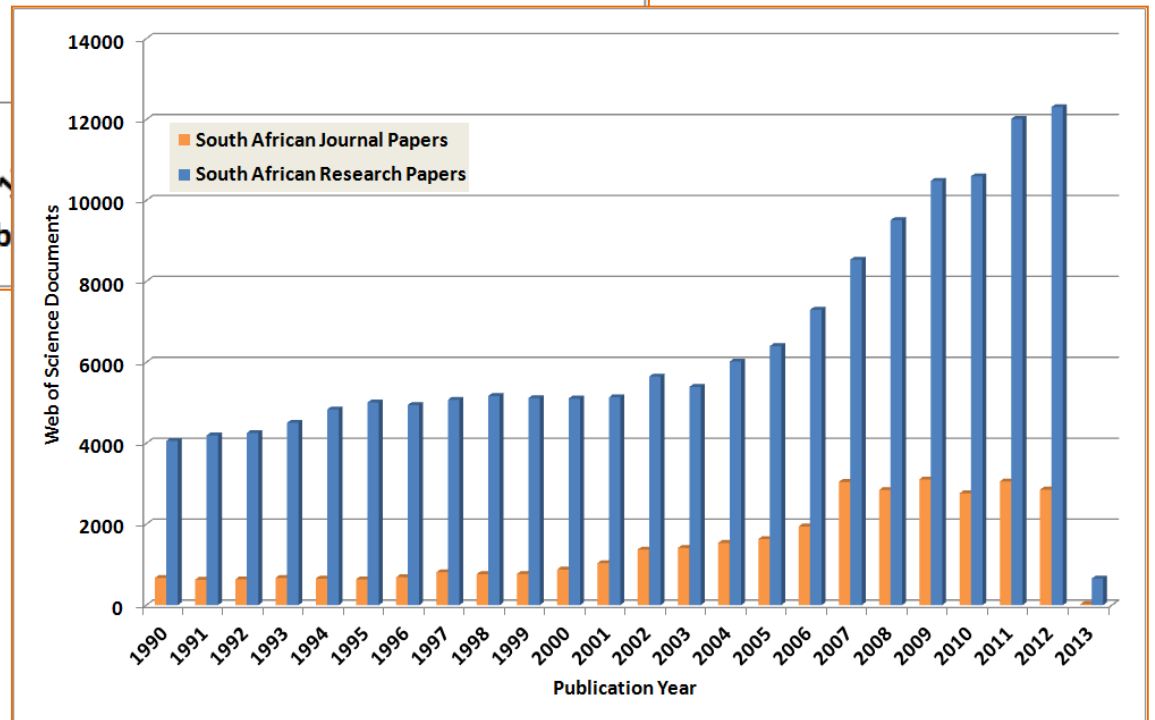
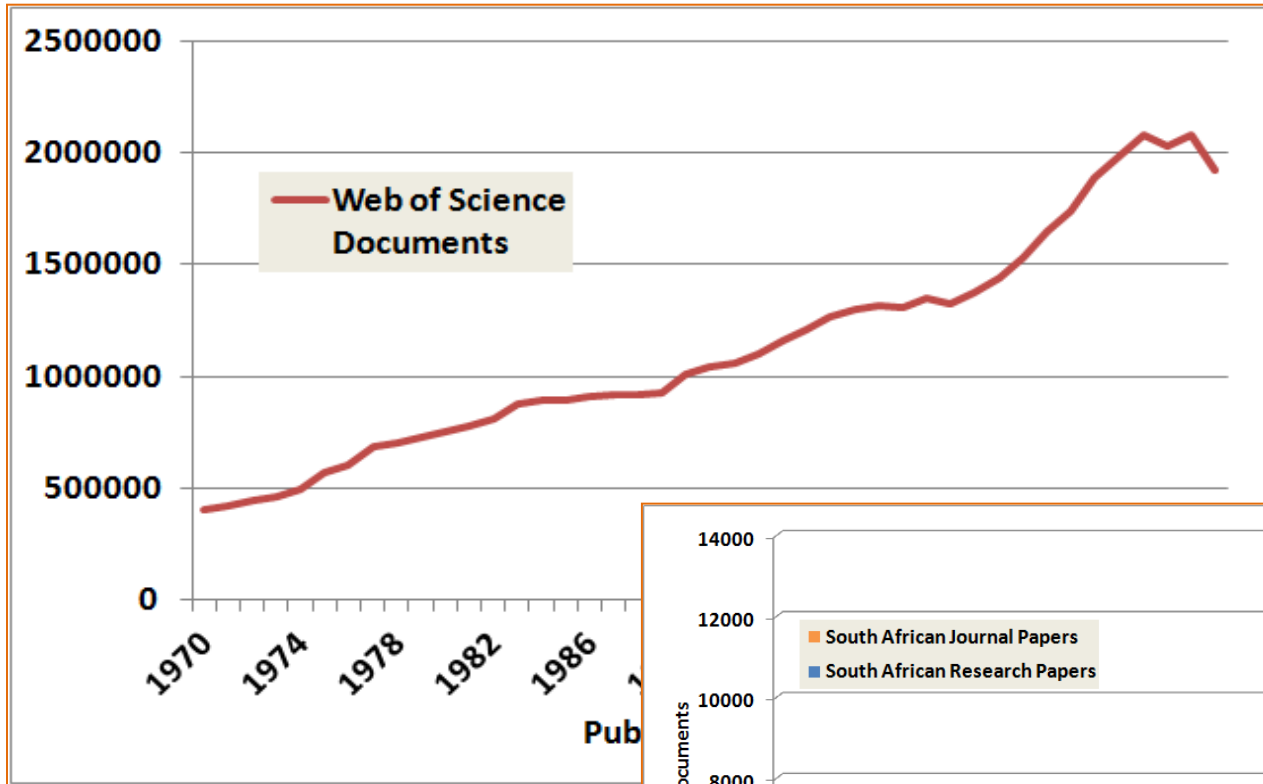
Veterinary sciences articles from this year have been cited 33.91 times

Ranking of papers by percentile

Times Cited	Journal Expected Citations	Category Expected Citations	Journal Actual/Expected Citations	Category Actual/Expected Citations	Percentile in Subject Area	2011 Journal Impact Factor	Publication Year	Subject Area View Ranking	Document Type View Ranking	First Author View Ranking	Journal View Ranking	Document Title
72	6.84	2.49	10.53	28.92	0.21	5.16	2009	ENGINEERING, ELECTRICAL & ELECTRONIC	ARTICLE	GUNGOR, VC et al.	IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS	Industrial Wireless Sensor Networks: Challenges, Design Principles, and Technical Approaches
41					0.80	5.16	2010	ENGINEERING, ELECTRICAL & ELECTRONIC	ARTICLE	GUNGOR, VC et al.	IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS	Opportunities and Challenges of Wireless Sensor Networks in Smart Grid
29					1.42	5.00	2010	ENGINEERING, ELECTRICAL & ELECTRONIC	ARTICLE	GUERRERO, JM et al.	IEEE INDUSTRIAL ELECTRONICS MAGAZINE	Distributed Generation Toward a New Energy Paradigm
68	15.29	8.71	4.45	7.81	2.15	2.95	2001	COMPUTER SCIENCE, THEORY & METHODS	ARTICLE	ENGELBRECHT, AP et al.	IEEE TRANSACTIONS ON NEURAL NETWORKS	A new pruning heuristic based on variance analysis of sensitivity information
68	19.24	8.47	3.53	8.03	2.43	2.11	2003	AUTOMATION & CONTROL SYSTEMS	ARTICLE	XIA, X et al.	IEEE TRANSACTIONS ON AUTOMATIC CONTROL	Identifiability of nonlinear systems with application to HIV/AIDS models
6	0.18	0.17	33.33	35.29	2.90	1.48	2011	ENGINEERING, ELECTRICAL & ELECTRONIC	ARTICLE	XIA, XH et al.	CONTROL ENGINEERING PRACTICE	An application of model predictive control to the dynamic economic dispatch of power generation
16	4.87	2.32	3.29	6.90	3.84	2.83	2008	ENGINEERING, ELECTRICAL & ELECTRONIC	ARTICLE	SHEN, YJ et al.	AUTOMATICA	Semi-global finite-time observers for nonlinear systems
12	6.42	2.84	1.87	4.23	5.79	5.30	2009	TELECOMMUNICATIONS	ARTICLE	DE VILLIERS, JP et al.	PROGRESS IN ELECTROMAGNETICS RESEARCH-PIER	GAUSSIAN PROCESS MODELING OF CPW-FED SLOT ANTENNAS
51	10.48	8.13	4.87	6.27	6.49	1.66	2000	ENGINEERING, MULTIDISCIPLINARY	PROCEEDINGS PAPER	OJO, O et al.	IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS	PWM-VSI inverter-assisted stand-alone dual stator winding induction generator

First 6 papers are placed within the top 3% of their subject areas in the world

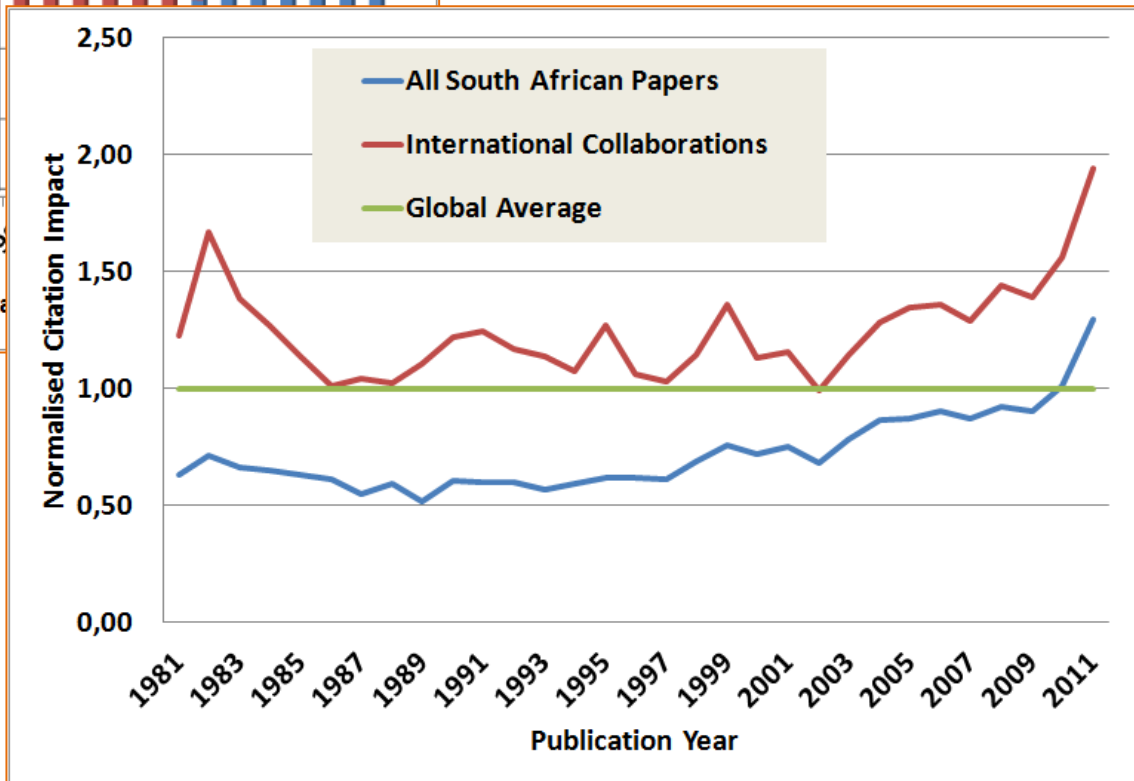
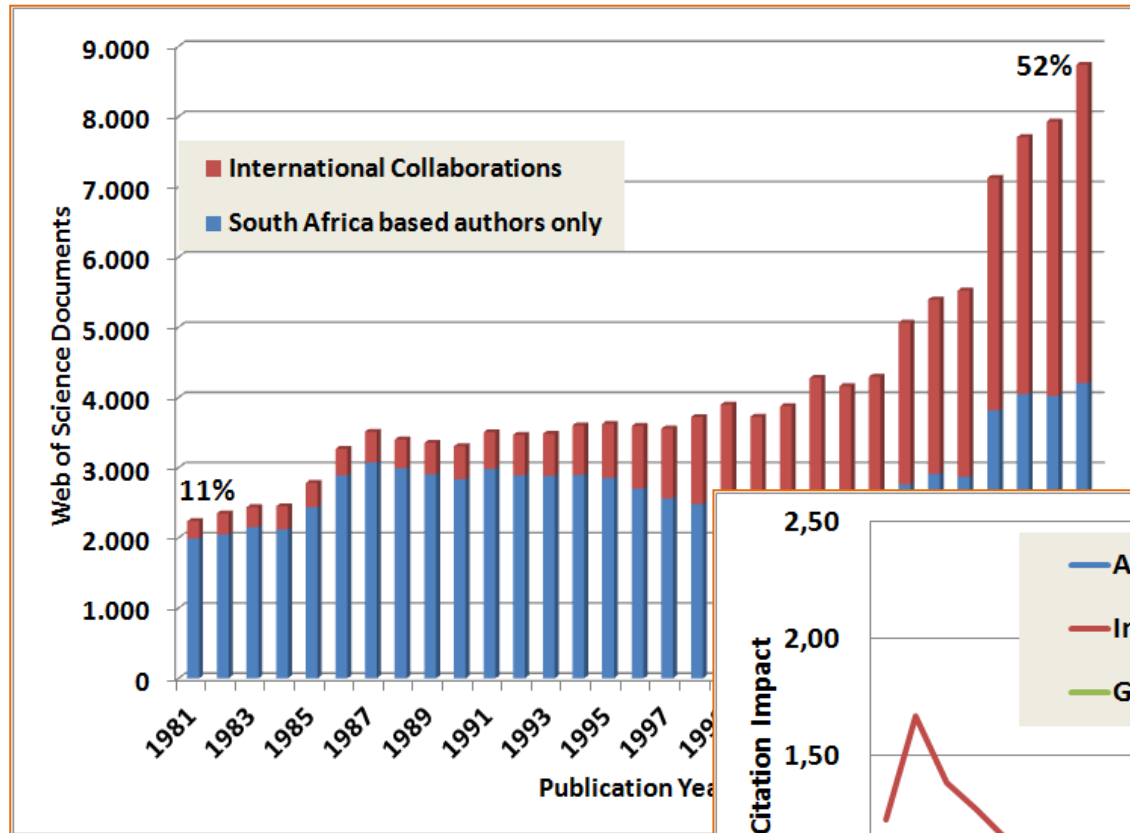
Increase of SA research output



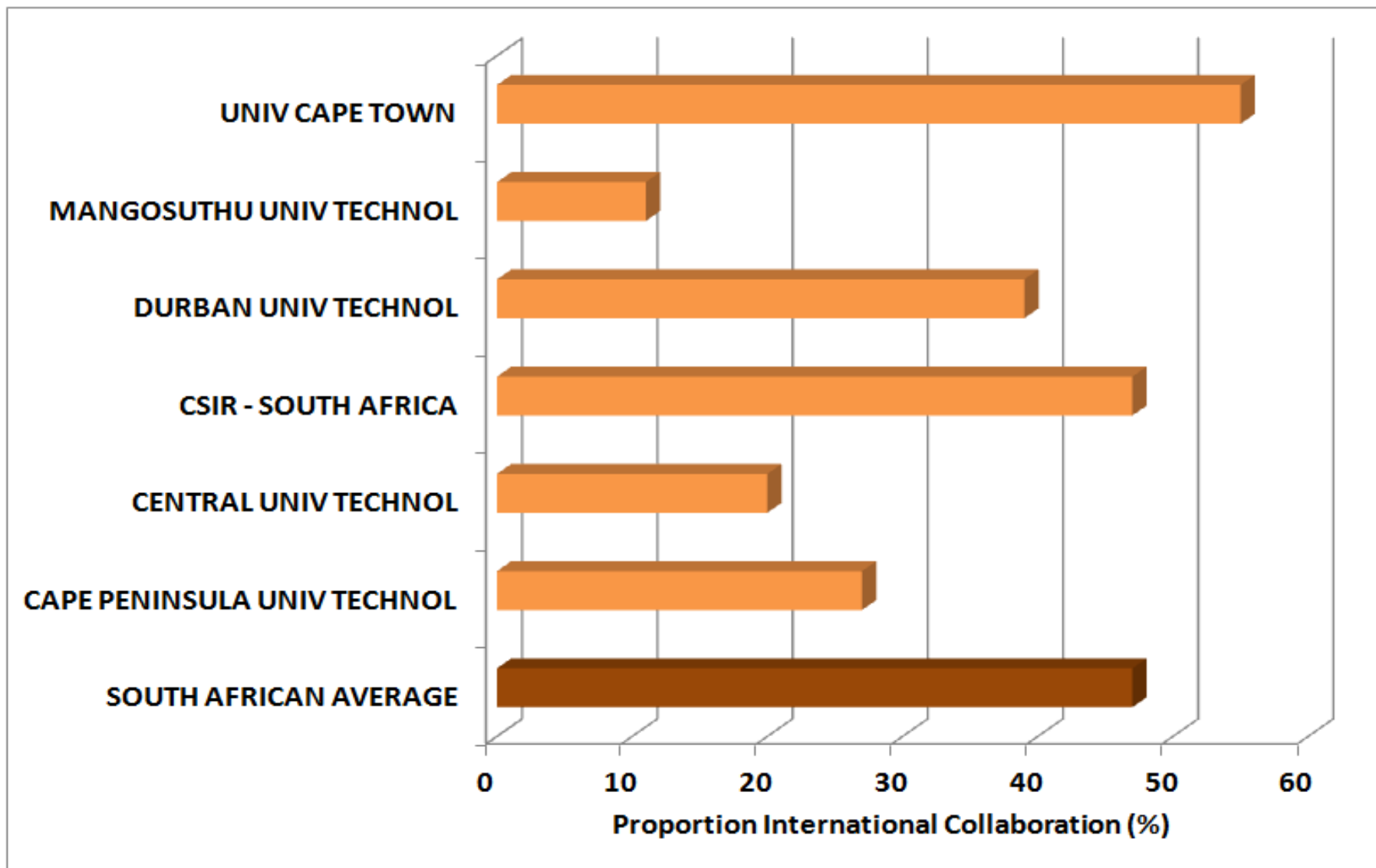
Research output: SA journal papers vs SA research Papers

Publication Years	South African Journal Papers	South African Research Papers
2001	1.036	5.137
2002	1.373	5.648
2003	1.414	5.395
2004	1.538	6.023
2005	1.634	6.403
2006	1.945	7.299
2007	3.045	8.539
2008	2.846	9.514
2009	3.107	10.486
2010	2.765	10.598
2011	3.058	12.018
2012	2.855	12.309
Total	26.616	99.369

Collaboration of SA researchers



Collaboration of SA institutions



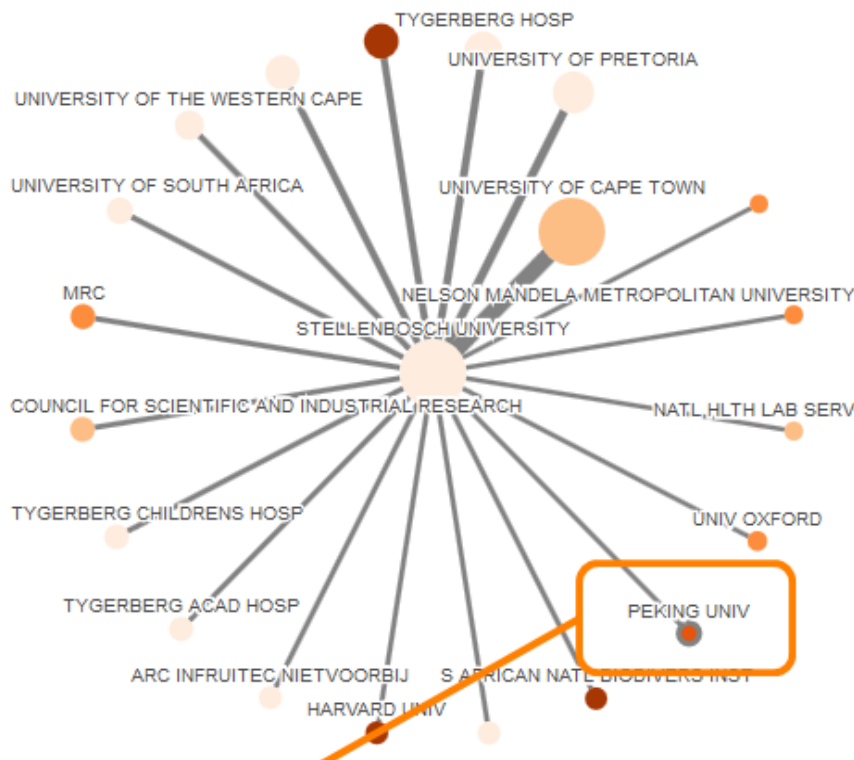
Analysis of the Institutional Collaboration for Stellenbosch University

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Web of Science Documents

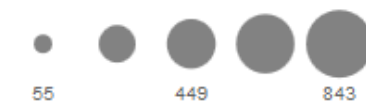
Institution	Documents
UNIVERSITY OF CAPE TOWN	14877
UNIVERSITY OF THE WITWATERSRAND	10818
UNIVERSITY OF PRETORIA	10633
STELLENBOSCH UNIVERSITY	9624
UNIVERSITY OF KWAZULU NATAL	8874
RHODES UNIVERSITY	2736
UNIVERSITY OF JOHANNESBURG	2728
UNIVERSITY OF THE FREE STATE	2668
NORTH WEST UNIVERSITY	2643
UNIVERSITY OF THE WESTERN CAPE	2183
UNIVERSITY OF SOUTH AFRICA	2027
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL	1758

Showing 1 to 50 of 24,607 institutions



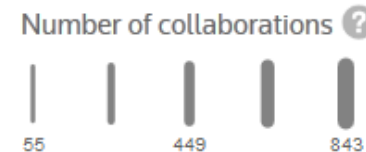
Top 1-20 of 3,983 collaborators

[Previous](#) 20 [Next](#) 20
 Web of Science Documents



Category Actual/Expected

1.0 2.0 3.5



73 collaborations between PEKING UNIV & STELLENBOSCH UNIVERSITY in dataset "National Citation Report: South Africa"

Average Cites per Document: 9.93 **Category Actual/Expected Citations:** 2.71

Journal Actual/Expected Citations: 2.05 **Average Percentile:** 48.75 **Times Cited:** 725

Funding of research

Funding Agency	Web of Science Documents
National Research Foundation of South Africa	5317
National Science Foundation, USA	613
Department of Science and Technology, India	589
University of Cape Town	537
Medical Research Council of South Africa	912
National Institutes of Health, USA	499
Wellcome Trust	465
University of KwaZulu-Natal	435
University of the Witwatersrand	434
European Union	395
University of Pretoria	327
Deutsche Forschungsgemeinschaft	320
Council of Scientific and Industrial Research, India	305
Rhodes University	269
Department of Science and Technology of South Africa	268
University of Stellenbosch	262
National Natural Science Foundation of China	241
THRIP	239
University of Johannesburg	230
NASA	207

Research funding: Determining ROI

Citation Metrics

Times Cited	447
Web of Science Documents	18
Cites per Document	24.83
% Documents Cited	
h-index	14
Median Cites	22
2nd Generation Citations	1.273
2nd Generation Citations per Citing Document	3,36

Collaboration Metrics

Unique Authors	91
Average Authors per Document	9,00
Unique Institutions	30
Average Institutions per Document	4,67
Average Countries/Territories per Document	2,44



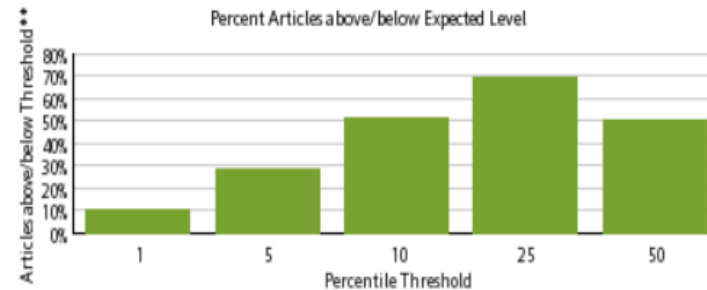
Category actual / Expected Cites 4,89



Journal actual / Expected Cites 3,10



Average Percentile 8,94



Percentile	1	5	10	25	50
Number of Documents*	2	6	11	17	18
Percent of Documents	11,11%	33,33%	61,11%	94,44%	100,00%
Articles above/below Threshold**	10,11%	28,33%	51,11%	69,44%	50,00%

*Includes document types: Article, Note, Review and Proceedings Paper (from SCIE/ SSCI/ A&HCI)

**Percentage articles above/below Expected Percentile Threshold' = (Percent of Documents [-] Percentile Threshold)

CONCLUSION

- New internet-based tools, normalised indicators and relational visualisations provide analytical means to evaluate scholarly output
- Public & Private funding bodies have to demonstrate ROI
- Not easy as fruits of research take many years to manifest
- Tools such as these provide funders, scientometricians and others to gain insight into output and performance of publications over range of aggregations.
- Next step is to link performance of publications with other outputs such as patents and then to outcomes of society.