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ON THE EVALUATION OF THE QUALITY OF RESEARCH IN GREEK HEIs USING BIBLIOMETRIC INDICES

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Abstract: *For the assessment of the quality of research and the scientific contribution of Higher Education Institutes (HEIs) and their research groups, a variety of approaches have been proposed, including expert based qualitative approaches, such as evaluation by widely accepted researchers in specific disciplines with broad recognition in the scientific community (peer-review methodology). However, the rapid Internet proliferation and the easier access to scientific databases, offers an alternative approach to assessing the scientific outcome of a researcher or a Faculty.*
Nowadays, there seems to be a movement towards bibliometric measures and indices. In this paper, the research output of four Engineering Departments, one being part of the School of Pedagogical & Technological Education (ASPETE) and the three others belonging to Technological Educational Institutions (TEIs) is evaluated by using bibliometric indices such as the total and average publications and citations and the mean h-index. For comparison purposes the evaluation also includes two Eng. Depts; one from a University and the other from a Higher Military Educational Institute. It is concluded that despite the inherent limitations of bibliometrics the viability of the adopted method for measuring and evaluating the scientific performance of higher education departments is effective in terms of Robustness, Validity, Functionality and Cost and time effectiveness. The useful results obtained suggest that such an approach could be used in a broader context.
Keywords: *quality of research, bibliometric indices, evaluation, Greek Higher Education Institute*

1. INTRODUCTION

A core component of higher education reform in Europe is the systematic quality assurance and improvement of Higher Education Institutions (HEIs). Assuring quality in teaching, learning and research is no longer a matter only for Higher Education policy programs or broad international professional discussions. Quality development and assurance have long since come to play a central role in strategic Higher Education planning and in the everyday work of HEIs [1, 2].

In Greece the evaluation (both internal and external) of HEIs is now obligatory in accordance with Law 3374/2005 [3] following also the European initiatives for a European Higher Education Area (Bologna process and Bergen report) [4].

For the assessment of the quality of research and the scientific contribution of HEIs and their research groups, a variety of approaches have been proposed, including expert based qualitative approaches, such as evaluation by widely accepted researchers in specific disciplines with broad recognition in the scientific community (peer-review methodology).

However, the rapid Internet proliferation and the easier access to scientific databases, offers an alternative approach to assessing the scientific outcome of a researcher or a Faculty. Nowadays, there seems to be a movement towards bibliometric measures and indices [5].

In this paper, the research output of four Engineering Departments, one being part of the School of Pedagogical & Technological Education (ASPETE) and the three others belonging to Technological Educational Institutions (TEIs) are evaluated by using bibliometric indices such as the total and average publications and citations and the mean h-index.

For comparison purposes the evaluation also includes two Eng. Depts; one from a University and the other from a Higher Military Educational Institute. The data about each faculty member (surname, name and academic rank) were extracted from the website of each Department. The research outputs of faculty members were retrieved from Scopus scientific database.

It is concluded that despite the inherent limitations of bibliometrics the viability of the adopted method for measuring and evaluating the scientific performance of higher education departments is effective in terms of Robustness, Validity, Functionality and Cost and time effectiveness.

The useful results obtained suggest that such an approach could be used in a broader context.

2. EVALUATION OF RESEARCH

2.1. Fundamentals

The rationale of the bibliometric approach to measuring scientific performance is presented in this section. In brief, the term "bibliometrics" describes the statistical analysis of texts, especially of published literature. Historically bibliometric methods have been used to trace relationships amongst academic journal citations. Citation analysis, which involves examining an item's referring documents, is used in searching for materials and analyzing their merit. Data from citation indexes can be analyzed to determine the popularity and impact of specific articles, authors and publications.

Since the seventeenth century scientists have communicated and codified their findings in a relatively orderly and well-defined way. Particularly important is the phenomenon of serial literature: publications in international journals. Thus communication, i.e. the exchange of research results, is a crucial aspect of scientific endeavour. Publications are not the only elements in this process of knowledge exchange, but they are definitely very important [6]. Publications offer key elements for 'measuring' important aspects of science: authors' names, institutional addresses, journal title – which indicates not only the field of research but also its 'status', references (citations) and concepts (keywords, keyword combinations) [7].

Nowadays, a publication is considered as a 'building block' of science and as a source of data. Thus bibliometric assessment of research performance is based on one central assumption: scientists who have something important to say publish their findings vigorously in the open international journal (serial) literature. The daily practice of scientific research shows that in most cases inspired scientists – particularly in the natural sciences and medical research fields – go for publication in the 'better' and, if possible, the 'best' journals. A similar situation is developing in the social and behavioural sciences, engineering and, to a lesser extent, the humanities [6, 8].

Besides bibliometric approach, for the assessment of the quality of research and the scientific contribution of HEIs and their research groups, a variety of approaches have been proposed. Typically expert based qualitative approaches were applied, such as evaluation by widely accepted researchers in specific disciplines with broad recognition in the scientific community.

This process, characterizes the model of faculty members' selection in most countries. However, it is not without drawbacks, since it requires significant resources and it is influenced by personal perceptions and the specific scientific profile of the evaluators [5]. More important it is very difficult to be applied to Departments or HEIs overalls due to very high expense of resources. As indicated in a recent publication; see [9], the superiority of bibliometrics over peer-review is evident for the natural and formal sciences, along the dimensions of:

- Robustness: bibliometrics allows evaluation of all, rather than a subset of overall output of a research group or a department.
- Validity: it avoids any distortions that could occur during internal selection of publications to be evaluated.
- Functionality: in providing evaluations for single scientists, then proceeding step by step to research groups, and ever larger aggregations, it permits each institution to allocate resources in an efficient manner.
- Cost and time effectiveness: it provides a dramatic saving on direct and indirect costs, and dramatically reduces time of execution.

Finally, bibliometrics is not limited to the evaluation of quality of research, but also permits the consideration of quantity.

2.2. Bibliometric indices

For the effective and robust evaluation of research by bibliometrics of crucial importance is the selection of the appropriate bibliometric indices. It has been indicated; see [10] that "at all levels of evaluation no indicator should be taken in isolation. A series of indicators representing the different facets of scientific activity should be employed".

In the present research indices selected corresponds to four axes of research output: productivity, impact, efficiency and hybrid (productivity + impact). The same scheme was used in a recent publication comparing the research of Economics Depts in Greece and Cyprus [11]. The indices used read as follows:

Productivity

- P: Total number of publications
- Pf: Total number of publications of a faculty member
- Pav: Average number of publications of a faculty member

Impact

- C: Total number of citations excluding self-citations
- Cs: Total number of citations with self-citations
- Cf: Number of citations of a faculty member excluding self-citations
- Cfs: Number of citations of a faculty member with self-citations
- Cav: Average number of publications of a faculty member excluding self-citations

Efficiency

- c: Average number of citations per publication excluding self-citations (Pf/Cf)
- p-index

- p0: percentage of uncited publications

Note that the p-index corrects c by giving emphasis on C_f rather than on P_f [12]. It is calculated by the form $p= (C_f^2/P_f)^{1/3}$.

Hybrid (productivity + impact)

- h-index
- hs-index (h-index, taking into account self-citations)

The h-index was introduced in 2005 by J. Hirsch [13], combining in a single indicator a measure of quantity and impact of the scientific output of a researcher. According to Hirsch, "a scientist has index h if h of his or her N_p papers have at least h citations each and the other (N_p-h) papers have ≤h citations each". The scientific community has shown a huge interest for this indicator, as shown by the high number of publications on the topic and its adoption by *Nature* and *Science* [14, 15]. In general, h-index results in the characterization of the scientific output of a researcher with objectivity, and therefore may play an important role when making decisions about promotions, fund allocation and awarding prizes. Moreover, it performs better than other single-number criteria commonly used to evaluate the scientific output of a researcher (impact factor, total number of articles, total number of citations, citation per paper rate and number of highly cited papers) [14]. Last but not least it has been found to correlate well with peer judgment [16].

However, several limitations of the h-index have also been remarked: Young researchers whose levels of publications are relatively low are handicapped since they are not involved many years in the research process. In addition, the publication policies across different scientific sectors vary. If a scholar has a low number of citations, this could be also attributed to a variety of reasons such as small impact in the field, due to work in field of a limited scope, publishing in a language other than English, or finally publishing mainly books. Also, the h-index may be increased not only by publishing new scientific papers, but also by increasing the number of citations on already published works. It is also non sensitive to the number of co-authors of a paper and thus their specific contribution to it [5, 13, 14].

3. METHODOLOGY

In an attempt to apply the evaluation of the quality of research in Greek HEIs by using bibliometric indices we select - on a pilot basis – four Mechanical Engineering Departments belonging to Technological Educational Institutions (TEIs). For comparison purposes the present research also includes two more Mech. Eng. Depts; one from a University and the other from a Higher Military Educational Institute. The Depts under consideration are:

- Dept. of Mech. Engineering Educators/School of Pedagogical & Technological Education (ASPETE)
- Dept of Mech. Engineering/T.E.I. of Larissa
- Dept of Mech. Engineering/T.E.I. of Pireaus
- Dept of Mech. Engineering/T.E.I. of Serres
- Dept of Mech. Engineering/University of Thessaly
- Dept. of Aeronautical Studies/Hellenic Air Force Academy (HAFA) [Engineering Section]

Note that in Greece the Higher Education comprises of two sectors; one being the Universities (five years studies as far as engineering disciplines are concerned) and the other being the Technological one (TEIs) with four years studies. Moreover, under Law 3187/2003 the Higher Military Educational Institutes (Hellenic Military Academy, Hellenic Naval Academy and Hellenic Air Force Academy) constitutes a third sector of HEIs equivalent to University one. Worth mentioning also that for faculty members in Universities and Military Universities there are four ranks, i.e. Professor, Associate Prof., Assistant Prof. and Lecturer); for all four degrees holding a Ph.D and having a number of publications is a prerequisite. On the contrary, in TEIs a lecture/instructor is actually laboratory staff without obligation to perform research or to hold a Ph.D.

The evaluation was conducted at a faculty level (in total 84 faculty members were evaluated), as well at department level. The data about each faculty member (surname, name and academic rank) were extracted from the website of each Department. Only tenured academic staff was included. The research outputs of faculty members were retrieved from Scopus scientific data base. The data were collected from July 25, 2011 to August 5, 2011. There was no time period restriction; therefore, it should be obvious that the Depts under consideration were evaluated on the basis of the lifetime achievement of their faculty.

Note, that traditionally, bibliometric studies were based on the number of publications and citations, using the well-known Web of Science (WoS) distributed by Thomsom-ISI, which has dominated the world of multidisciplinary citation indexes. However, in 2004, two alternatives have become available. One of them is Scopus (http://www.scopus.com/) developed by Elsevier and the other is the freely available Google Scholar (http://scholar.google.com/). The comparison of these three databases is beyond the scope of the present study; see on the topic [5, 11. 17]

Subsequently, for each faculty member the bibliometric indices outlined in section 2.2 were calculated and the results for each Dept. were tabulated; see Annex. Then, the aggregate results were calculated for each department; these results are discussed in the next section.To the authors knowledge there only a few

published studies concerning evaluation of HEIs or their Depts in Greek and in South-eastern Europe by bibliometric methods. The first attempt to compare two Greek Mathematics departments using bibliometric indicators was published in 1991 [18]. A research in 2008 was focussed exclusively on Computer Science Greek depts examining 552 faculty members using Google Scholar and Publish or Perish software [19]. In a similar publication in 2010 an evaluation of Chemistry, Materials Science, Chemical Engineering and Physics Greek University depts was presented. 601 faculty members were assessed by using h-index as calculated from the Web of Science scientific database [20]. Recently 93 Greek University Depts from the fields of Social Sciences and Humanities, Sciences, Engineering, Pharmacy and Economics were evaluated according to their faculty members' h-index by using the Google Scholar scientific database [5].

4. RESULTS AND DISCUSSION

The aggregate evaluation results are summarized in Table 1. Detailed data for all Depts are given in Appendix 1. Values of c, p-index, p_0, h-index and h_s-index presented in the Table below are the mean values of all faculty members holding a Ph.D in a given Dept.

Table 1. Cumulative bibliometric indices for all HEIs.

HEI	ASPETE	TEI of Lariss	T.E.I. of Pireaus	T.E.I. of Serres	University of Thessaly	HAFA
Faculty members	8 (5)	15(11)	16(9)	12(9)	18	15
P:	71	60	203	87	763	179
C	338	373	1447	233	6401	537
P_{av}	14.20	5.45	18.45	9.67	42.39	11.93
C_{av}	67.6	33.90	160.78	25.89	355.61	35.8
c	4.76	6.22	7.13	2.88	8.39	3.00
p-index	5.58	3.67	6.90	3.05	12.17	3.24
p_0	0.32	0.27	0.28	0.50	0.26	0.46
h-index	4.40	2.18	3.73	2.11	9.33	2.13
h_s-index	4,80	2.45	5.10	2.22	10.78	3.60

Results in Table 1 should be read and analyzed in conjunction with the detailed data presented in Appendix and having always into mind the need of using multiple indicators for the assessment of HEIs' research [21] as well as the fact that publication-related activities is only one output in the knowledge transfer process of HEIs [22].

To start with, from the data presented in the Appendix it is evident that there is a large variance between the performance of the faculty members in TEIs and in HAFA. Results concerning the University seem to be more homogeneous. From the data of Table 1 it is evident that all indices are quite higher for the University in comparison with TEIs. The inherent differences in the nature and the historic evolution of these two types of HEIs may be the may reason. HAFA, whilst it is typically equivalent to University, is characterized by rather low indices. Note however, that the dual nature of "Military Universities" (HEI and military Organization) minimizes the research opportunities of their faculty members. Amongst TEIs the TEI of Pireaus possesses, in general, the highest indices. However, this should be credited to a very small portion of its faculty member; see Appendix. ASPETE has the highest mean h-index and the second higher P_{av} and C_{av}. On the contrary, mean indices for the TEI of Serres are, in general the lowest ones.

5. CONCLUSIONS

The research output of six Engineering Departments, belonging to three distinct types of HEIs (University, Technological Institute and Higher Military Educational Institute) was evaluated by using bibliometric indices such as the total and average publications and citations and the mean h-index.Evaluation of individual departments of HEIs is a worthwhile endeavor. Such efforts are still not many. Bibliometric department evaluation is fast and effective, especially when one uses simple measures like the h index and mean values. With relatively little effort this activity can be extended to all Greek HEIs.

REFERENCES

[1] *M. Spasos, A. Alexandris, G. Petropoulos, N.M. Vaxevanidis,* "Implementation of EFQM Model in a Greek Engineering Higher Education Institute: A Framework and a Case Study*", International Journal for Quality research, 2(1), pp. 43-50, 2008.*

[2] Z. Arsovski, "*Approach to quality assurance in higher education"*, Proceedings ICQME 2006, 13-15 September 2006, Budva, Montenegro, pp. 158-161.

[3] Greek Republic, Quality *assurance in higher education. Credit transfer and accumulation system - diploma supplement*. Greek State Law 3374/2005, 2005.

[4] A.M. Stamatelos, "*Experience gained from the application of basic quality assurance procedures in a Greek university engineering department*", European Journal of Engineering Education, 35(3), pp. 259-270, 2010.

[5] P. Altanopoulou, M. Dontsidou, N. Tselios, "*Evaluation of 93 major Greek University Departments using Scholar Google*", submitted to Quality in Higher Education, 2011.

[6] Centre for Science and Technology Studies, Leiden University, "*Scoping study on the use of bibliometric analysis to measure the quality of research in UK higher education institutions*", Report to HEFCE, November 2007.

[7] G. Lewison, "*Researchers' and users' perceptions of the relative standing of biomedical papers in different journals*", Scientometrics, 53, pp. 229-240, 2002.

[8] T.N. van Leeuwen, "*The application of bibliometric analyses in the evaluation of social science research. Who benefits from it, and why it is still feasible*", Scientometrics, 66 (1), pp. 133-154, 2006.

[9] G. Abramo, C. A. D'Angelo, "*Evaluating research: from informed peer review to bibliometrics*", Scientometrics, 87, pp. 499–514, 2011.

[10] J.M. Russell, R. Rousseau, "*Bibliometrics and institutional evaluation*", available online- http://www.vub.ac.be/BIBLIO/itp/lecturers/ronald_rousseau/ronald_roussea_stim1_bibliometrics_russell.pdf (retrieved: 20/06/2011).

[11] K. Zontanos, S. Katranidis, "*Comparative evaluation of the research of depts of Economic Science in Greece and Cyprus*", University of Macedonia, Thessaloniki, 2009. (in Greek)

[12] G. Prathap, "Is there a place for a mock h-index?", Scientometrics 84(1), pp.153-165, 2010.

[13] J.E. Hirsch, "An *index to quantify an individual's scientific research output*", Proceedings of the National Academy of Sciences of the United States of America, 102(46), pp. 16569-16572, 2005.

[14] R. Costas, M. Bordons, "*The h-index: Advantages, limitations and its relation with other bibliometric indicators at the micro level*", Journal of Informetrics, 1, pp. 193-203, 2007.

[15] L. Bornmann, R. Mutz, H.-D. Daniel**,** "*Are There Better Indices for Evaluation Purposes than the h Index? A Comparison of Nine Different Variants of the h Index Using Data from Biomedicine*", Journal of the American Society for Information Science and Technology, 59(5), pp. 830-837, 2008.

[16] A. F. J. van Raan, "*Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups*" Scientometrics, 67, pp. 491-502, 2006.

[17] J. Bar-Ilan, "*Which h-index? - A comparison of WoS, Scopus and Google Scholar*", Scientometrics, 74(2), pp. 257-271, 2008.

[18] G. Zachos, "Research output evaluation of 2 university departments in Greece with the use of bibliometric indicators", Scientometrics, 21, pp. 195–221, 1991.

[19] T. Lazaridis, "*Ranking university departments using the mean h-index*', Scientometrics, 82(2), pp. 211-216, 2010.

[20] D.Katsaros, V. Matsoukas, Y. Manolopoulos, "*Evaluating Greek Departments of Computer Science & Engineering using Bibliometric Indices*", *Proceedings of the Panhellenic Conference on Informatics* (PCI), Samos Island, Greece, August 28-30, pp. 93-102, 2008.

[21] B.R. Martin, "*The use of multiple indicators in the assessment of basic research*", Scientometrics, 36, pp. 343-362, 1996.

[22] U. Schmoch, T. Schubert, "*When and how to use bibliometrics as a screening tool for research performance*", Science and Public Policy, 36(10), pp. 753-762, 2009.

APPENDIX

Table A1. Bibliometric data for academic staff for all Depts of HEIs.

Faculty member	No. of scientific articles	No. of articles without citations	No. of citations	No. of citations excluding self-citations	h_s-index	h-index	p-index	Year of 1rst publication	Citations per article
ASPETE									
Prof. 1	14	5	65	44	4	4	5.08	2000	3.14
Assoc. Prof 1	12	3	73	60	5	5	6.56	1985	5.00
Assoc. Prof 2	30	13	197	161	9	8	9.31	1986	5.37
Assist. Prof 1	15	2	99	73	6	5	6.94	1999	4.87
Assist. Prof 2	0	0	0	0	0	0	0	-	-
Lect. (Instruct.)1	0	0	0	0	0	0	0	-	
Lect. (Instruct.)2	0	0	0	0	0	0	0	-	
Lect. (Instruct.)3	0	0	0	0	0	0	0	-	
SUM	71	23	434	338					
AVERAGE				42.25	3.00	2.75			
AVERAGE (on staff holding PhD)	14.20			67.60	4.80	4.40	5.58		4.76
SUM (on staff holding PhD)	71			338					
TEI of Larissa	P_f	P_0	C_{fs}	C_f	h_s	*h-index*	*p-index*		c_f
Prof. 1	7	3	7	1	1	1	0.52	1989	0.14
Prof. 2	2	0	15	15	2	2	4.75	1999	7.50
Prof. 3	2	2	0	0	0	0	0	2006	0
Assoc. Prof 1	1	1	0	0	0	0	0	2006	0
Assoc. Prof 2	12	2	203	167	7	7	12.9	1999	13.92
Assoc. Prof 3	7	0	108	86	5	4	9.95	1998	12.29
Assist Prof 1	12	1	101	84	6	6	8.2	2002	7.00
Assist Prof 2	0	0	0	0	0	0	0	-	0
Assist Prof 3	6	3	9	3	2	1	1.14	2008	0.50
Assist Prof 4	11	4	31	17	4	3	2.94	2004	1.55
Assist Prof 5	0	0	0	0	0	0	0	-	0
Lect. (Instruct.) 1	0	0	0	0	0	0	0	-	0
Lect. (Instruct.) 2	0	0	0	0	0	0	0	-	0
Lect. (Instruct.) 3	0	0	0	0	0	0	0	-	0
Lect. (Instruct.) 4	0	0	0	0	0	0	0	-	0
SUM	60	16	474	373					
SUM (excluding common articles)	53								
AVERAGE				24.87	1.80	1.60			
AVERAGE (on staff holding PhD)	5.45			33.91	2.45	2.18	3.67		6.22
SUM (on staff holding PhD)	60			373					

TEI of Piraeus	P_f	P_0	C_{fs}	C_f	h_s	*h-index*	*p-index*		c_f
Prof. 1	103	27	804	444	16	11	12.1	1987	4.31
Assoc. Prof. 1	16	3	105	90	7	6	7.8	1996	5.63
Assoc. Prof. 2	28	6	597	549	8	6	21.4	1993	19.61
Assoc. Prof. 3	8	2	150	138	5	5	13.01	1987	17.25
Assoc. Prof. 4	0	0	0	0	0	0	0	-	0
Assoc. Prof. 5	1	0	20	20	1	1	7.22	2006	20.00
Assoc. Prof. 6	5	2	0	0	0	0	0	1995	0
Assist. Prof. 1	29	8	213	170	8	7	9.76	1996	5.86
Assist. Prof. 2	0	0	0	0	0	0	0		0
Lect. (Instruct) 7	13	6	63	36	6	5	4.56	1996	2.77
Lect. (Instruct.) 1	0	0	0	0	0	0	0		0
Lect. (Instruct.) 2	20	0	258	146	10	7	9.98	2001	7.30
Lect. (Instruct.) 3	0	0	0	0	0	0	0		0
Lect. (Instruct.) 4	0	0	0	0	0	0	0		0
Lect. (Instruct.) 5	8	3	129	123	3	3	12.05	2009	15.38
Lect. (Instruct.) 6	1	1	0	0	0	0	0	2010	0
SUM	232	58	2339	1716					
SUM (excluding common articles)	202								
AVERAGE	14.50			201.88	4.00	3.19			
AVERAGE (on staff holding PhD)	18.45			131.55	5.10	3.73	6.90		7.13
SUM (on staff holding PhD)	203			1447					
TEI of Serres	P_f	P_0	C_{fs}	C_f	h_s	*h-index*	*p-index*		c_f
Prof. 1	7	2	34	30	3	3	4.97	1989	4.29
Prof	17	11	46	22	3	3	3.01	1999	1.29
Prof. 3	29	9	91	65	4	4	5.17	1991	2.24
Prof. 4	0	0	0	0	0	0	0	-	0.00
Assoc. Prof. 1	3	2	16	10	1	1	3.18	1993	3.33
Assoc. Prof. 2	0	0	0	0	0	0	0	-	0
Assoc. Prof. 3	10	1	104	98	6	6	9.64	1996	9.80
Assist Prof. 1	21	19	36	8	3	2	1.44	1996	0.38
Assist Prof. 2	0	0	0	0	0	0	0	-	0
Lect. (Instruct.) 1	0	0	0	0	0	0	0	-	0
Lect. (Instruct.) 2	0	0	0	0	0	0	0	-	0
Lect. (Instruct.) 3	0	0	0	0	0	0	0	-	0
SUM	87	44	327	233					
SUM (excluding common articles)	84								
AVERAGE	7.25			19.42	1.67	1.58			
AVERAGE (on staff holding PhD)	9.67			25.89	2.22	2.11	3.05		2.68
SUM (on staff holding PhD)	87			233					
Univ. of Thessaly	P_f	P_0	C_{fs}	C_f	h_s	*h-index*	*p-index*		c_f
Prof. 1	55	11	1022	965	18	16	24.85	1985	17.55
Prof. 2	46	3	563	444	13	12	15.79	1989	9.65
Prof. 3	57	18	339	283	12	10	10.93	1988	4.96
Prof. 4	30	8	324	260	11	9	12.77	1991	8.67
Prof. 5	58	20	613	434	15	13	14.41	1991	7.48
Prof. 6	58	14	687	499	14	11	15.8	1986	8.60

Prof. 7	50	13	331	168	11	7	8.09	1985	3.36
Prof. 8	32	4	374	309	10	9	14.01	1994	9.66
Assoc. Prof. 1	30	4	391	342	12	11	15.31	1987	11.40
Assoc. Prof. 2	67	27	241	158	10	7	7.05	1991	2.36
Assoc. Prof. 3	62	14	382	310	12	10	11.29	1989	5.00
Assoc. Prof. 4	29	5	262	214	8	8	11.38	1990	7.38
Assoc. Prof. 5	14	6	88	80	5	5	7.54	1982	5.71
Assoc. Prof. 6	107	20	2057	1706	25	24	29.06	1987	15.94
Assist. Prof. 1	9	4	21	18	2	2	3.26	2002	2.00
Assist. Prof. 2	14	3	43	34	2	2	4.29	1990	2.43
Assist. Prof. 3	34	16	188	135	9	7	7.95	1989	3.97
Lecturer	11	3	64	42	5	5	5.34	1997	3.82
SUM	763	193	7990	6401					
SUM (excluding common articles)	737								
AVERAGE	42.39			355.61	10.78	9.33	12.17		8.39
HAFA	P_f	P_0	C_{fs}	C_f	h_s	*h-index*	*p-index*		c_f
Prof. 1	9	8	1	1	1	1	0.48	1989	0.11
Prof. 2	26	15	53	15	5	2	2.03	1981	0.58
Prof. 3	10	4	20	8	3	2	1.84	1988	0.80
Assist. Prof. 1	35	17	49	17	4	3	2.02	1988	0.11
Assist. Prof. 2	13	3	108	104	4	4	9.19	1988	8.00
Assist. Prof. 3	5	2	5	2	2	1	0.92	1992	0.40
Assist. Prof. 4	15	5	124	99	5	4	8.49	2003	6.60
Assist. Prof. 5	6	6	0	0	0	0	0	1998	0
Lecturer 1	25	2	301	267	9	8	13.8	1981	10.68
Lecturer 2	0	0	0	0	0	0	0	-	0
Lecturer 3	5	2	24	22	2	2	4.52	1991	4.40
Lecturer 4	4	2	3	2	1	1	1	1996	0.50
Lecturer 5	4	2	3	3	1	1	1.3	1987	0.75
Lecturer 6	21	15	30	8	3	2	1.44	2002	0.38
Lecturer 7	1	0	2	2	1	1	1.58	2002	2.00
SUM	179	83	723	537					
SUM (excluding common articles)	164								
AVERAGE	11.93			35.80	3.60	2.13	3.24		3.00

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