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ScienceDirect

Procedia Technology 16 (2014) 279 – 287

Procedia Technology

CENTERIS 2014 - Conference on ENTERprise Information Systems / ProjMAN 2014 - International Conference on Project MANagement / HCIST 2014 - International Conference on Health and Social Care Information Systems and Technologies

Bibliometric analysis of Portuguese research in e-government

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Abstract

In this article we present a bibliometric analysis of journal articles, conference papers and book chapters published internationally by researchers affiliated to Portuguese institutions in the subject of e-government in the past ten years. The Scopus® database was used as source. The identified articles were analyzed concerning year of publication, citations, topics addressed, scope, methods used, and authors and their affiliation institutions. A benchmark exercise was also performed by comparing Portuguese bibliometrics with all the other countries in the European Union. We conclude that e-government research in Portugal still has a substantial room for improvement. This is apparent from the small number of researchers and institutions involved in e-government research, the limited number of topics addressed, and the results of the international benchmark. By establishing the evolution and current standing of e-government research in Portugal our conclusions are useful to researchers in the area of e-government, and to research managers and research policy makers.

Peer-review under responsibility of the Organizing Committee of CENTERIS 2014.

Keywords: e-government, Portugal, bibliometrics, content analysis; conceptual analysis, research;

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Peer-review under responsibility of the Organizing Committee of CENTERIS 2014.
doi:10.1016/j.protcy.2014.10.093

1. Introduction

In 2012, Portugal was ranked 33 out of 190 countries in the United Nation (UN) e-Government Development Index [1]. Within the European Union (EU) members, according to the same index, Portugal was ranked 18 out of 28 countries. In the same year, in the EU e-government benchmark [2], Portugal was ranked 2 out of the 28 EU member countries regarding 'online availability of basis and extended services' and 5 regarding 'e-government use'. This rankings show that Portugal has a comfortable position in e-government development, and a very good position in availability and use of public services online. However, this does not imply that the same is true in what concerns e-government research.

The main objective of this article is to address the development and current standing of Portugal relating e-government research, using international research indexes as a source, and to analyze how it compares with other EU countries in that respect. To our knowledge, this is the first study to address this subject in Portugal. Our conclusions may prove useful to researchers in the area of e-government, and to research managers and research policy makers.

The remaining of this article is organized as follows: in section 2 we present the methods used in the study; in section 3 we present the results obtained with the study; in section 4 we discuss those results; and in section 5 we present the general conclusions and future work.

2. Methods

The set of articles analyzed in this text was retrieved using the Scopus® database as a source. Scopus® was used because it retrieved more entries for the intended search conditions than other sources, thus implying a bigger sample. The fact that the Portuguese Foundation for Science and Technology (FCT) has recently used this index to perform the 2013 bibliometrics analysis of the Portuguese research units and laboratories was also relevant to this choice.

The set of articles was retrieved the 9th of June, 2014 using the online search engine of the database. The search conditions included all articles having the expressions 'e-government', 'e-gov', 'egovernment', 'egov' or 'digital government' in their title, abstract or keywords for which 'Portugal' appeared as affiliation country, in a ten year window, starting in 2003 (see expression 1). The resulting set was analyzed for correction and one article was subsequently excluded because it respected to a workshop editorial introduction. The final set included 48 articles [3-50].

(TITLE-ABS-KEY(**{e-government}**) OR TITLE-ABS-KEY(**{e-gov}**) OR TITLE-ABS-KEY(**egovernment**) OR TITLE-ABS-KEY(**egov**) OR TITLE-ABS-KEY(**{digital government}**)) AND AFFILCOUNTRY(**portugal**) AND PUBYEAR > **2002** AND PUBYEAR < **2014** (1)

A bibliometric analysis was performed in the set of 48 articles. The following items were analyzed:

- Number of published articles by year, source type and language used;
- Number of citations by year;
- Number of articles by author and affiliation institution;
- Number of citations by author and affiliation institution;
- Global and per author and per affiliation *h* index.

For international benchmarking, EU countries were selected. This option was made do to the similar contexts that exist in these countries, without compromising diversity concerning their relative dimensions and development stages. Expression 1 was adapted for each of the referred countries to retrieve national data. The following items were registered for each country:

- Number of published articles;
- Number of citations;
- h index.

The article abstracts were subsequently analyzed concerning their scope, the e-government topics addressed, and the methods used, if any. To this purpose, a conceptual analysis (a subcategory of content analysis) was performed. The categories were comprehensively established during the analysis, taking in consideration the descriptions presented.

3. Results

From the set of 48 articles selected, 14 are journal articles, 32 are conference papers (23 published in conference proceedings and 7 in book series) and two are book chapters. Concerning language, 40 were written in English and 8 were written in Portuguese. Figure 1 depicts the evolution of articles published and citations received by researchers affiliated to Portuguese institutions, between 2003 and 2013. Despite the small numbers, it is noticeable a growing trend in both variables.

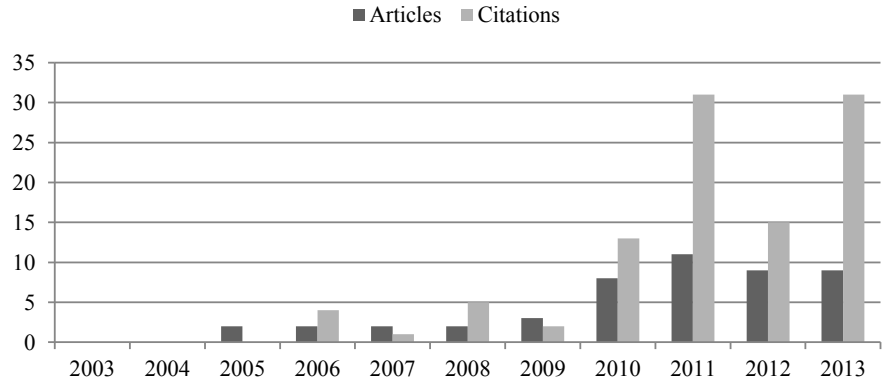

Fig. 1. Evolution of articles published and citations received by researchers affiliated to Portuguese institutions, since 2003.

3.1. International benchmarking

Table 1 presents information concerning the number of articles published; number of citations received; average citations per article; h index; and articles and citations per million inhabitants by EU country, between 2003 and 2013. The last two variables were introduced to relativize the asymmetric dimensions of the EU countries. Portugal ranks 14 out of 28 in number of articles and in average citations per article. When relative numbers are used, Portugal ranks 17 in articles per million inhabitants and 15 in citations per million inhabitants. It ranks 14 in what concerns h factor, *ex aequo* with Lithuania, Slovakia and Hungary.

Table 1. Number of articles, number of citations, average citations per article, *h* index, and articles and citations per million inhabitants (pMi) by EU country, since 2003.

Country	Articles	Citations	Average citations	*h* index	*Articles pMi*	*Citations pMi*
United Kingdom	632	4420	6,99	33	10,24	71,64
Greece	330	1083	3,28	17	29,46	96,70
Germany	323	700	2,17	14	3,94	8,54
Italy	313	763	2,44	11	5,22	12,72
Netherlands	248	1181	4,76	18	15,12	72,01
Spain	233	996	4,27	15	5,09	21,75
Austria	158	309	1,96	7	19,04	37,23
Sweden	135	259	1,92	8	14,67	28,15
France	108	281	2,60	7	1,68	4,37
Ireland	97	331	3,41	10	21,56	73,56
Denmark	68	468	6,88	6	12,36	85,09
Belgium	65	313	4,82	8	6,07	29,25
Slovenia	59	225	3,81	7	29,50	112,50
Portugal	48	102	2,13	4	4,53	9,62
Romania	43	53	1,23	3	2,00	2,47
Czech Republic	40	29	0,73	3	3,81	2,76
Poland	40	41	1,03	3	1,05	1,08
Finland	33	50	1,52	3	6,23	9,43
Hungary	25	25	1,00	4	2,50	2,50
Estonia	23	22	0,96	3	17,69	16,92
Lithuania	23	49	2,13	4	6,97	14,85
Slovakia	16	29	1,81	4	2,96	5,37
Croatia	14	4	0,29	1	3,18	0,91
Bulgaria	11	6	0,55	2	1,45	0,79
Luxembourg	9	64	7,11	2	18,00	128,00
Cyprus	5	1	0,20	1	6,25	1,25
Malta	1	0	0,00	0	2,50	0,00
Latvia	1	0	0,00	0	0,43	0,00

3.2. Topics, scopes and methodologies

Tables 2 to 4 present the results of the conceptual analysis. Considering the topics addressed 71% of the articles fall into one of the five most representative categories: ‘interoperability and service integration’; ‘strategies, methodologies and key factors’; ‘marketing and public participation’; ‘back-office processes and workflows’; and usability of government websites (see Table 2). Concerning the scope of the articles, 58% are of general application (i.e. not addressing a specific level or branch of government) and 31% relate to local e-government. Specific branches of government are addressed by only 10% of the articles (see Table 3). Concerning the methods used, 40% of the articles present new model or system proposals; 23% are case studies; and 13% are based on empirical data collected through the observation of governmental websites.

Table 2. Frequency and percentage of topics categories addressed by the selected articles.

Topic category	Frequency	Percentage	Articles
interoperability and service integration	11	23%	[13, 15, 19-21, 29-31, 40, 45, 49]
strategies, methodologies and key factors	7	15%	[6, 8, 35, 38-40, 42]
marketing and public participation	6	13%	[22, 23, 26-28, 46]
back-office processes and workflows	5	10%	[3, 7, 15, 47, 50]
usability of government websites	5	10%	[4, 5, 24, 34, 37]
administrative and socioeconomic impacts	4	8%	[16, 17, 41, 43]
maturity models and maturity assessment	3	6%	[9, 11, 12]
e-learning environments	3	6%	[18, 33, 44]
mobile government	2	4%	[25, 32]
privacy and security	2	4%	[10, 48]

Table 3. Frequency and percentage of scope categories addressed by the selected articles.

Scope category	Frequency	Percentage	Articles
general	28	58%	[7, 8, 12, 14, 18-20, 22, 24-32, 34-37, 45, 46, 48-50]
local government	15	31%	[3-6, 9-11, 13, 21, 39-43, 47]
judicial system	2	4%	[15, 38]
tax administration	2	4%	[33, 44]
health care	1	2%	[23]

Table 4. Frequency and percentage of main method categories used by the selected articles.

Main method category	Frequency	Percentage	Articles
new model or system proposal	19	40%	[8, 14, 15, 19-22, 24, 26, 29-31, 33, 36, 42, 43, 46, 47, 50]
case study	11	23%	[6, 7, 13, 27, 28, 38-41, 44, 49]
web site observation	6	13%	[4, 5, 9-11, 34]
employees or experts survey	2	4%	[3, 45]
new method proposal	2	4%	[25, 49]

3.3. Authors and research institutions

Table 5 presents data concerning the research institutions to which the authors of the selected articles are affiliated. Only Portuguese institutions to witch 2 or more articles are affiliated are presented. The University of Aveiro, per se, is responsible for 33% (16 out of 48) of the published articles and 53% (53 out of 102) of the citations. The University of Minho is responsible for 14% of the citations. Altogether, these two universities represent 42% of the articles published and 66% of the citations. They are also the two research institutions with bigger average citations per article (3.31 and 3.50, respectively) and with bigger values for the h factor (3 and 2, respectively).

Table 6 presents data concerning the authors that published articles affiliated to Portuguese institution between 2003 and 2013. Only authors affiliated to Portuguese institutions and with 2 or more articles are presented. The first relevant observation is that only 19 authors have more than one article published. From those, only two have more than 10 citations (Dias, G.P., and Rodrigues, H.). In fact, only two articles, one of each of those authors, have more than 10 citations [14, 25]. These two articles, per se, are responsible for 47% of the country citations. It is also worth mentioning that 4 out of the 5 authors with three or more articles published are affiliated to the University of Aveiro and have co-authored several articles (Dias, G.P., Zúquete, A., Gomes, H., and Marques, F.).

Table 5. Number of articles, number of citations, average citations per article, and *h* index by affiliation institution with more than two articles published since 2003.

Affiliation Institution	Articles	Citations	Average citations	*h* index
Universidade de Aveiro	16	53	3.31	3
Universidade Técnica de Lisboa	5	2	0.40	1
Universidade do Minho	4	14	3.50	2
Universidade de Coimbra	4	5	1.25	1
Universidade Técnica de Lisboa	4	2	0.50	1
Instituto Universitário de Lisboa	3	5	1.67	1
Universidade Aberta	2	2	1.00	1
Universidade do Porto	2	1	0.50	1
Universidade do Algarve	2	0	0.00	0
Universidade de Trás-os-Montes e Alto Douro	2	0	0.00	0

Table 6. Number of articles, number of citations, average citations per article, and *h* index by author with Portuguese affiliation and more than two articles published since 2003.

Author	Articles	Citations	Average citations	*h* index
Dias, G. P.	14	53	3,79	3
Zuquete, A.	5	7	1,40	2
Roque, L.	3	4	1,33	1
Marques, F.	3	4	1,33	1
Gomes, H.	3	3	1,00	1
Rodrigues, H.	2	16	8,00	2
Pinto, J.S.	2	3	1,50	1
Isaias, P.	2	3	1,50	1
Aleixo, C.	2	3	1,50	1
Rodrigues, M.	2	3	1,50	1
Teixeira, A.	2	3	1,50	1
Rocha, A.	2	1	0,50	1
Sá, F.	2	1	0,50	1
Borbinha, J.	2	0	0,00	0
Vieira, R.	2	0	0,00	0
Silva, P.S.	2	0	0,00	0
Trigo, A.	2	0	0,00	0
Varajao, J.	2	0	0,00	0
Vasconcelos, A.	2	0	0,00	0

4. Discussion

In 2012, Portugal was ranked 18 out of 28 EU countries in the UN e-Government Development Index [1]. When e-government research is a stake, depending on the variable used, Portugal ranks between 14 and 17 out of the same 28 countries (see Table 1). Thus, at first glance it may seem that the country's position in terms of e-government research is roughly equivalent to its performance in terms of effective e-government development, as measure by the UN. However, the same is not true when the EU e-government benchmark [2] is used. In effect, in that study Portugal stands as one of the EU leading countries, namely in terms of 'online availability of basis and extended services' (rank 5) and 'e-government use' (rank 2). Thus, it seems that a gap exists between the achievements of the country in terms of e-government effective applications and use and e-government research.

Also, the country achievements in terms of e-government research (or its international visibility trough research indexes) are substantially lower than for some other EU countries of comparable dimension. Greece is, to this respect, a notable example, with an *h* index of 17 (4 for Portugal). Other examples are Austria and Belgium, with *h* index scores of 7 and 8, respectively.

When the effective research production is analyzed, this is even more evident. Indeed, only five researchers affiliated to Portuguese institutions have three or more articles listed in the Scopus® database, and only two have more than 10 citations in that database (Table 6). The same is true when research institutions are at stake − only one institution has 10 or more articles published in the database and only two institutions have 10 or more citations to their articles in the same database (Table 5).

The list of research topics, scopes and methods used is also limited. Although 'interoperability and service integration' is the most represented category and 'new model or system proposal' is the more common approach, it is symptomatic that the country achievements in terms of online availability of services, namely the platforms used, do not rely on the models and technologies presented in these articles. Also, local government is the scope of 31% of the articles published, when it is recognized that local e-government is substantially undeveloped in Portugal when compared to central government [9, 11].

Thus, it can be concluded that there is a substantial room for improvement with regard to the investigation of e-government in Portugal, in particular taking advantage of the country achievements in terms of e-government services and use.

The study presented in this article is based on a bibliometric analysis of journal articles, conference papers and book chapters listed in the Scopus® database and authored by researchers affiliated to Portuguese institutions. This approach has some limitations. In fact, it can be argued that the Scopus® database does not represent all e-government research conducted in Portugal in the past 10 years, both because it does not include all published articles and because it does not include other relevant works like master and PhD thesis or funded research projects. Nevertheless, it can also be argued that it would be natural that those other works should be visible internationally through research indexes like Scopus®. Despite these limitations, it is our conviction that this source is sufficiently representative to support the conclusions presented in this article and that no substantially different conclusions could be achieved using different sources of information.

5. Conclusions and future work

In this article we presented a bibliometric analysis of articles published internationally by researchers affiliated to Portuguese institutions in the subject of e-government, between 2003 and 2013. The Scopus® database was used as a source.

We concluded that, although Portugal as very good results in terms of online delivery of government services and of e-government effective use, there is still substantial room for improvement with regard to the investigation of this subject in Portugal. This is evident from the international comparison with other EU countries and from the analysis of the research production that was published internationally. As evidence, only one Portuguese institution and one researcher (from that institution) have more than 10 articles published in the subject of e-government and only two institutions and two researchers (one from each of those two institutions) have more than 10 citations to their articles.

The conclusion that there is a great room for improvement with regard to the investigation of e-government in Portugal, namely by involving more researchers and institutions in the study of the country achievements in terms of e-government development, is useful for researchers that might be interested in the subject as well as to research managers and policy makers at the central government and at the several universities and other research centers.

The study presented in this article could be extended by including data from additional sources, namely from other national and international repositories, and by extending its scope to master and PhD thesis produced and the participation in e-government research projects, for example. This could allow detecting if the low international visibility of e-government research in Portugal is only due to the limited number of researchers and institutions involved in the subject research, as we have concluded, or also because some difficulties exist in achieving international visibility to the research produced. Other relevant analyses could include the constitution of the research teams that are active in researching e-government in Portugal and their degree of national and international cooperation.

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