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academic careers understood through measurement and norms

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D2.12 Sample Web indicators for research assessment

In this deliverable a set of web-based indicators for individual research assessment is provided. Indicators are divided into two groups: webometrics and altmetrics. Webometric indicators measure a general web impact through web (web citations or web mentions) (Kousha & Thelwall, in press-c). Altmetric indicators measure more specific impacts by using information such as the number of readers for a publication, tags, bookmarks, comments, tweets or blogging provided by users to assess the impact of authors or publications (Bar-Ilan et al., 2012; Priem et al., 2010; Wouters & Costas, 2012). For each indicator proposed, we provide the type of impact that it assesses, the source/s that can be used for data collection, the type of evidence found, an explanation concerning its manual and automatic counting possibilities as well as it advantages and limitations, which is compiled in Table 1 in Appendix.

1.1 Webometric indicators

The main webometric indicators to assess the web impact have been web citations, web links and web mentions by considering that whether a web page is linked, mentioned or cited is because it had some type of impact (Kousha & Thelwall, 2006).

1.1.1 Web citations

The first approach to assess the web impact was to move conventional citation analyses to the web, in which citations to scholarly publications from the web resources were counted, since web citations seem to be correlated with traditional citations (Vaughan & Shaw, 2005) and they "are sufficiently numerous to be useful for the impact assessment of research" (Kousha et al., 2010), although it has also been found non-standard reasons for its creation (Kousha & Thelwall, in press-c).

Web citations are identified using commercial search engines (e.g., Google, Bing; also Exalead, Gigablast, Teoma) and they have been used, for instance, to analyze the impact of articles in teaching assessing citations from online syllabuses (Kousha & Thelwall, 2008) or to assess citations to scholarly journals from online PowerPoint presentations (Thelwall & Kousha, 2008). Specific sources can be used for collect web citations:

- *Google Scholar* (GS). It is a free tool that collects citations from scholar publications: published papers, preprints, postprints, technical reports, dissertations, conference articles… Google Scholar has wider coverage of citation data than traditional bibliometric databases (e.g., WoS and Scopus), especially in the social sciences and arts and humanities and some studies have found strong correlations between GS and WoS citations across fields, so that the use of GS can give wider picture of the scholarly impact of individual researchers (Bar-Ilan, 2008; Harzing & van der Wal, 2008; Kousha & Thelwall, 2007; Meho & Yang, 2007). In fact, in some fields (e.g. computer science and informatics) Google Scholar citation is already used to support peer review process in some countries (Panel criteria and working methods, 2012). However, this tool lacks a quality control mechanism, has some false matches and can be artificially manipulated (Jacso, 2006), so it is not recommended as a unique source to evaluate the impact of research, but a complement to traditional databases (Bakkalbasi et al., 2006). Both manual and automatic counting are possible: the first one with online searches and the second one with Publish and Perish. This source is useful to assess research impact.

- *Google Books (GB).* It is also a free tool that collects citations from books sources such as monographs, edited books and book chapters. It is the largest database of digitised books and it has been showed that GB citations is an useful indicator in book-oriented disciplines (social sciences and arts and humanities) for impact assessment and to support peer review for research evaluation (Kousha & Thelwall, 2009; Kousha et al., 2011). However, it has an unknown coverage, huge false matches with manual online searches and some unwanted results when extraction citations automatically. Manual counting is possible with online searches followed by removing false citation matches. In response, an automatic method was developed and tested using Google Books API in Webometric Analyst (http://lexiurl.wlv.ac.uk/, see also Thelwall, 2013), free software to automatically capture citations and remove false matched inside digitised books to get systematic sufficient results for research assessment. (Kousha & Thelwall, in press-a).
- Google or Bing. General search engines can be used for extracting citations from online scholarly sources such as presentations or academic course syllabi.
    - Citations from online presentations (PowerPoint files) measure research impact. Manual counting is possible with special formatted files (e.g., ppt and pptx) or using Slideshare, a specific web tool for sharing presentations. Automatic counting is possible with Bing API search using Webometric Analyst. Scientific presentations are covered even if they are not published in conference proceedings. They may include educational presentations, which can be valuable for tracking the popularisation of research outside the formal publications (Thelwall & Kousha, 2008). The main drawback is many scholarly presentations are also available in PDF or HTML format, and it is not practical to separate academic presentations from other publications during the search process.

    - Citations from online syllabi measure the impact of scholarly publications in teaching. Manual counting is possible looking for mentions on online syllabi and automatic counting is possible with Bing API search using Webometric Analyst, but there are some false matches that need manual checking, especially for educational research. It is especially useful in fields where teaching is an important academic activity and impact or value of publications with educational utility such as text books could not be assessed by the conventional bibliometric methods (Kousha & Thelwall, 2008). However, most of academic course syllabi are not free online.

1.1.2 Web links and web mentions (URL citations/title mentions)

First studies collected web links (inlinks, outlinks, interlinks), through commercial search engines or personal web crawlers, to assess the impact of websites by counting links pointing to them. However, hyperlink count metric is no longer able to be calculated because this method was carried out using commercial search engines and they do not allow hyperlink searches any more. As an alternative to hyperlinks, web mentions (title mentions and URL citations) were proposed in the belief they can reflect come type of influence (Kousha & Thelwall, in press-b; Thelwall et al., 2012). A title mention is the inclusion of a title (for example title of a publication) in a webpage, with or without a hyperlink, while a URL citation is a mention "of a specific URL in the text of a web page, whether hyperlinked or not" (Kousha & Thelwall, in press-c).

Web mentions cannot be counted manually, but automatically using commercial search engines and personal crawlers, but they cannot crawl hyperlinked citations embedded in images or titles of online documents (Kousha & Thelwall, in press-c). The main advantage of web mentions is that URLs are unique (Kousha & Thelwall, in press-c), although "including URLs in the visible text of webpages seems to be unnatural, and it is not clear that they are a reasonable source of online impact evidence, except perhaps in special cases like articles" (Thelwall & Sud, 2011, p. 1489). It is also possible to count citations to identifiers like DOI or ORCID (for researchers), which can be expressed as full URLs, or which can be separately searched for.

Mentions of researchers can also be searched for using search engine queries names (if highly distinctive) or unique identifiers (like ORCID) but there is no evidence that such results would give useful indicators.

2 Altmetric indicators

Altmetrics uses information such as the number of readers and downloads for a publication, tags, bookmarks, comments, tweets or blogging provided by users in social web-based tools to assess the impact of authors or publications (Bar-Ilan et al., 2012; Priem et al., 2010; Wouters & Costas, 2012; Thelwall et al., 2013).

2.1 Usage data (views, downloads and readers).

Usage statistics are no usually related to altmetrics because they provide information about the number of downloads or views from digital libraries, online databases or journals. We have included this within Altmetrics because some web-based scholarly sources such as Mendeley, Academia and ResearchGate provide usage data, and these tools are considered alternative tools.

Usage data are faster indicators than citation analyses (Bollen et al., 2009). They may show how often online research is read and they can be predictors of later citations (Brody et al., 2006; Bollen & Van De Sompel, 2008). However, usage data does not measure the same than citations, and not all downloaded articles are read (Neylon & Wu 2009). Sources for extraction on usage information use could be divided into two groups:

- These one providing information about views and downloads from digital libraries, journals, online databases, and institutional websites. These sources offer high quality information and may show how often online research is read, but data owners do not usually share this information for free (Haustein & Siebenlist, 2011). Both manually and automatic counting are possible, but a permission is necessary and may have to pay for access.

- These one providing information about views and downloads from author's profiles in scholarly web-based tools related to Altmetrics, such as Academia.edu, ResearchGate.net, Mendeley and other social reference sharing sites.

    - Academia.edu provides information about document views and profile views, being especially interesting for research assessment the information related to documents views.

- ResearchGate.net provides information about publications views and full-text downloads.
- Mendeley provides information about readers of publications added to users' libraries in the tool. Other social reference sharing sites may are interesting.

This information is freely available. Manual checking is possible, but it is a slow method. Manual checks are also possible using Webometric Analyst (http://lexiurl.wlv.ac.uk/), and perhaps other crawlers.
A drawback of these tools is that many scholars do not use them, many of scholars using these tools do not register their publications, and many of them do not provide the full-text. It also should take into account that not all downloaded articles are read (Neylon & Wu, 2009), although the main limitation for using these tools for research assessment is the facility to manipulate the data. Mendeley seems the most promising tool. A study found significant correlations between the user counts in Mendeley and CiteUlike and citation counts in WoS and Google Scholar (Li et al., 2012).

2.2. Blog citations

Research blogs have become a popular way for disseminating and discussing scholarly information. Researchblogging.org is an aggregator of science blogs, letting bloggers to refer to peer-reviewed research in an academic citation format. "Bloggers discussing peer-reviewed research can register with the aggregator, and when they mark relevant posts in their blog, these posts appear on the aggregator's site, allowing one-stop access to research reviews to interested readers" (Shema et al., 2012, p. 2). Automatic counting may not be possible since blogs are widespread and there do not seem to be simple web searches that can identify them without manual checking.

Blog citations can show early evidence of the scientific impact of a publication (i.e., more blogged articles are likely to be subsequently more cited) and possibly also its wider impact (Shema et al., in press), although it may be exaggerated for articles with peripherally attractive features, such as funny titles.

2.3 Web recommendations

Web recommendations of publications also have been considered as an indicator for research assessment. A particular source for this is F1000, a post-publication peer review service that recommends important publications, but it is restricted to areas within biological and medical sciences (Waltman & Costas, 2013). There are three positive recommendations levels by expert reviewers: 1= good, 2 = very good and 3 = exceptional. It is possible a manual counting, but it is necessary to pay for information access. An automatic counting is not possible.

Post-publishing peer review indicator is useful to assess the hidden impact of biomedical research based on wider peer-review process, and a large scale study (Waltman & Costas, 2013) showed correlation (but weak) between F1000 recommendations and citations; however, it only reflects the value of important articles based on positive recommendations and it is restricted to biomedical research.

2.4 Tweet citations

Citations from Twitter and other microblogging sites also have been used as indicator to assess some type of social (and immediate) interest of publications. Some studies have shown tweet counts to be early predictors of subsequent citation impact (Eysenbach, 2011). Manual counting of tweet citations is possible, for example with search.twitter.com, but it is limited to last seven days, so it is not practical if it is not made in a continuous process. Automatic counting is also possible, but is also limited to last seven days. Thus, for comprehensive data it is necessary either a continually monitor Twitter or pay to access tweets older than 7 days. Others limitations are that tweets might be manipulated and affected by spam and that some tweets may be exaggerated for articles with peripherally attractive features, such as funny titles.

2.5 Posts in social network sites

Posts to articles from Facebook or other network sites also have been considered as an indicator to assess some type of interest. Although less research has been carried out on them, it seems reasonable to expect Facebook status updates to have similar advantages and limitations as tweets.

2.6 Video comments

Views and comments from online videos such as course lectures are also used for a possible research assessment. Views counts displayed underneath videos in YouTube and TedTalks and similar site are possible (Kousha et al., 2012; Sugimoto & Thelwall, 2013). Automatic count is also possible with Webometric Analyst, but only for YouTube.

3. Conclusions

Different methods and web sources are being investigated to be used for research assessment as complement to traditional metrics. It seems that webometric indicators measure some types de research and teaching impact not measured by traditional metrics. Altmetric indicators seem to be more oriented to social impact. Although altmetrics tools have some limitations to be used in broad research evaluation at present, it seems that some of them are considered as a promising to measure scientific impact.

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Appendix

Table 1. Web impact indicators for ACUMEN Portfolio

Broad type of indicator	Specific type of indicator	Type of impact	Source	Type of evidence	Manual counting possible?	Automatic counting possible	Advantages	Limitations
Webometric indicator	Web citations	Research and teaching impact	Commercial search engines	Citations from online different scholarly publications.	Yes	Yes	Correlated with traditional citations (Kousha & Thelwall, 2006, in press-c).	Non-standard reasons for citation creation (Kousha & Thelwall, in press-c).
		Specific sources:						
		Research impact	Google Scholar (GS)	Citations from online published papers, preprints, postprints of articles, technical reports, dissertations, conference papers *****	Yes with online searches.	Yes, with *Publish or Perish*	- Larger coverage of citation data than traditional bibliometric databases. - Strong correlations between GS citations and WoS citations. - Wider picture of the scholarly impact of individual researchers and in some fields (Computer Science and Informatics) - Already used in some countries (Bar-Ilan, 2008; Harzing & van der Wal, 2008; Kousha & Thelwall, 2007; Meho & Yang,2007).	- Lacks a quality control mechanism. - Has some false matches. - Can be artificially manipulated (Bakkalbasi et al., 2006; Jacso, 2006; Panel criteria and working methods, 2012).
		Research impact	Google Books (GB)	Citations from online books sources (monographs, edited books, book chapters) *****	Yes	Yes See Kousha & Thelwall, in press -a	- The largest database of digitalized books. - Strong correlations between GB citations and WoS citations.	- Unknown coverage. - Mostly false matches with manual searches - Some unwanted results when extracting

							- GB citations is a useful indicator in book-oriented disciplines (Kousha & Thelwall, 2009; Kousha et al., 2011)	citations automatically.
		Research impact	Google or Bing	Citations from online presentations ****	Yes	Yes	- Can be covered both scientific and educational presentations. (see also Thelwall & Kousha, 2008)	Many scholarly presentations are available in PDF or HTML format, and it is not practical to separate them.
		Teaching impact	Google or Bing	Citations from online syllabi ****	Yes	Yes	- It assesses the educational utility of publications, which is not assessed by traditional methods (Kousha & Thelwall, 2008).	- Most of academic course syllabi are not free online. - Some false matches that need manual checking.
	URL citations/ title mentions	General impact	The web	Inclusion of a specific article or home page URL/title in the text of a web page. **	No	Yes	URLs are unique (Kousha & Thelwall, in press-c).	Cannot crawl hyperlinked citations embedded in images or titles of online documents (Kousha & Thelwall, in press). Matches could be from irrelevant or automatically generated documents (e.g., publisher catalogs)
Altmetric indicator	Usage data (views, downloads, readers)	Usage impact	Academic web sources	Number of downloads or views from different academic web sources ****	Depending on the source	Depending on the source	- Faster indicators than citation analyses (Bollen et al., 2009). - May show how often online research is read. - Early usage statistics can be	- Data owners do not usually share usage data (Haustein & Siebenlist, 2011). - Usage data does not measure the same than citations.

							predictors of later citations (Bollen & Van De Sompel, 2008; Brody et al., 2006). - High quality information, if available.	- Not all downloaded. articles are read (Neylon & Wu, 2009). - Downloads and views can be inflated.
		Specific sources						
		Usage impact Social impact	Digital libraries, journals, online databases, insti-tutional sites	Number of downloads or views from digital libraries, online databases, journals, institutional sites. ****	Yes, but usually paying for that	Yes, with permissio n from data owner	- High quality information.	- May have to pay for access or data may not be available.
			Web-based scholarly tools.	Academia: document views and profile views. *** ResearchGate: Publications views and full-text downloads. *** Note: LinkedIn is not recommended as it has no relevant statistics.	Yes	Yes	- Free access to data (in ResearchGate it is necessary to be registered) - Measure the use of author's publications.	- Many scholars do not use these tools. - Many scholars using these tools do not register their publications, and many of them do not provide the full-text. - Not all downloaded articles are read (Neylon & Wu, 2009). - Data can be easily manipulated.
				Mendeley: Readers of publications added to users' libraries in the tool. Other web-based social reference sharing sites (e.g. CiteUlike) ***	Yes	Yes	- Significant correlations between the user counts in Mendeley and CiteUlike and citation counts in WoS and Google Scholar (Li et al., 2012).	- Only a small percentage of readers register their publications. Unknown bias in terms of users.
	Blog citations	Research impact Social impact	Scientific blogs	Number of scientific blog posts citing a publication. ***	Yes	No	Early evidence of the scientific impact on the public and possibly also	May be exaggerated for articles with peripherally attractive

							its wider impact (Shema et al., 2012). Early blog citations can predict future formal citations.	features, such as funny titles.
	Web recommendations	Research and applied impact	Faculty of 1000	Recommend important publications *****	Yes	No	- Useful to assess the hidden impact of biomedical research based on wider peer-review process. - Correlation (but weak) between F1000 recommendations and citations (Waltman & Costas, 2013).	- Each article can be assigned to more than one subject area. - Only reflects the value of important articles based on positive recommendations. - Restricted to biomedical sciences.
	Tweet citations	Social impact	Twitter and other microblogging sites	Citations or links to articles from Twitter ***	Yes	Yes	- Tweet counts seem to be early predictors of subsequent citation impact (Eysenbach, 2011). - May also indicate wider public interest in some work.	- Limited to last 7 days. - For comprehensive data, either, need to continually monitor Twitter or pay to access tweets older than 7 days. - Tweets might be manipulated and affected by spam. - May be exaggerated for articles with peripherally attractive features, such as funny titles.
	Posts in social network sites	Social impact	Facebook and other social network sites	Facebook wall posts linking to articles. ***	No	Yes	Probably the same as for Twitter	Probably the same as for Twitter
	Video comments	Social impact	YouTube TedTalks	Views and comments from online videos such as course lectures. ***	Yes	Yes, for YouTube	- It is a non-traditional method of dissemination that might otherwise be ignored. -Lectures, lab	- Few scholars put effort into video creation so this is not useful to compare researchers. - Statistics can be

							experiments, and other visual outputs or artistic outputs might be valuable for impact assessment (Kousha et al., 2012; Sugimoto & Thelwall, 2013).	manipulated.

******* High quality source; **** Medium-high quality source; *** Medium quality source – fairly easy to manipulate; ** low quality source – fairly easy to manipulate and lots of irrelevant content;**

Researchers may also be evaluated on whether they attempt to disseminate their research on the web, irrespective of the success of such attempts. Table 2 lists some types of web presence that may be evaluated.

Table 2. Web research dissemination and publicity indicators for individual research assessment.

Source	**Type of evidence of attempts at research dissemination (not impact)**	**Manual counting possible?**	**Automatic counting possible?**	**Advantages**	**Limitations**
Traditional web presence	Simple possession of a web CV.	Google search for author name and institution.	Automated Bing searches with webometric analyst but needs to be manually checked.	Possession of a basic web presence is important for researchers but not all have one.	Some web presences may be automatically generated by institutions with no effort by the researcher.
Social web presence	Simple ownership of an academic web presence in one or more social network sites.	Google search for author name and site name (e.g., smith site:academia.edu).	Automated Bing searches with webometric analyst but needs to be manually checked.	Possession of a social web presence can be an advantage for researchers but not all have one.	Some disciplines may not use the social web at all or only some parts of it.
Academic CVs, publication lists or homepages	Link to open access (OA) papers, academic discussions, or other scholarly contents such as blog posts or videos helping to disseminate research.	Yes – manual checking of Web CVs, difficult in a large scale study. Better to use systematic method.	Yes – The *SocSciBot* web crawler (socscibot.wlv.ac.uk) and *Webometric Analyst* can be used to automatically extract and analyse outlinks from the academics' web CVs.	Simple and shows attempt at dissemination of research results by academics and departments. See also Kousha & Thelwall, in press-b)	Does not measure the success of the dissemination attempt and needs list of URLs for Web CVs or publication lists