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Using citation analysis to determine the use of information sources in the humanities by postgraduate students in the health and biomedical sciences: a case study

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Abstract

The paper presents and discusses the method and results of a study done at the Tshwane University of Technology (TUT) in South Africa to determine the nature and extent of information sources used by postgraduate students in the health and biomedical sciences at that university, with special reference to the use of humanities information. The study covered the period 2004 – 2007 and used the reference lists of theses and dissertations of masters and doctoral students in the health and biomedical sciences at TUT as data sources. The outcome of the study showed that citation analysis is a valid, reliable and practical method to provide reasonably accurate information on the use of humanities literature by postgraduate students in health and biomedical sciences. At TUT, it enabled researchers to establish that postgraduate students in health and biomedical sciences at that university make only very limited use of humanities literature for doing their master's and doctoral research. This is notwithstanding the fact that students have wide access to humanities literature in both paper and electronic formats. With the aid of citation analysis, the researchers could also establish that health and biomedical sciences students at TUT are not averse to citing information sources beyond their own discipline; just over 3% of all citations were to information sources in the social sciences, which mostly comprised psychology, business, law, management and public administration. Although the reasons for the outcome of this study have not been investigated, the most likely explanations are probably because TUT does not offer a course in medical humanities, and because medical humanities seldom pertain to purely research papers in narrow scientific areas.

Introduction

The research literature contains many arguments – for instance, those of Skelton, Macleod and Thomas (2000a, 2000b) – that justify and encourage the use of humanities literature in medical education and patient care. Those arguments are often based on renewed interest by the medical profession in the humanities (Calman, 2005: 958, Dali & Dilevko, 2006:259). To put this renewed interest into perspective: it is estimated that literature was already taught in about one third of all US medical schools as far back as 1996. (McLellen & Jones, 1996:110).

Notwithstanding a growing recognition of the role that humanities literature could play in supporting medical education, there is very scanty evidence of the actual use of humanities literature by health and biomedical science students. An extensive literature search could only find two articles that deal specifically with this topic. The one is by Hodgson and Thomson (2000:622 – 629), who assessed the reading habits and attitudes towards literature of undergraduate medical students in a medical school in Newcastle-upon-Tyne, England. The other study was done by Piccoli et al. (2003: 54 - 56), who did a similar study among medical students in Turin, Italy. Although both these studies provided valuable knowledge about the use of humanities literature by medical students, their findings are limited to leisure reading activities.

One other article that is worth mentioning is that by Dali and Dilevko, focusing on how to improve access to fiction in academic health sciences libraries. Unfortunately, the authors do not provide statistics on the actual use of information sources in the humanities, but the following general statement gives a clue to the situation in health sciences academic libraries where fiction titles relevant to medical humanities have not been integrated with non-fiction titles: "…fiction titles are rarely, if ever, retrieved in catalog searches related to a health science topic" (Dali & Dilevko, 2006: 259).

Problem statement

The outcome of a literature study clearly showed that insufficient information exists on the use of humanities literature by health sciences students as part of their academic studies. This situation encouraged the author of this paper to determine the nature and extent of information sources used by postgraduate students in the health and biomedical sciences at the Tshwane University of Technology (TUT), with special reference to the use of humanities information.

Terminology

The terms "humanities", "medical humanities" and "social sciences" are central to the understanding of this paper and need clarification. For this purpose, the definitions of Wikipedia were used:

Humanities are "those academic disciplines which study the human condition using methods that are largely analytic, critical, or speculative, as distinguished from mainly empirical approaches of the natural and social sciences. Conventionally the humanities include ancient and modern languages and literature, history, philosophy, religion, visual and performing arts (including music). Additional subjects sometimes included in the humanities are anthropology, area studies, communications and cultural studies, although these are sometimes described as social sciences".

Medical humanities is an interdisciplinary field of medicine which includes the humanities (literature, philosophy, ethics, history and religion), social science (anthropology, cultural studies, psychology, sociology), and the arts (literature, theatre, film and visual arts) and their application to medical education and practice

The **social sciences** are a group of academic disciplines that study human aspects of the world. They differ from the arts and humanities in that the social sciences tend to emphasise the use of the scientific method in the study of humanity, including quantitative and qualitative methods. Disciplines of the social sciences are anthropology, economics, education, geography, history, law, linguistics, political science, psychology and sociology.

For the purposes of this paper, the term **postgraduate students** refers to master's and doctoral students only.

Setting

The Tshwane University of Technology (TUT) in Pretoria, South Africa, was selected as setting for the research. The reasons for using this university were the following: TUT offers a variety of health and biomedical science courses up to doctoral degree level. The courses are offered in the following departments: Biomedical Sciences, Dental Sciences, Environmental Health, Nursing, Pharmacy, and Sport and Physical Rehabilitation Sciences. The Department of Biomedical Sciences, for instance, offers courses in biomedical technology, clinical technology, radiography, and veterinary technology. Secondly, health and biomedical sciences students of TUT have access to the paper and electronic information sources of the humanities. Access to those sources is provided through nine campus libraries and a wide variety of electronic databases that include several databases on the humanities, social sciences and the arts. A third reason for selecting TUT as research setting is that TUT does not offer a course in medical humanities. The use of humanities literature by students of health and biomedical sciences could therefore be studied without external influences such as lecturer or peer expectations to make use of humanities literature. A fourth reason is that although TUT is a university of technology, it is in many ways similar to a non-technology university. Apart from technology-orientated courses such as engineering and computer technology, it also offers

courses in agricultural sciences, humanities, social sciences, management sciences, and the arts. As a matter of fact, four of the seven faculties in TUT can be considered non-technology faculties. Health and biomedical sciences at TUT are therefore studied in a fully interdisciplinary environment.

Method

The study used citation analysis as method. In essence, the method comprises the following: the analysis and measurement (counting) of citations according to predetermined and well-defined categories; quantification and ordering/ranking of the categorised units; analysis and comparison of attained data; and interpretation of the data insofar as the research questions are concerned.

As data sources, the study used reference lists of all theses and dissertations submitted by postgraduate students in the health and biomedical sciences at TUT. No sample was taken. The total number of data sources was 48 and they covered the period 2004 to 2007. The 48 theses and dissertations provided 5 365 citations. The size of the population was regarded as large enough to make valid conclusions.

A library assistant photocopied the title pages and reference lists of all theses and dissertations and provided each data source with a sequential number. The assistant then captured the following data from the title pages on an Excel worksheet: a) author, b) title, c) date, d) faculty, e) department within the faculty, f) language of the thesis, and g) whether it was a master's thesis or a doctoral dissertation. Subsequently, the researcher collected the following data: h) number of citations per information type, i) number of citations per thesis, j) number of theses per department, k) frequency of journal titles cited, l) cited periodicals owned or provided access to by the library, and m) the number and nature of citations to humanities literature. For the sake of comparison, the researcher also collected data on the number and type of citations to information sources in the social sciences. All the data collected (a – m) was captured on Excel worksheets.

The two most demanding tasks were to identify and code each citation listed in the 48 theses (see task "h" above), and to identify citations to humanities and social sciences literature (see task "m" above). This involved the analysis of each of the 5 365 citations and making informed decisions on whether an information source cited could be regarded as a source from the humanities or social sciences. A second qualified librarian verified the analysis and coding for accuracy and consistency.

Because this study took the usual process of citation analysis a step further by also identifying the subject discipline of the information sources, it is necessary to elucidate this activity. The researcher found that, in a reference list of a specific discipline (such as health and biomedical sciences), it is relatively easy for a

qualified librarian to identify citations that do not belong to that subject discipline. In most cases, it is possible to spot the odd one out by analysing citation elements such as the title, the type of source, and the journal title, if journal articles are cited. Naturally, such analysis has to be done within the framework of the topic of the theses. The following section from a reference list of a thesis in the Department of Nursing will serve as an example:

Figure 1: Extract from the reference list of a master's thesis with the title *Effect of blood conservation on the length of stay and total cost of treatment of anterior-posterior spinal fusion surgery patients"*

> PHYSICIANS AND NURSES FOR BLOOD CONSERVATION. 2003. Educational resources. [Online]. Available at: http://pnbc.ca/06_01_04.toc.en.html Accessed 16 July 2004.
>
> ROSSOUW, D. 2000. Intellectual tools: Skills for human science. Pretoria: Amabhuku Publications.
>
> SAVARES, D. et. al. 1999. Bloodless medicine and surgery. Journal of intensive care medicine, 14, August: 20 – 33.
>
> SEARLE, c. 2002. Professional practice: a South African nursing perspective. 4th ed. Durban: Butterworths.
>
> SCHALLOM, L. 1999. Point-of-care testing in critical care. *Critical Care Nursing North America*. 11: 99 – 106.

However, not all citations revealed their subject discipline orientation at first sight. In those cases, the researcher had to search Google for more leads and clues to the discipline of a specific source (book, journal, conference paper, etc.) that was cited.

Reasons for selecting citation analysis as research method

Citation analysis is known to be a low-cost method whereby a researcher can gather and study citation data in an unobtrusive and non-invasive way. Citation analysis is also a flexible method: it can be applied in the assessment of data sources of a group of libraries, or a single collection, or a library collection supplemented with external information sources. It is also flexible in terms of the size of samples, types of citation sources (whether a standard list or a specific collection within a library) as well as the manner of citation selection (Ching, 2002: 399). Of specific importance to this study is that citation analysis is of value for interdisciplinary research. Furthermore, it can be used to focus on the type and number of information sources that researchers or library users use in a

specific discipline or over a period of time. In this regard, the research of Peritz and Sor (1990) and Allen, Jacobs and Levy (2006) serves as example.

Citation analysis is also a well-studied method in a university library environment. Not only do citations play an important part in the scholarly communications process, but "citations and the composition of bibliographies reflect changes in the information-seeking behaviour of academics", as well (Naudé, Rensleigh & Du Toit, 2005: 4). In this regard, theses and dissertations have proved to be particularly appealing to use for assessing library collections because they serve as a convenient source of in-house research. Furthermore, Zipp (1996: 341) found that "the most heavily cited journal titles in theses and dissertations can be used as a surrogate for the titles most heavily used by faculty in their publications". This is because the research interests of graduate students often reflect the research interests of their faculty advisers.

Limitations of the study

By using citation analysis as research method, the researcher recognised that it measures only what information sources postgraduate students used for doing formal research. As Griscom (1983: 38) correctly observes, citation analysis cannot measure the informal, day-to-day use of library materials.

Several of the general limitations and weaknesses of citation analysis apply to this study, as well. For instance, materials that postgraduate students used for background research may be underrepresented in their theses; sources cited may only have been superficially used or may not necessarily have been used at all; and journals that publish less frequently (i.e. quarterly or semi-annually) will receive fewer citations than journals that publish weekly or monthly. This problem would include new journals and journals that have undergone name changes. As is the case in many other citation studies, this study also counted all citations equally, regardless of whether they are positive, negative or neutral. Furthermore, citation analysis does not provide information on possible reasons why a particular information source is used or not used, or why information sources are considered important enough to merit a citation.

Although the general limitations and weaknesses of citation analysis mentioned above cannot be ignored, they are regarded as the exceptions and not the rule. In the majority of cases, the sources cited by postgraduate students in theses and dissertations are very indicative of the sources actually used by those students – regardless of whether a source was only superficially used or whether a source was cited in a negative, positive or neutral way.

Another weakness of the study to take note of is that, notwithstanding the relative ease for a qualified librarian to distinguish citations to humanities information sources from citations to health and biomedical sciences, there still is a possibility of error. The main reason is that not all titles in the humanities are

sufficiently descriptive to identify their discipline with certainty at first glance. It sometimes requires considerable search effort to identify the discipline of information sources with titles that are not descriptive enough. This problem was also mentioned under the heading "Method". Another difficulty that the researcher experienced was dealing with information sources of an interdisciplinary nature.

A final limitation of the study concerns the generalisation of the findings. Although the size of the population (data sources) was large enough to make valid conclusions, the conclusions, at this stage, are limited to TUT.

To conclude this part of the paper, it can be said that information obtained from research literature provided sufficient evidence that citation analysis is indeed a valid, reliable and practical method to use for the purposes of this study. It provided reasonably accurate information on the extent to which health sciences students use humanities literature. However, the literature also alerts researchers and library practitioners to the fact that no single indicator, such as citation analysis or circulation statistics or interlibrary loan data, provides a complete picture in assisting with collection development decisions (Haycock, 2004:106; Loree, 2007:3).

Findings and discussion

To put the findings of this study into context, it is necessary to present an overview of the types and numbers of information sources cited by the students under discussion. Table 1 shows that, of the 35 different material types cited, almost 70% of all citations were to journals and magazines. Books and chapters of books were cited in 17% of the cases. The remaining 13% of citations were to 33 different types of information sources that are usually classified as "grey literature". This finding supports other studies that found that users of health sciences literature primarily use journals (Allen, Jacobs & Levy, 2006: 210 - 211).

Table 1: Types and number of information sources cited

Information sources	Total citations 2004 - 2007	Percentage
Journals and magazines	3 743	69.5%
Books and chapters in books	914	17%
Websites	247	4.6%
Government publications	98	1.8%
Conference proceedings and papers	80	1.5%
Reports	68	1.3%
Personal communication	41	0.8%
Theses and dissertations	25	0.5%
Unidentified	21	0.4%
Operating manuals and user manuals	21	0.4%

Other, consisting of newsletters and bulletins (16), policy documents (16), Standards and test methods (14), technical publications (10), course material (9), newspapers (8), statistical data (8), in-house documents (7), manuscripts and draft documents (5), patents (5), fact sheets (5), surveys & questionnaires (4), working papers (3), discussion and position papers (3), planning documents (2), codes of conduct (2), abstracts (1), briefing documents (2), radio and TV programmes (1), notices (1), posters (1), software and computer files (1), trade literature (1) and pamphlets and brochures (1)	127	2.4%
	5 385	100.2

The main findings of this study are presented in Table 2. It shows that, in four consecutive years, postgraduate students in the health and biomedical sciences at TUT made very few references to humanities literature in their master's theses or doctoral dissertations. On average, only 0.34% of all citations were to the humanities. The 18 citations were made only to non-fiction literature and consisted of six citations to books, three to journals, seven to general websites and two to reports.

Table 2: Number of citations to information sources of the humanities

	2004	2005	2006	2007	Total
Number of theses and dissertations	7	27	9	5	48
Number of references	458	3 433	1 160	313	5 365
Citations to humanities literature	0 0%	11 0.32%	5 0.43%	2 0.64%	18 0.34%

Because the social sciences are sometimes regarded as part of the humanities, this study also counted the types and number of citations to the social sciences. According to the definition of social sciences earlier in this paper, the following disciplines form part of the social sciences: anthropology, economics, education, geography, history, law, linguistics, political science, psychology and sociology

Table 3 shows that just over 3% of all citations were to the social sciences. Seventy-three of the citations were to books and 50 were to acts, bills and regulations concerning health sciences matters, e.g. the Medicines and Related

Substances Act, and Air Quality Regulations. The remainder of the citations were made to journals (17), websites (7), newspapers (1), newsletters (3), census/statistical reports (7), conference papers (1), reports (8), policy documents (2) and planning documents (2). Citations to books in the social sciences were mainly to books dealing with research methodology and psychology (behavioural studies).

Table 3: Number of citations to information sources of the social sciences

	2004	2005	2006	2007	Total
Number of theses and dissertations	7	27	9	5	48
Number of references	458	3 433	1 160	313	5 365
Citations to the social sciences	10 0.22%	105 3.06%	57 4.91%	11 3.51%	171 3.19%

While analysing the citations of postgraduate students in the health and biomedical sciences, the researcher noted that some students also made use of information sources in the fields of engineering and natural sciences. Although it fell outside the aims and scope of this study to determine the use of information sources in fields other than the humanities and the social sciences, it is nevertheless important to observe that the postgraduate students under discussion do indeed make use of information sources from a variety of sciences and disciplines.

This study has no scientific proof of why health and biomedical postgraduate students at TUT make very little use of information sources in the humanities. The following possible reasons are therefore only hypotheses and require further investigation: Firstly, medical humanities is not offered as a course at TUT and postgraduate students may not be not sensitive enough to issues relating to medical humanities, or they may regard such issues as extra-curricular issues. They therefore tend not to use information sources of the humanities in their formal research. Secondly, apart from the fact that medical humanities are not taught at TUT, it may be that research supervisors at TUT do not sufficiently encourage cross-disciplinary or interdisciplinary research – specifically with the humanities. Thirdly, although postgraduate students in the health and biomedical sciences at TUT are free to select research topics of their own choice, the tendency is nevertheless to select topics requiring no or very little perspectives from the humanities. The following two titles of master's theses will illustrate:

Cross-linked chitosan in mini-tablets for controlled drug release.

A novel test for adductor muscle flexibility in females.

Lastly, medical humanities often address professionalism and ethics issues and may seldom pertain to purely research papers in narrow scientific research areas.

Conclusion

This study showed that citation analysis is a valid, reliable and practical method to provide reasonably accurate information on the use of humanities literature by postgraduate students in health and biomedical sciences. At TUT, it enabled researchers to establish that postgraduate students in health and biomedical sciences at that university make only very limited use of humanities literature for doing their master's and doctoral research. This is notwithstanding the fact that students have wide access to humanities literature in both paper and electronic formats.

With the aid of citation analysis, the researcher could also establish that health and biomedical sciences students at TUT are not averse to citing information sources beyond their own discipline; just over 3% of all citations were to information sources in the social sciences, which mostly comprised psychology, business, law, management and public administration. Although the reasons for the outcome of this study have not been investigated, the most likely explanation is probably the fact that TUT does not offer a course in medical humanities. On the other hand, a course in medical humanities at TUT might lead to a few theses and dissertations in the area of professionalism or bioethics over time, but it is doubtful whether such a course or greater humanities emphasis will necessarily lead to greater citation of humanities literature in theses and dissertations in narrow scientific areas.

The abovementioned outcomes are significant in that they provided some insight into a phenomenon that had in the past been researched on the periphery only. Hopefully similar research will be conducted elsewhere to provide more evidence on the actual use of humanities literature in health and biomedical education – especially in the wake of renewed interest in the medical humanities in some countries.

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