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Citation Analysis and Grey Literature: Stakeholders in the Grey Circuit

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Introduction

The goal of this research project is to learn more about the expanding field of information known as 'grey literature'. Citation analysis allows one the possibility to follow the work of the authors in the GL-Conference series, as well as authors whom they have cited both in grey and commercial publishing. A further goal of this paper is to examine the value of the GL-Conference Proceedings for research in the field of grey literature by examining among other things, its impact on the work of contributing authors. This study was sparked by a general interest in citation analysis as an instrument used in various sciences including information science. And, in particular by a paper presented at GL5 in which grey literature as a main channel for publication by an International Marine Scientific Advisory Body was investigated (MacDonald et al., 2004).

The stakeholders in this study are not first and foremost the authors who produce a document type, which falls within the category of grey literature. Instead this study is directed to those authors who focus their research and writing on the topic of grey literature, these are referred to as the meta-authors on grey literature. They have entered the field of information studies and focussed on a particular area, they entered in small numbers and in the past decade they have become contending stakeholders.

In the first five volumes of the GL Conference Proceedings a total of 139 conference papers were published, 30 of which did not contain references. Bibliographic data shows that 152 authors/co-authors, which is a full sample, were responsible for the content of these papers. 108 are 1st authors, 78 of whom are sole authors. 30 of the authors (>20%) have published more than once in the conference series and 6 of whom (>.05%) have published three or more times in this series. It is important that those authors who published within the series are also published outside the series – indicating that their clout extends beyond the grey circuit. In this way, their sphere of influence covers their entire work and reflects well on the conference series as a whole. The direction until now has been grey to commercially published e.g. a conference paper is later published as a journal article; however, with the advent of OAI, Open Archive Initiative, this direction could now even allow for reversal.

Procedure and Method

This research project is divided into three stages:

1. The first stage is the compilation of data from the first 5 volumes in the GL Conference Proceedings (1994-2004) in which the parameters are defined, software chosen, the fields described, a division of labour among the project workers, creation of a database, control of the input, and an informal documentation of the process by way of a project log.
2. The second stage is a literature search on citation analysis previously carried out in the field of grey literature and to some extent beyond.
3. The third stage is the analysis of the primary data from Stage 1 within the framework of the findings from the literature research in Stage 2, as well as a reflection on the problems encountered and the observations made during the first two stages. This final stage also includes the writing of the paper and the creation of a PowerPoint presentation.

Data Collection and Processing

The printed and published volumes of the GL proceedings served as the primary source for our data collection. Since there was no electronic version of the earlier volumes available, the data input had to be done manually. The fact that there was no standard applied to citations from the onset of this series meant that a manual input would have been required even if the e-papers were available. MS Access was the most used database software among the four project workers; therefore this was the most suitable choice. The definition and description of the fields in the database, which would constitute a record was the next task ahead. The final number of fields was 19 and the final number of records was 1374, which brought the total number of possible data entries to 26106. This is also counting the number of fields left blank. For example up to four fields were available for Cited Sources i.e. 1st through 4th author. When there was only one Cited Source the other three fields were left blank. When the comparative analysis was carried out using the index from the Annotated Bibliography on the topic of Grey Literature (4th ed., 2000) the possible number of entries in the Citation Database increased to 31602.

The table below provides an overview of the record fields and a description of each field. The description was important for the data input since four project workers were entering data simultaneously on multiple locations. This however did not detract from the fact that fields would later have to be expanded and data entry corrected and standardized.

RECORD FORMAT AND FIELD DESCRIPTIONS

Field Name	Description of the Field
Record Number	Record Numbers were assigned after the final record input starting with 1001 ranked in the order of (1 st) Date of Publication, (2 nd) Sourced by, and (3 rd) Citation Number
Series Number	Number of the Proceedings in the GL-Conference Series from 1 to 5
Date of Publication	Date the Proceedings were published not the date of the conference
Sourced by	The author(s) of the paper in the conference proceedings (E.g. Carroll, B.C.; Cotter, G.A.)
Type of Citation	Endnote, Footnote, Non-Numbered (Reference) * Later expanded to include No Citations
Citation Numbering	Yes, No, Non-Applicable * This field was later added to all of the records
Citation Number	If numbered, the number as it appears in the paper, whether endnote or footnote
Format of Citation	Standard (i.e. bibliographic) or Hyperlinked * Later expanded to include Explanative Notes as well as Names & Addresses of Organisations cited
Citation Date	Date of the cited work
Serial Citation	Does the citation refer to another paper in the GL-Series * Later expanded to include other GreyNet publications (Yes/No)
Type of Publication	Examples: Book/Monograph, Proceedings, Report, Web-paper, etc. * Later changes were made to achieve uniformity (e.g. article to journal article, website to Webpage, etc.)
Kind of Publication	Commercial Publication, Grey Literature, Uncertain * Later, as a result of the first team meeting, the number of 'Uncertain' entries was significantly reduced
Language	Language of cited work (English, French, Italian, etc.)
Cited Source	Person or Non-Person
Self Citation	Does it refer to one of the Authors/Co-authors of the conference paper: Yes, No, Non-Applicable (i.e. when a non-person is cited) * Later expanded to include publications by ones own organization.
Name of 1 st Cited Source	If a person (e.g. Gelfand, J.) Otherwise use the title of the journal/work * Later expanded to include the Acronym of a Corporate Author (E.g. CEC, CERN, etc.)
Name of 2 nd Cited Source	Ibid, if applicable
Name of 3 rd Cited Source	Ibid, if applicable
Name of 4 th Cited Source	Ibid, if applicable

No doubt, the title of this conference 'Work on grey in Progress' best describes the work that was done on this paper. It allowed the four project workers leeway to implement and legitimate later additions, changes, and expansion of the record fields. In fact, 11 of the 19 fields resulted in this way. In June of 2004, when the team first met for a full day in Amsterdam, the final revisions were adapted. And in October of 2004, when the team met for a second time in Nancy, only textual changes were made in the Description of the fields. The 8 fields that remained unchanged from the outset of the research project are quite straightforward, and require no further explanation at this point. However, the fields that were altered or expanded are dealt with here explicitly. It might be assumed that these 11 fields identify more than the other 8 what unique is, or what sets a citation analysis of grey literature apart from other conventional citation analyses?

Those record fields that were added, revised, and/or expanded during the course of the data collection include:

- **Type of Citation:** Authors, who did not furnish notes or references in their papers, would still be entered in the citation database. And, in the field Type of Citation, the term "No Citations" was entered. In the field Citation Numbering, the term "Non-applicable" was used. The other fields in these records were then left blank. While this accounts for only 30 of the 1374 records (0.02%) in the database, it amounted to 30 of the 139 papers (21%) in the GL-Series
- **Citation Numbering:** The field Citation Numbering was later added bringing the total number of fields to 19 per record.
- **Format of Citation:** To the field Format of Citation were added the terms: "Explanative" to indicate an author's note that was given outside the body of the text and "Name & Address" to indicate a general reference source to a corporate body.
- **Serial Citation:** To the field Serial Citation, other GreyNet publications were likewise understood e.g. citations to the GreyNet Newsletter, Webpage, Notebook, etc.
- **Type of Publication:** Since there was no authority file linked to the field Type of Publication, post-standardization was applied. For example, when the term Website was first used, it was later replaced by the term Webpage. And when the term Article was initially entered the term Journal Article replaced it. In a recent paper by Helmut Artus (Artus, 2004), where he examines grey and commercial journals in the social sciences, the term journal article applies to both. Prior to this study, and in line with a policy maintained by EAGLE, journal articles were not included in the SIGLE database. This insinuated that journal articles were not a type of grey literature, when in fact we will see that today they are among the top five types of grey literature cited.
- **Kind of Publication:** In the field Kind of Publication, a significant number of "Uncertains" as to whether a cited document was grey or not, would later be resolved through literature search, team discussion, and further explanation of the term "commercial publishers", which is traced to the Luxembourg definition of grey

literature, 1997. For our purposes here, publishers whose primary or sole activity is publishing for profit, are distinguished from “grey publishers”, whose primary activity does not lie in the publishing industry and is not primarily commercial.

- **Self-Citation:** To the field Self Citation, citations not only to oneself but also to ones organisation were added.
- **Name of Cited Source (1st, 2nd, 3rd, 4th):** And finally, to the field(s) Name of (1st, 2nd, 3rd, 4th) Cited Source, if the data entry pertained to a non-person the ISBN rule of thumb was initially used, and the “Title of the work” was first entered. Later it was evident that for GL records, the “Acronym of the Corporate Author” should have taken precedence and was later implemented.

PROJECT LOG: INFORMAL DOCUMENTATION OF THE RESEARCH PROJECT

Throughout all three stages of the research project and perhaps most importantly in the first stage of data collection and processing, the instrument of a project log was implemented. Since four project members would be working in separate offices in two different countries, maintaining a project log in which the questions, comments, and problems encountered could best be captured and recorded. One member of the team was responsible for maintaining the project log, and it was first utilized at the June meeting in Amsterdam where all four-project workers were present. In fact the project log served as an agenda for the daylong meeting as well as a means for the further division of labour among the team members during the remaining two stages of the research project. By the second and last meeting in October, the emphasis on the Project Log was replaced by attention to the Rough Draft of the paper.

Literature Search and Review

SELECTION AND IDENTIFICATION OF THE SOURCES

The second stage in the research project was a literature search and review on citation analysis previously carried out in the field of grey literature and to some extent beyond. The references and sources cited at the end of this paper are divided under three headings, and as such enable the reader to understand their place and emphasis in this research project. Under the first heading are references dealing both with the topic of grey literature and the use of citation analysis. All but two of the twenty-four bibliographic references under this heading are found in the 4th edition of the Annotated Bibliography on the Topic of Grey Literature. It is interesting to note that 10 of these 24 references are related to papers in the GL-Conference Series and that two of the remaining 14 references mention that the original text was written as a paper in the GL-Conference Series. Hence, half of the references under this heading are directly related to papers in the GL-Conference Series. Under the second heading, are the references that deal with citation analysis but which are not specific to the topic of grey literature. And, under the third heading are the sources from which our data for this citation analysis were collected. These comprise the bibliographic references to the first

five proceedings published in the GL-Conference Series from 1994 to 2004 and to the 4th edition of the Annotated Bibliography on the Topic of Grey Literature published in 2000.

REVIEW OF THE FINDINGS FROM THE LITERATURE

Examining the issues dealt with in our review of the literature, we find that the use of citation analysis in the study of grey literature has been applied in many disciplines, across disciplines, and in all of the branches of science i.e. the physical, the social, and the humanities. At least 14 specific fields of study are identified. The fields of agriculture and physics are dealt with in multiple studies, while the fields of transportation, social work, environmental protection, education, astronomy, aerospace are each dealt with in one study. When looking at the types of documents that were examined, we find that reports, grey journals, and conference proceedings are accounted for in most of the studies, while e-prints, preprints, and synopses were each the object of only one particular study. An interesting point is that some of the studies that were non-specific to grey literature, also dealt with specific types of grey literature such as theses, dissertations, and grey journals. The studies that were specific to grey literature were the ones most concerned with the fields in a citation record as well as the format of the citation. The type of grey literature cited, the producers of the document, language of the document, and the publication date were the fields most discussed. Language was the field, which preoccupied the researchers most. English language publications were by far in the majority and local languages such as Finnish were considered barriers to information transfer. Two studies dealing with the life of a citation showed that the highest percentage of citations was within 5 years for journals and up to 10 years for reports. Incomplete citations and errors in citations affect about 12% of the total citations in studies. The impact factor that grey and non-grey citations have on a field of study is of interest to researchers. One study refers to the law of scattering, where 80% of the citations are shown to come from 20% of the journals cited. Stated otherwise, the top 20% of journal titles generates 80% of use. Another study proposes a formula to arrive at **(x)** the intensity of grey literature citing by dividing **(z)** the frequency/proportion of GL references out of all the references cited by **(y)** the frequency/proportion of the articles with GL references out of all the articles examined. The formula would then read $z \div y = x$. And when applied to the results from our research, the intensity of grey literature citing is 59%.

A number of studies, most of which were not specifically dealing with grey literature call for convergence or aggregates of data, where not only citations are used to explain or demonstrate the impact factor but also a number of other empirical data are used. One such study calls for a web invocation portfolio (WIP), where web links (inlinks), standard citations (non-links), bibliographic references, log files, press cuttings, etc., have to be examined together in order to arrive at the true impact factor. It is the role of organisations such as library associations and grey literature producing bodies' i.e. corporate authors to promote and support this type of research in order to demonstrate its uses and applications. These could be to access trends, arrive at a representation/snapshot of a particular field of study, or

to influence information policy. In particular, we have seen some studies carried out with grey literature, where citation analysis was used to determine and evaluate appropriate publication channels and others for purposes of collection development. A few studies looked at citation use in order to determine communication across various fields of study. And a couple of studies in particular examined grey literature's implications for scientific communication - differentiating between scientific and non-scientific grey. No doubt, abstracting and indexing services such as ISI Web of science are an invaluable means for carrying out citation analyses making use of automated technologies on an economics of scale. However, grey literature can only really profit from this when they have established a record format, one that is collectively applied. This can be done with the support of those library associations and grey literature producers mentioned earlier. Our review of the literature reveals a number of plans of action and specific recommendations for grey literature - the upshot of various researches. These range from the establishment of national and regional networks to the formulation of guidelines, and the development of course training.

Content and Data Analysis

ANALYSIS OF THE CITATION DATA

The Citation database, which was compiled during this research project, contains 1374 records. 30 of these records (0.02%) are to papers in the GL-Series that do not include references. Each record contains 19 fields, which amounts to 26106 possible entries in the database. This includes fields left blank. The data was extracted from the 139 papers in the first five volumes of the GL-Conference Proceedings. When the 30 papers that did not include references (21%) is subtracted, our citation analysis is then to 109 conference papers. A total of 152 authors/co-authors were responsible for the 139 conference papers. Of these, 108 (71%) are sole or first authors of the papers.

In total 1721 authors/corporate authors (i.e. the sources) were cited in the 1344 records, which was compiled from those papers containing references. When multiple citing is accounted for (i.e. authors cited 1> times), the number of distinct or unique authors cited in this study is then 1128. There were 72 different types of documents cited of which journal articles and conference papers accounted for the first and second most cited types of documents. There was an average of 12.3 cited references per conference paper. And, looking at the age of the citations, 58% are <4 years old.

When standard bibliographic citations are compared with hyperlinked citations, we find that 51% of the standard citations are to grey literature, 48% to commercial publications, and 1% is uncertain. Persons accounted for 84% of the standard citations, while non-persons or corporate authors accounted for 16%. If we compare this with the hyperlinked citations, we find that 90% are to grey literature, 5% to commercial publications, and 5% is uncertain. Persons accounted for only 26% of the hyperlinked citations, while non-persons or corporate authors accounted for the other 74%.

If we look at self-citations, which in this study also include citations to one's own organization, this accounts for 10% of the citations. In this category, 26% is non-applicable, because the citations are to non-persons or corporate authors with no affiliation to the citing author. If we turn to serial citations, that is a citation to one of the earlier papers in the GL-Conference Proceedings or to one of GreyNet's other publications (e.g. Annotated Bibliography, Guidebook, Notebook, etc.), nearly 8% (0.0775) fall under this heading. Citations in the first volume in the Conference Series (GL'93) would then by our definition of serial be excluded here. The cited documents were in 13 different languages in which English accounted for 84.7% followed by Italian 5.59%, French 2.41%, Spanish 1.86%, German 1.32%, and Dutch 1.24%. The remaining 7 languages (Indian, Indonesian, Japanese, Korean, Polish, Portuguese, and Russian) each accounted for less than 1% of the cited documents. If we compare this with the language of the Citing Authors, we find that 65% of the GL Conference Papers are by non-native English speakers.

Of the 72 types of publications cited, an average of the top five over the conference series show Journal Articles at 47%, Conference Papers at 19%, Books/Monographs at 17%, Reports at 14%, and Conference Proceedings at 3%. These percentages are based on standard citations; however, when hyperlinked citations are included, then the Webpage ousts the Conference Proceedings from the fifth place. The last conference in the series (GL5) follows these averages almost entirely. There are only 17 types of commercial publications cited, while 72 types of grey literature publications are cited. Reports, which held second place at the first conference (GL93) dropped to third place by the second conference (GL95) and to fourth place by the third conference (GL97). These had traditionally been the mainstay of GL, but this research shows that conference papers have taken and hold second place.

A COMPARISON WITH OTHER DATA

When we compare the authors cited in the conference proceedings with the authors cited in the index to the 4th edition (2000) of the Annotated Bibliography on the Topic of Grey Literature, we find an average match of 24.7%. Some 630 authors are indexed in this Annotated Bibliography, and it contains over 750 bibliographic references.

Cited Authors in the Proceedings compared with Authors indexed in the Bibliography

1 st Cited Source	2 nd Cited Source	3 rd Cited Source	4 th Cited Source
330/1344 = 24.6%	87/293 = 29.7%	21/89 = 23,6%	8/38 = 21%

The authors indexed in the Annotated Bibliography are authors who specifically deal with grey literature in their research and writing i.e. the GL meta-authors. It might then be safe to speculate that this quarter of the authors cited in the conference proceedings could be matched by another quarter that deals with grey literature, but does not explicitly adhere to the term. The remaining half of the authors cited in the proceedings may then have intended

no reference to grey literature at all. In short, half of the citations in our primary analysis are directly or indirectly related to grey literature and the other half are non-related. If we were to rely on the type of documents cited as an indicator, then the ratio would not be 50-50 but instead would increase to nearly 60-40 with grey citations outnumbering commercial citations by 790 to 534 with still 20 uncertain. Either way, this is a very healthy position for grey literature within the entire field of information. It offers foundation and links grounded in broader theory and practice, while it demonstrates a clear and identifiable entity within the whole. If the meta-authors in grey literature would have remained predominately or solely within the research and findings of those with the same signature - then over the past quarter of a century, grey literature would have withered and become dormant. And, this is certainly not the case.

FINDINGS OF THE RESEARCH

Results from our research project indicate that many of the problems encountered in the citation analysis of books and journal articles are also found in the citation analysis of grey literature e.g. typographical errors, omissions, and inconsistencies. These problems are augmented in a citation analysis of grey literature, because it is necessary to indicate the "type of publication" (i.e. report, conference paper, Webpage, etc.) as well as the "kind of publication" (grey or commercial). The more complete and accurate the citation, the easier it is to make these determinations. Hyperlink citations prove to be even more difficult for the project workers than standard bibliographic ones. Citation analysis of grey literature requires not only the name(s) of the individual author(s), but also the corporate author or organisation responsible for the publication.

Across disciplines, reports, grey journals, and conference proceedings are the main sources used in research and authorship. This finding supports the premise that the GL-conference proceedings are of significant importance to the field of grey literature. This field of information studies currently does not have a flagship journal. In 2000, this was attempted with the launch of IJGL (International Journal on Grey Literature). But, it only lasted one year with the publication of one volume containing four issues. Interestingly, a third of the articles in this volume first appeared as conference papers in the GL-Series. De facto, the GL Conference Proceedings has taken on a flagship role. And it is not an unlikely one, because as Buckley purports (Buckley, 1997), conference papers in proceedings are similar to articles in journals. Another attempt in the past was to bring together a selection of the GL papers for publication in a special issue of a journal, first published in PRQ (Publishing Research Quarterly volume 13, no.2, 1997). With the re-launch of the GL-Series in 2003, this has now led to a cooperative publishing agreement with PRQ, where annually an issue of this quarterly journal focuses on the topic of grey literature. Collection holdings of the GL conference proceedings and papers should be comprehensive and available from more than one centre or clearinghouse. Currently, the British Library Document Supply Centre in Boston Spa is to our knowledge the only dedicated centre for this purpose. And, this arrangement between the GL

Proceedings publisher, TextRelease, and the British Library has been recently reaffirmed. Contacts with other national libraries and centre are likewise being pursued, for example with the Netherlands Depot and INIST in France.

Where once reports were the main type of grey literature, we see that grey journals and conference papers are the most heavily cited types of grey literature. Since the onset of the GL Conference Series, more than a decade ago, English has been the language of publication. This has enabled the authors' research findings to reach global communities. We see that only about 35% of the papers in the GL-Conference series are from authors from English Speaking countries, while non-native English speakers account for 65% of the content contributions. One of the drawbacks of the GL Proceedings brought out in this study indicates the lack of standardization applied to citations. This aspect is one in which both the authors and their works would most readily stand to gain were a standard applied. One which would capture and accommodate the various types of grey literature and which would be in line with standards applied by existing abstracting and indexing services such as ISI, LISA/CSA, etc.

From our research findings, we have compiled the following guidelines for grey literature citations.

GUIDELINES FOR GREY LITERATURE CITATIONS

General

- i. All conference papers should contain references
- ii. Standardization should be maintained among the citations provided
- iii. The more complete and accurate a citation, the more guarantee of a paper's content and subsequent review.

Examples of Errors that were encountered and corrected

Hedlund, G. (GL97); Hedlung, G. (GL99) – (GL97 is correct)
Hugenholtz, **B.P.** (GL95); Hugenholtz, **P.B.** (GL99) – (GL99 is correct)
Rozkuszka, **W.** (GL95); Rozkuszka, **D.W.** (GL99) – (Rozkuszka, **W.D.** neither was complete or correct)

Specific

- iv. Endnotes are preferred and should be numbered
- v. Hyperlinks need the accompanying name of resource and date; a simple URL is not acceptable
- vi. If the citation is to a corporate author, the acronym takes precedence
- vii. If the document type is known, it should be stated at the close of a citation.
- viii. If a citation is revised and refers to an edited and/or abridged work, the original source should also be mentioned.

While these guidelines do as yet offer a citation style for grey literature; hopefully, this will be a spin-off from our research. Perhaps, starting with the 7th volume of the GL-Conference Proceedings, a standard or citation style will be in place. Likewise, a renewed contact with LISA, is underway that will hopefully lead to re-establishing and exchange agreement, where the abstracts of the GL Conference Proceedings would be given to LISA and in turn LISA

would held facilitate the research and work carried out by GreyNet, Grey Literature Network Service. Clearly, we see that the impact of our study is leading GreyNet to establish and formalize a policy, which would have lasting benefit for authors and researchers both within and outside the GL-conference series. A policy which would enhance the published proceedings, bring excellence outside of the grey circuit through the cooperative publishing agreement with PRQ, guarantee document delivery and/or loan of the full-text of all of the conference papers in the series via an ongoing agreement with the British Library and hopefully other depots and clearinghouses of longstanding. Yet another impact that our citation analysis could have is on the advancement of grey literature as a field of information study in its own right. The core papers could be compiled and published as a reader(s) used by colleges and universities in course modules on grey literature. Also, Auger's first roadmap of GL systems and services, which reached its 4th and last edition in 1998 (Auger, 1998) could benefit by way of a thorough and comprehensive revision in light of the research and findings from the GL-Conference Proceedings.

Conclusions and Further Recommendations

The concern at the outset of this research project was to apply the instrument of citation analysis to the work of authors in the GL-Conference series, as well as authors whom they cited both in grey and commercial publishing. A further concern was to determine the value of the GL Conference Proceedings for research in the field of grey literature by treating it as a type of grey literature and comparing it with other types. Our findings indicate that an impact in one of the three areas is connected in some way to the other two. We find that the term "commercial" in the Luxembourg definition of grey literature needs to be further elaborated in order to better serve its purpose. The meta-authors should not underestimate the explicit use of the term grey literature in the title of their works. Further, based on this research, a set of guidelines has been compiled for citations used in grey literature. These will be implemented starting with the 7th volume of the GL-Conference Proceedings; however, it should not yet be taken as a standard or citation style for grey literature. The authors of this paper would hope that by maintaining the Citation Database and making it available to researchers for secondary analysis, a follow-up study would be possible. Perhaps this could be combined with a research proposal to ISI/ASIS, who offers an annual grant for research dealing with citation analysis.

In close, GreyNet is interested in carrying out a survey among the authors and co-authors in the GL Conference Series, including the 40 new contributors to GL6. It is believed that this would provide evidence of a wider impact for research than can be shown by citation analysis alone. Finally, GreyNet would like to explore the possibility of launching a grey journal, where better coverage and exposure of research in the field of grey literature is achieved not just for the portion that crosses over to commercial journals. As this study indicates, journal articles

and conference papers are the top two types of cited publications both in grey and commercial publishing. Would this then not be considered a mandate in itself?

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