A Bibliometric Study of the Literature Related to Research on Public Libraries

Dr. Bo Jarneving
The Swedish School of Library and Information Science
at Göteborg University and Högskolan i Borås
E-mail: bo.jarneving@hb.se

Dr. Bo Jarneving is a senior lecturer at the Swedish School of Library and Information Science in Borås. He defended his doctoral thesis "The combined application of bibliographic coupling and the complete link cluster method in bibliometric science mapping" *in 2005 at the Göteborg University. His research fields are science mapping methodology, citation analysis and scientometrics and his ongoing projects involve evaluation of citation based mapping methods and research evaluation (visibility and production).*

Abstract

A quantitative survey of the literature pertaining to the study of public libraries, covering the period of 1986-2005, was pursued applying bibliometric methods. The survey aimed at the arrival of descriptive data that would inform about the features and development of the field's base literature. It was found that the monographic form of cited references was more common than cited references of the journal form, but over time, the tendency to cite articles published in journals increased on behalf of monographs. In addition, the intellectual import from other fields than Library and Information Science was approximated and found more than marginal.

On different levels of citation aggregations, frequency distributions and rank orders indicated a fragmented base literature. Cores of the more cited authors and journals were identified and illustrated by bibliometric mapping techniques. The exploration of a presumed shared intellectual focus on the earlier literature showed that approximately half of all papers were isolated in terms of not sharing references with any other paper, though a weak tendency of increased consensus was noted. Finally, though somewhat more than half of all citations were more than five years old, a tendency over time to cite more current literature was notable.

Keywords: *Bibliographic Coupling, Citation Analysis, Co-citation Analysis, Intellectual Base, Public Libraries.*

1. Introduction

Knowledge about which literature has been used by scholars could be reflected by patterns emerging from the collective citation by authors. This provides one with an understanding of how previous researches were used

in the generation of new knowledge. In this study, the development of the base literature of research on public libraries was studied from a bibliometric perspective. The point of departure is that we regard research on public libraries as a coherent research theme, a sub-field of *Library and Information Science* (LIS). In concordance, we investigate some aspects that would inform us about the general character of a research field's base literature. Hence, this study is exclusively descriptive.

In this study, the reporting of findings is divided into two parts. The first part gives an overview illustration of the structure of the base literature. The second part highlights several features of the intellectual base from a longitudinal perspective.

2. Method and Data

For this survey, a total of 1,495 papers published between 1985-2005 (1) containing the string "public librar" in titles were downloaded from the "*Web of Science*". All document types and languages were taken into consideration (see Table 1).

The two most frequent document types were article and book review. However, book reviews should be attributed some special considerations for though they may communicate important scholarly information, they contained mostly only one cited reference, namely the work which was reviewed, and they were seldom cited. Hence, though there were exceptions, by and large they contributed little to the generation of citation data. (2)

The Anglo-Saxon impact is obvious when considering the distribution of assigned languages of papers.

Table 1: ***The Distributions of Document Types and Languages over Citing Papers.***

Freq.	Document type	Freq.	Document type	Freq.	Language
657	Article	4	Reprint	1410	English
597	Book review	3	Biographical-item	33	German
75	Editorial material	3	Correction	19	French
55	News item	3	Correction, addition	10	Japanese
27	Note	2	Fiction, creative prose	10	Italian
21	Letter	2	Bibliography	6	Spanish
17	Meeting abstract	2	Item about an individual	3	Russian
11	Review	1	Music score review	2	Multi-L
7	Art exhibit review	1	Database review	1	Slovak
6	Poetry	1	Record review	1	Portuguese

The purpose of directing the search for pertinent papers to titles was to gather papers explicitly addressing issues concerning public libraries. This approach also brought about the inclusion of papers not explicitly pertaining

to the LIS perspective. Some uncontrolled variables must be regarded when interpreting data. Most important is that the choice of data should reflect the journal market as well as the growth and maturity of the field, but it may, however, be attached by some randomness due to choices made by data base producers. It is also important to recognize that the research design only aims at the investigation of *formal* scholarly communication pursued through scholarly journals. (3)

Two bibliometric methods, namely, co-citation analysis and bibliographic coupling were applied.

Co-citation analysis was first presented by Small in 1973 and has ever since been the dominating method for bibliometric document mapping. A special case of co-citation analysis is "author co-citation analysis" (ACA) introduced by White and Griffith in 1981, where the analyzed units are authors. This method of ACA has also been applied for the co-citation analysis of journals (McCain, 1991 & 1997), in which case, the analyzed units are journals. All three forms of co-citation analysis were applied in this study.

Bibliographic coupling was first presented by Kessler in 1963 and it has had an impact on both bibliometric mapping and information retrieval. The co-citation strength between two items (4) is the frequency by which they occur together as cited references in the reference lists, whereas bibliographic coupling is the number of shared references between two citing items. The co-citation strength and the bibliographic coupling strength thus express the similarity between two journals, authors or documents as reflected by authors' referencing.

Besides the common descriptive statistical methods, a multivariate statistical technique known as "Multidimensional scaling" (MDS), was also applied. MDS could be summarised as a method for solving the problem of how to represent *n* objects geometrically by *n* points, so that the distances between the points correspond to experimental dissimilarities or similarities (5) between objects (Kruskal, 1964, p.1). The resulting map can then be interpreted so that a long distance between points representing objects corresponds to a low similarity and vice versa.

3. FINDINGS

3.1 Features of the Intellectual Base

Using citations as indicators of use and visibility, we can assess the structure of the core of the base literature of a field of research in terms of important documents, authors and journals. When analysing the complete set of data comprising the period 1985 to 2005, we arrived at a summary and overview of the field as the impact of documents, authors and journals change over time.

3.1.1 *Cited Document Types*

In general, natural sciences tend to favour journal articles for the reporting of research results whereas arts & humanities tend to favour monographs. As for this case, we found that approximately 63 percent of all cited references were directed to the monograph type of cited work and 37 percent to papers published in journals. (6) Conclusively, the literature dealing with public libraries rely to a greater extent on monographs. If the quality of communication differs between the two reference types, one could speculate that more topical problems and findings are reported in journals and that the summing up of research is related to the monograph format.

3.1.2 *Citation Distributions*

First, we will look at the dispersion of citations to journals in order to assess the discipline influence on the field. Counting all citations to papers published in journals, a total of 1,234 unique journal titles were found after standardisation of spelling variants. Rank ordering these by citation frequency, we found that journals from LIS dominate. A total of 18 cited journals, where all but one pertained to LIS, account for a quarter of all citations (see Table 2).

Table 2: ***The Share of Journal Citations.***

A	B	C	Abbreviated Journal Titles
1	3%	3%	LIB J
2	2%	5%	LIBR INFORM SCI RES
3	2%	7%	LIBR TRENDS
4	2%	9%	AM LIB
5	2%	10%	COLL RES LIBR
6	2%	12%	LIBR Q
7	1%	13%	RQ
8	1%	15%	PUBLIC LIB J
9	1%	16%	J AM SOC INF SCI TEC
10	1%	17%	PUBL LIBR
11	1%	18%	LIBRI
12	1%	20%	LIB ASS RECORD
13	1%	21%	J DOC
14	1%	22%	WILSON LIBRARY B
15	1%	23%	RUSSKAYA SHKOLA
16	1%	24%	CAN LIBR J
17	1%	24%	J LIBR INF SCI
18	1%	25%	J ACAD LIBR

Note: Column A holds the rank order by citation frequency.
Column B shows the relative frequencies.
Column C shows the cumulated relative frequencies.

This dominance can be reflected from another angle. Searching the complete file of cited papers for journal titles containing any abbreviation of the word "library", a total of 222 titles were found which accounted for 44 percent of all citations. Counting references that could not be categorized as pertaining to the field of LIS, we reached a total of 32 percent. An additional 24 percent could not be identified as to subject category. (7) Though this is a crude approximation, it does reflect the impact from LIS research on public libraries and that LIS represents the largest single subject category. However, from another point of view, a considerable share of references pertained to a wide range of other disciplines. A rough approximation of the more contributing fields was attempted and the more frequent topics were found to relate to *economy & management*, *education & pedagogy*, *history-philosophy*, *Information technology*, *psychology* and *sociology*.

The discipline influence could also be reflected by focusing on papers of the document type *book review*. This approach puts the focus on the most cited document type, i.e., the monograph. This is also a somewhat special situation as the cited items in book reviews by definition belong to the base literature and the book review itself to the current citing literature, but the topics of both the citing and the cited item should be near identical. It was found that 83 % of all papers of the document type book review pertained to the field of LIS, but some influences from other fields was notable, foremost from computer science and the humanities as shown in Table 3.

Table 3: ***The Frequency of Journal Subject Categories Assigned Book Reviews***

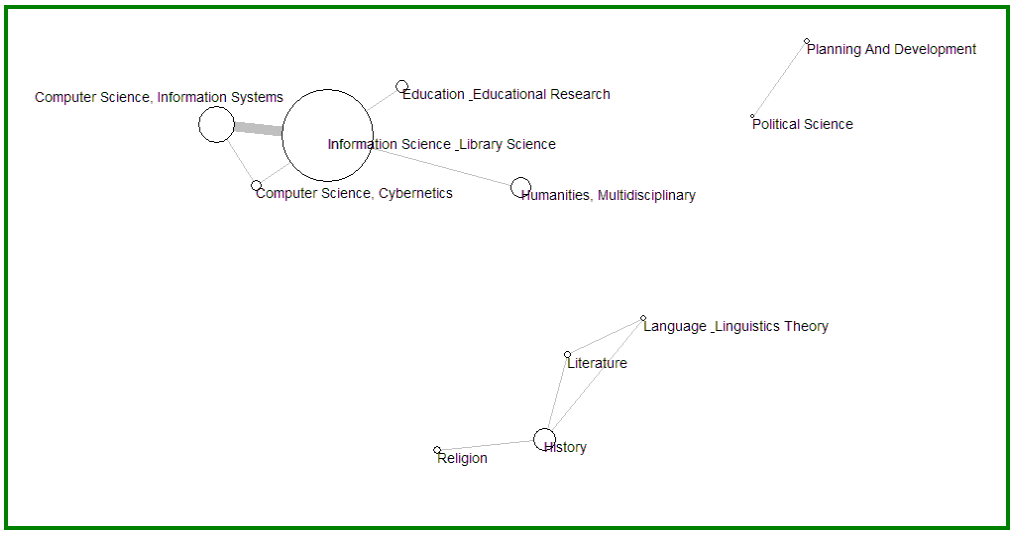
Frequency	Journal Subject Category
493	Information Science & Library Science
78	Computer Science, Information Systems
60	History
36	History & Philosophy of Science
25	Humanities, Multidisciplinary
9	Education & Educational Research
7	Computer Science, Cybernetics
6	Classics
4	Religion
4	Literature, Romance
3	Art
3	Literature
2	Planning And Development
2	Literature, Slavic
2	Music

2	Language & Linguistics Theory
2	Dance
2	Asian Studies
1	Psychology, Developmental
1	Political Science
1	Poetry
1	Philosophy
1	Ethnic Studies
1	Communication
1	Architecture
1	Archaeology
1	Literature, German, Dutch, Scandinavian
1	Literature, African, Australian, Canadian
1	Literary Reviews

Note: Journal subject categories are sometimes overlapping.

A total of 108 papers had a double journal classification which to some extent should mirror the associations between fields in the context of public libraries (see Figure 1). We can conclude that LIS has the strongest impact on the field, but the import from other disciplines is more than marginal.

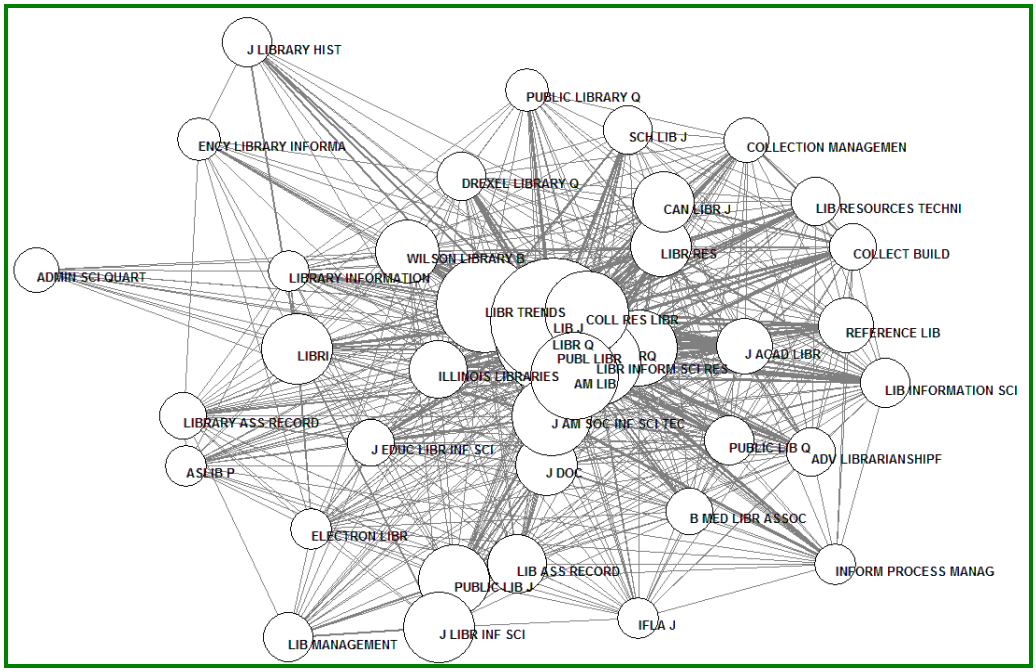
Figure 1: *MDS Map Showing the Relationships between Disciplines in the Context of Public Libraries.*



Note: 1. The underlying matrix was based on 108 co-occurrences of journal subject categories from different fields.
2. Circle sizes correspond to the frequency of papers assigned a subject category.

In order to visualise the journal core of the base literature, the co-citation strength between journals was computed and the resulting data applied for MDS where the output provided us with a spatial configuration in two dimensions of the relationships between the most cited journals. In Figure 2, we can appreciate that the core of the intellectual base indeed pertain to library research with a few library journals located in the centre of the map and less cited and co-cited journals in more peripheral positions. Journals cited less than ten times were not included.

Figure 2: *Co-citation Map Illustrating the Associations between Co-cited Journals for the Period 1985-2005.*



Note: Circle sizes are proportional to the frequency of papers citing corresponding journal.

Though there exits an identifiable core of central journals pertaining to the research on public libraries, the distribution of citations to journals is extremely skewed. A total of 927 journals were only cited once and only 79 journals were cited more than five times as can be seen in Table 4. Please note the break of class intervals.

Table 4: ***The Distribution of Journals over Class Intervals of Citation Frequency.***

Frequency	Class interval
1155	1-5
43	6-10
16	11-15
3	16-20
5	21-25
3	26-30
5	31-50
4	51-95

On another level of aggregation, counting the frequency by which authors are cited would tell us something about the existence of a core of highly cited authors and the degree to which citations are concentrated. Most authors received just a few citations over the whole period under study and the distribution of citations is skewed as one can see from Table 5.

Table 5: ***The Distribution of Cited Authors over Citation Frequencies.***

Authors	Received Citations
5355	1
877	2
338	3
150	4
89	5
50	6
35	7
19	8
18	10
17	9
10	12
9	11
7	18
6	22
5	14
5	13

Authors	Received Citations
4	17
4	16
3	15
2	30
2	24
1	23
1	26
1	19
1	21
1	71
1	33
1	32
1	31
1	40
1	29
1	35

However, on this level of citation aggregation, a core of relatively highly cited authors can be identified (see Table 6).

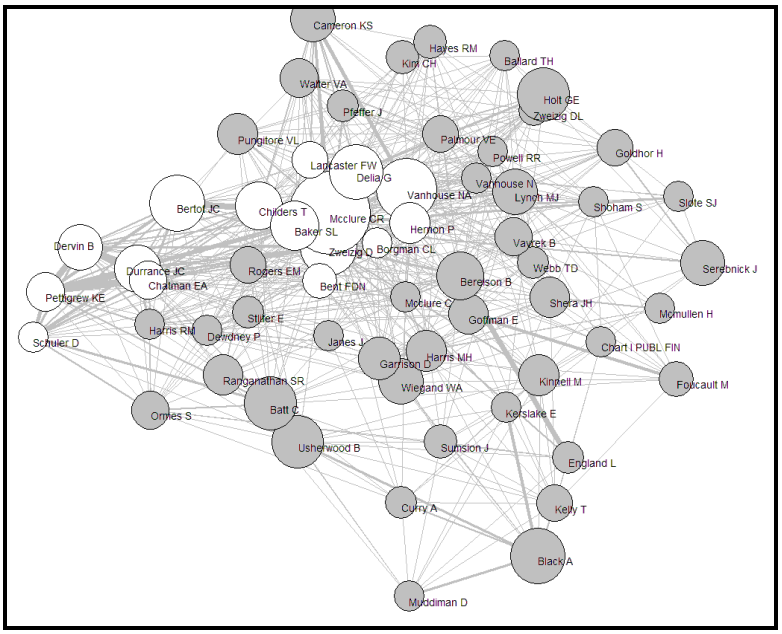
Table 6: ***The 20 Most Cited Authors over the Period of Study.***

Citations	Authors
71	Mcclure CR
40	Vanhouse NA
35	Zweizig D
33	Bertot JC
32	Black A
31	Delia G
30	Batt C
30	Holt GE
29	Usherwood B
26	Baker SL

Citations	Authors
24	Berelson B
24	Childers T
23	Durrance JC
22	Cameron KS
22	Dervin B
22	Lynch MJ
22	Sargent JS
22	Wiegand WA
21	Serebnick J

In order to visualize the associations between the authors, a co-citation map was generated on the basis of the co-citation frequencies between most cited and co-cited authors over the whole observation period. As a first step, authors co-cited less than ten times were excluded. After computing the co-citation frequencies between all author pairs, those with less than 10 links to other authors were filtered out. The resulting map displays the 61 most central authors over the whole period (see Figure 3).

Figure 3: *MDS Map Showing the Most Central Authors over the Period 1985-2005.*



Note: Circle sizes are proportional to the number of received citations over the period.

As can be seen from Figure 3, there exists some centre-periphery pattern and a core around *McClure* is formed. There are also some authors strongly connected to *Dervin*. Otherwise, several research interests as represented by authors are spread rather evenly over the map.

Zooming in to the document level, the lopsidedness of the distribution of citations over documents is obvious, with only a few works receiving more than one citation (see Table 7). In fact, only six documents (all monographs) have received at least ten citations. This means that on the document level, there is in fact no core to visualize.

Table 7: ***The Distribution of Documents over Citation Frequencies.***

No. Of Documents	No. Of Received Citations
10609	1
480	2
110	3
39	4
25	5
9	6
7	7
3	8
2	11
1	9
1	13
1	10
1	21
1	20

3. 2 Longitudinal Aspects

In this part of the study, longitudinal changes of the base literature were explored. The following four variables/aspects were monitored over time:

1. The distribution of citations over two document types, namely:
   - papers published in journals; and
   - monographs.
2. The rank order by citation frequency of authors and journals.
3. The development of a shared intellectual focus on the earlier literature.
4. The recency of citations.

When measuring longitudinal developments, some kind of partition in time must be accomplished. For each of the four aspects above, a corresponding division of observation periods were applied as follows:

1. Three periods, each comprising three publication years with a distance between each period of six years
2. Three periods, each comprising three publication years with a distance between each period of six years
3. The whole period of observation, and each year was observed
4. The whole period of observation divided into three consecutive periods of seven years.

3.2.1 *The Distributions of Reference Types*

Underlying data was generated by simply partitioning references into three categories as follows:

1. Documents published as papers in journals,
2. Documents of the monograph type, and
3. Documents that cannot be attributed to categories 1 or 2 above.

(3) above could be regarded as noise in this context. (8)

For the period 1985-1987, the share of citations to journals was 29 percent and accordingly, 71 percent of all citations were directed to monographs. In the next period, 1994-1996, 38 percent of all citations were assigned to journals and 61 percent to monographs. In the final period, 2003-2005, 41 percent of all citations were directed to journals and 59 percent to monographs. Hence, we can see that the journal as a channel for the formal scholarly communication tend to be more important over time. (9)

3.2.2 *Journal and Author Citation Rank Orders*

As previously noted, an existent intellectual base in terms of cumulated citations to cited documents could not be detected, hence, the analysis of citation rank orders was delimited to comprise authors and journals only. The identification of re-occurring highly cited journals and authors within the higher citation ranks would reflect an identifiable intellectual base whereas rank order distributions that deviate considerably between periods might indicate an inconsistent intellectual base. Generally, changes over time in the citation rank ordering could also inform us about a possible change of research foci of cited authors and journals and/or a change of research focus of the field as well as changes of author productivity and visibility. Those changes are however not possible to detect by mere rank ordering.

In the next table, i.e. Table 8, we can see that there exists no overlap of highly cited journals over all three observation periods. Comparing the first period with the second, two journals are common. The first and last periods have five journals in common and the second and last periods have two journals in common. Hence, the period of 1994 to 1996 deviates considerably from the other two.

Table 8: ***The Rank Order of the Ten Most Cited Journals over Three Observation Periods.***

Journal Titles	1985-1987	1994-1996	2003-2005
American Libraries	3		4
Bulletin of the Medical Library Association			9
Canadian Library Journal		4	
College and Research Libraries	6		6
Horn Book Magazine		3	
J EDUC LIBR INF SCI (10)		9-10	
JASIST (11)	2		1
Journal of Library and Information Science			8
Library and Information Science Research	4		3
Library Association Record	8-10		
Library History			5
Library Journal	5	1	
Library Quarterly	8-10	5	
Library Trends	1		
Library Trends		7	2
LIBRI	7		
Public Libraries	8-10		10
Public Library journal		6	7
Publishers Weekly		8	
RQ		9-10	
Wilson Library Bulletin		2	

Note: 1. Numbers in the table represent ranks within observation periods.
2. Ties are noted in the table.

On the author level, the dissimilarity between periods is even more pronounced. Only two authors overlap periods with *McClure CR* common to all periods and *Holt GE* to the second and last periods (see Table 9).

Table 9: ***The Rank Order of the 10 Most Cited Authors over Three Observation Periods.***

Author Names	1985-1987	1994-1996	2003-2005
Aabo S			9-10
Ackerknecht E	3		
Baker SL		9-10	
Ballard TH		9-10	
Batt C		9	
Bertot JC			6
Bilal D			9-10
Black A			2
Brown R		9-10	
Cameron KS		9-10	
Cook C			9
Delia G	9-10		
Dresang ET			9-10
Garrison G	9-10		
Giustiniani L		1	
Golubeva OD		9-10	
Gross M			8
Hernon P			3
Hofmann W	1		
Holt GE		2	5
Julien H			9-10
Kerslake E			9-10
Kinnell M		7	
Koontz C			7
Kunitz SJ		4	
Lynch BP			9-10
Lynch MJ	7		
McClure CR	6	3	9-10
McColvin LR			1
Mittermeyer D		9-10	
Munford WA			9-10
Ogle JJ	8		
Palmour VE	5		
Pungitore VL		9-10	

Ranganathan SR	2		
Rosenberg P	9-10		
Rossoll E	9-10		
Scott AF		9-10	
Serebnick J		6	
Slote SJ		9-10	
Stlifer E		9-10	
Stuart M		9-10	
Train B			9-10
Trezza AF	9-10		
Turock BJ	9-10		
Usherwood B		9-10	
Walter VA			4
Vanhouse NA		8	
Vavrek B		5	
Zweizig D	4		

Note: 1. Numbers in the table represent ranks within observation periods.
2. Ties are noted in the table.

Thus, we can appreciate that on the higher level of citation aggregation (journal level) the overlap of cited journals is weak but still notable. On the author level of citation aggregation, the overlap is almost non existing. Surprisingly, the distance in time does not seem to be related to the degree of overlap. Conclusively, as reflected by this method, the findings indicate a base literature with little stability over time.

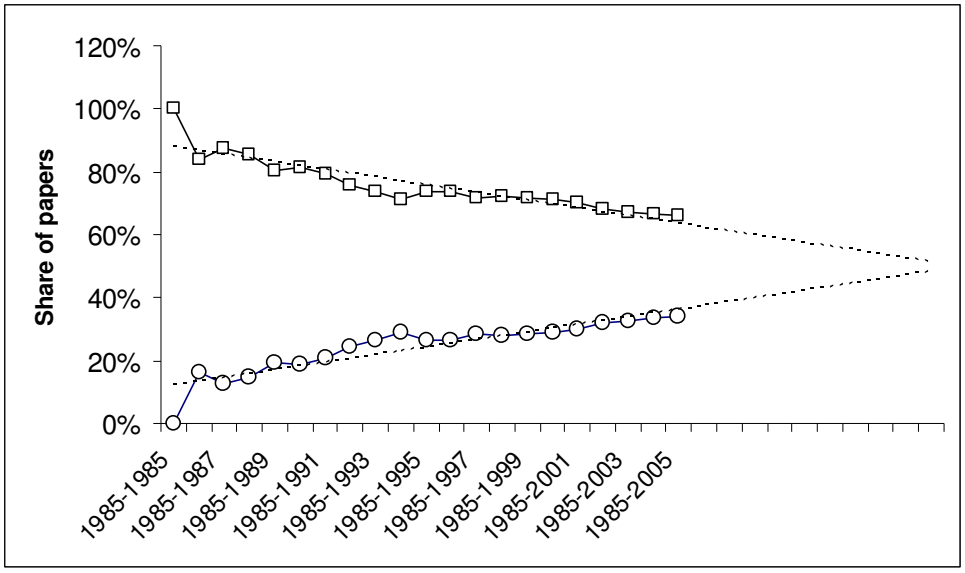
3.2.3 The Development of a Shared Intellectual Focus

Of immediate importance for the formation of an intellectual base mirrored by coherent research foci, is the extent to which authors share a common focus on the previous literature. For this investigation, we applied successively accumulated periods of observation and monitor the cumulative relative frequencies of papers sharing references over the 21-year observation period. (12) For this investigation, only papers of the article type were included as other document types would lead to biased results. (13)

Over the whole period of cumulated papers and references, we can see that most papers, in fact, are isolated in terms of not sharing references with other papers. However, there seems to be a tendency that the share of papers lacking common references decreases over time. Should this decrease continue at the same speed, it would take more than ten additional years

until only half of the literature would be isolated (see Figure 4). Over the whole accumulated period, the coupling strength between papers sharing references was low. Counted per accumulated year, the range of average coupling strength of links was 1.25-1.65 and likewise, the range of the average number of links of shared references between papers was 0.09-1.02.

Figure 4: *The Share of Papers over Cumulated Years Lacking Common References (Upper Curve) and the Share of Papers with Common References (Lower Curve)*



3.2.4 *The Recency of Citations*

An important aspect of citation behaviour is the recency of citations, or put differently, the currency of reference lists in publishing papers. It has since long been observed that there is a tendency to cite the more recent literature on behalf of the earlier (Price, 1965) and this is a factor that affects the formation of research fronts where the current literature cluster the later literature by the way citations are directed. Hence, a development over time where the distance between the citing and the cited literature is diminished would possibly indicate the formation of research fronts and their cited literatures. (14) Hence, the speed by which previous research is incorporated and used in subsequent research was measured applying the *Price's Index*. It measures the ratio between the frequency of citations no more than five years distant from the publication date of the citing entity (the document, the

journal or the field) and the total number of citations. An apparent advantage with this measure is that extremes do not have a strong impact. (15) For the whole period, Price's index was 0.46. (16) Hence, near half of all cited works are no older than five years. For the purpose of detecting a change or trend in one or another direction over time, we need to partition the original set of citing papers and cited references in at least three subsets, each covering seven years. Zooming in on each observation period, we can see that there is a notable and even increase of Price's index (see Table 10). Hence, we can conclude that there is a tendency to decrease the distance between the current research and the previous research by citing more current literature.

Table 10: ***Price's Index over Three Subsequent Seven Years Observation Periods***

Price's Index	Observation Period
0,39	1985-1991
0,44	1992-1998
0,48	1999-2005

5. Summary and Discussion

5.1 Summary

This study provides the following findings:

1. The most important channel for formal communication is the monograph, though the research article also plays an important role.
2. The distribution of citations over journals and journal subject categories of book reviews showed that the intellectual import from other fields than LIS is substantial, but the field of LIS is by far the most important contributor.
3. When citation distributions were further explored on different levels of aggregation, much skewed distributions were found and a small fraction of all citations generated visible cores of journals and authors.
4. On the document level of citation aggregation, the scatter of citations brought about that no core of highly cited documents could be identified. Generally, the impression was that the intellectual base was fragmented.
5. Comparing rank ordered citation lists from different observation periods in order to detect changes over time as to preferred sources, revealed a minimal overlap on both journal and author level. Hence, the base literature seemed to be inconsistent over time.

6. The exploration of shared intellectual focus on the earlier literature showed that approximately half of all papers were isolated in terms of not sharing references with any other paper, though a weak tendency of increased consensus was noted.
7. Though somewhat more than half of all citations were more than five years old, it was noted that there is a tendency to cite more current literature over time.

Conclusively, a coherent and discernable intellectual base was not found. On the contrary, citation patterns pictured a scattered and fragmented base literature, which was most distinctly illustrated by the citation frequency distribution of documents. However, a weak tendency of more consensual citation behaviour was detected. In addition, the contact with more current earlier literature seems to increase, possibly indicating the tendency of a research front.

5.2 Discussion

One question that needs to be addressed is to what extent the fragmentation is mirrored by an absence of identifiable, coherent research themes. It might well be that, in spite of the absence of a common base literature, coherent research themes may exists, but there exists little consensus as to which literature to build current research on (cf. Braam, Moed & van Raan, 1991). This question might lead to other directions of analysis. One alternative method would be to focus on the content of texts, e.g. title, abstracts and full texts. Some preliminary attempts to map research themes on the basis of co-occurring, standardized title words were made in connection to this study, however, with inconclusive results (see Appendix A). It seems also plausible that more qualitative approaches in combination with quantitative ones may be fruitful.

Appendix

In order to assess eventual and detectable changes of the subject content over time, title words from 597 book reviews were selected as the unit of analysis. As a first step, insignificant title words were filtered out using a stop word algorithm. Next, a stemming algorithm was applied in order to standardize different word forms. For each observation period, the hundred most frequent standardized words were then rank ordered by frequency of occurrence, and the intersection between lists computed. Finally, the *Spearman correlation* between intersections was measured in order to enhance the assessment of subject content deviation between periods (see Table A).

Table A: ***Matrix showing the number of common standardized book title words within the rank of the first 100 most frequent words (upper half of matrix) and the correlation between intersections between periods (lower half of the matrix).***

	1985-1991	1992-1998	1999-2005
1985-1991	1	35	28
1992-1998	0,21	1	41
1999-2005	0,41	0,42	1

As can be seen, between 28 and 42 percent of the most frequent words were common to all three periods. (!7) This means that a majority of the most frequent title words were not common. The largest intersection is between the periods of 1992-1998 and 1999-2005. Concerning the Spearman correlation, in no case was there a more than moderate positive correlation.

Conclusively, different words are frequently used in different periods, and a smaller share of words is shared between periods, but frequencies of use differ. However, as the use of homonyms and synonyms and the extent to which a common vocabulary of the field exists, are not known to the author, no conclusions regarding subject coherence between periods were drawn.

In the next step, three MDS maps corresponding to the observation periods 1985-991, 1992-1998 and 1999-2005, were generated on the basis of the co-occurrence of standardized title words in titles from 597 book reviews (Figure A-C). Standardized title words with a frequency < 5 were excluded and in order to normalize for the frequency, the Jaccard Index was applied. (18)

However, the interpretation of these maps as to identifiable research themes was inconclusive and to the author's best knowledge, they represent yet another illustration of a fragmented field and a possible interpretation of these maps should best be left to scholars of the field.

Figure A: *MDS map with standardised title words from book-reviews from the period 1985-1991.*

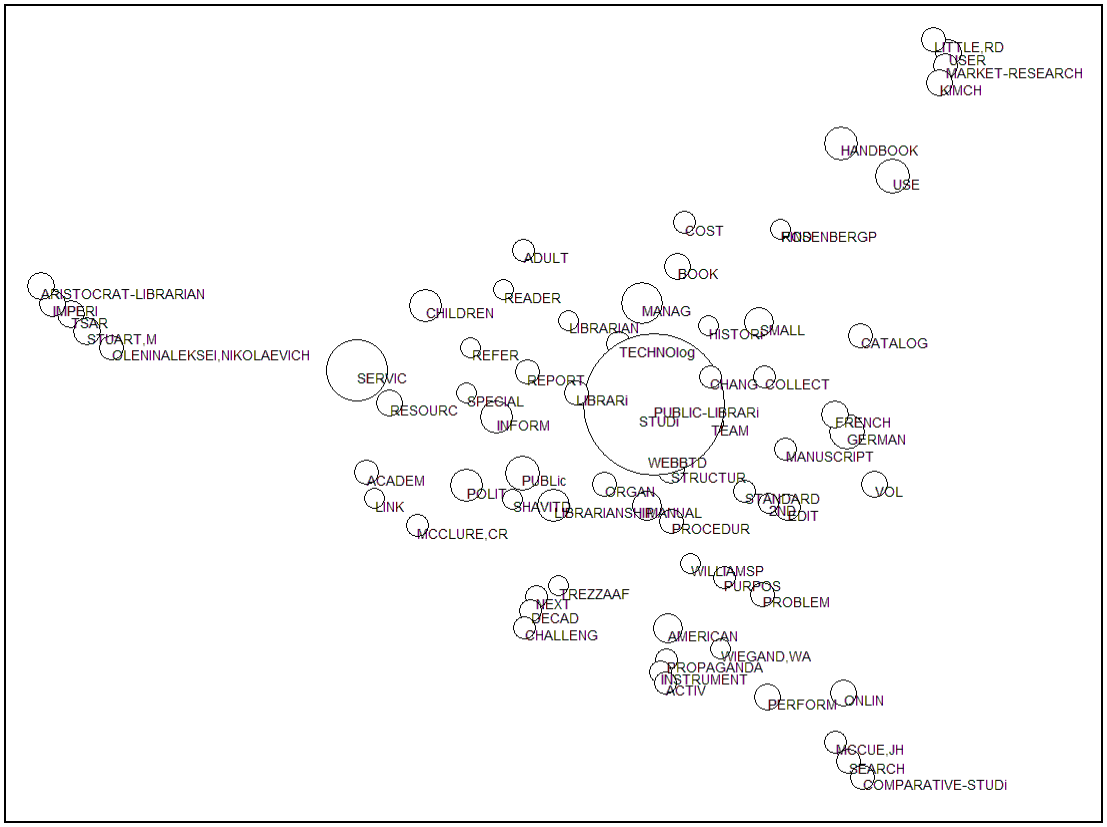


Figure B: *MDS map with standardised title words from book-reviews. The period 19992-1998.*

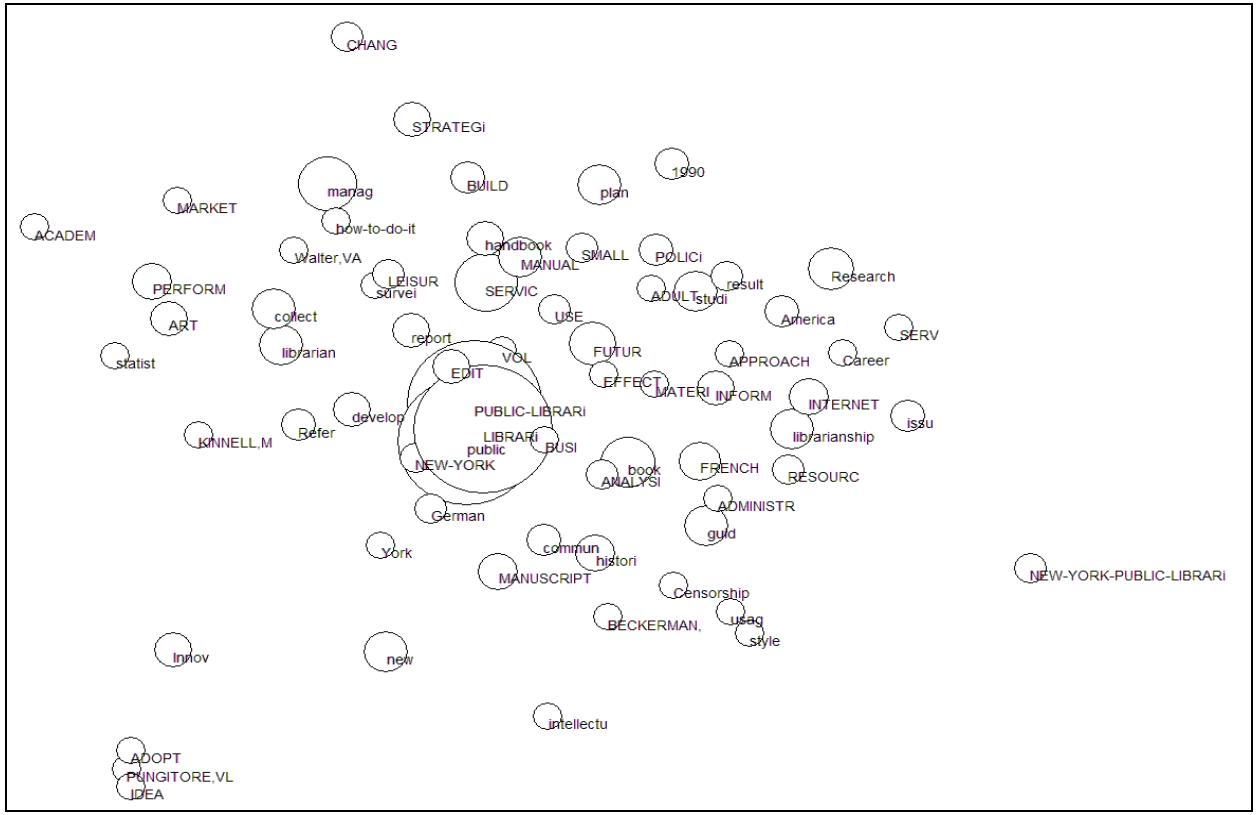
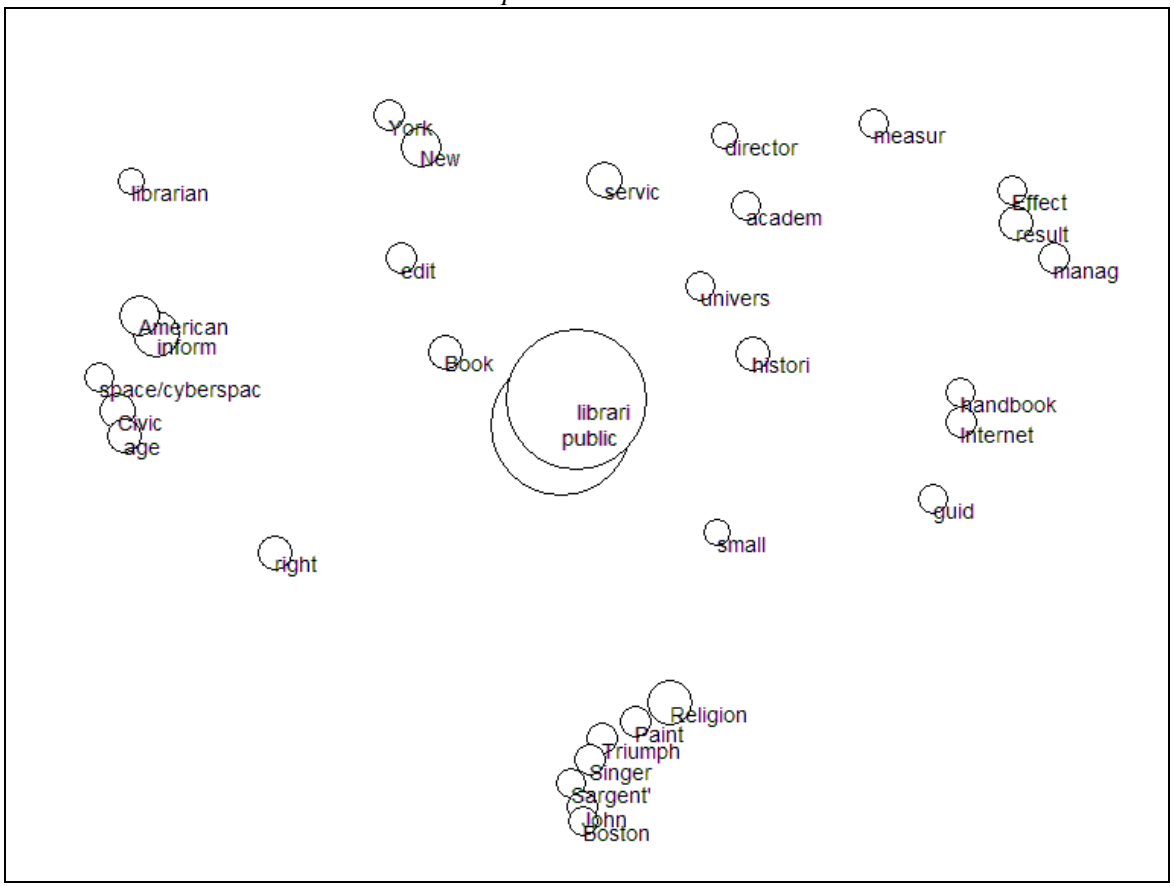


Figure C: *MDS map with standardised title words from book-reviews. The period 1999-2005.*



Notes

(1) For the publication year of 2005, approximately half of the year's publications were included.
(2) The arithmetic mean of number of references for review papers was 1.22 and the range 9 (1-10). The contribution of cited references from this document type was less than six percent. On the average, a reference cited by one or several book review papers received 1.32 citations and the range of received citations was 8 (1-9).
(3) The line drawn between scholarly journals and professional ones is, however, not seldom unclear.
(4) Journals, authors or documents. When the analyzed unit is journals or authors, the co-citation strength is usually counted as the *number of papers* citing two authors or journals simultaneously (frequencies of occurrence > 1 in a reference lists are not counted). This is, however, not evidently the best measure of similarity.
(5) "Similarities" in this paper applies to the co-citation strength between papers.
(6) In total, there was a drop out of approximately one percent when counting shares of the two cited reference types as a few items of catalogue type as well as some clerical errors in the original data were found.
(7) This was due to the relatively large amount of non-English references and some very unclear abbreviations and acronyms.
(8) The third category could be assigned a few items of catalogue type and the like, but was mostly due to clerical errors in the original data. Due to this, there was for each observation period a drop out of approximately one percent. Relative frequencies are, therefore, counted on the basis of slightly diminished data sets.
(9) The corresponding figures when only citing papers of the document type article were included were for the period 1985-1987 31 percent journal citations and 69 monograph citations. For the period 1994-1996, 41 percent of all citations were directed to journals and 59 percent to monographs. For the final period of 2003-2005, 43 percent of all citations were directed to journals and 57 percent to monographs.
(10) The full title is *Journal of Education for Library and Information Science*.
(11) The full title is *Journal of the American Society for Information Science and Technology*.
(12) As there should be a correspondence between the size of a field (in terms of number of authors and number of citable items) and the generation of shared references, the growth of references as a reflection of the growth of the field in general and the cited literature in particular, was calculated as the number of cumulated references per year, and the growth curve could easily be fitted to a linear function.
(13) Papers that normally contain considerably lesser references than papers of the article type have lesser chance of sharing references.
(14) The notion of research front aims at the existence of subject coherent groups of cited papers mirroring the current citing literature. Methods for the identification of research fronts are co-citation analysis, bibliographic coupling and Price's index.
(15) When older artefacts are cited, this would of course influence the average distance between citing and cited documents.
(16) Due to clerical errors in the downloaded data, 0.8 percent of all computed citing-cited distances had to be excluded.
(17) The stemmed word forms of public, library and libraries were excluded.

(18) The Jaccard's index is a well-known measure of similarity (S) between two objects (A and B) which counts the number of common attributes divided by the number of attributes possessed by at least one of the two objects:

$$S_{A,B} = \frac{|A \cap B|}{|A \cup B|}$$

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