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Empirical research methods reported in high-profile LIS journal literature

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ABSTRACT

This study describes a content analysis aimed at identifying the distribution of empirical research strategies and techniques reported in high-profile LIS journal literature published in 2005. For each article, researchers identified the overall research strategy, the data collection technique, and whether the type of analysis was quantitative or qualitative. The taxonomies used in the analysis were those based on Järvelin and Vakkari's [Järvelin, K., & Vakkari, P. (1990). Content analysis of research articles in library and information science. Library & Information Science Research, 12, 395–422] study in order to compare the results with the earlier findings derived from the 1975 and 1985 literature. The survey approach remains the predominant research strategy in both library science and information science. However, there was a marked increase in experimentation. There were more modest increases in the use of qualitative approaches, except for historical research, which showed a marked decline. This study's findings will inform development of methods courses in doctoral programs, which aim to cover the most commonly used strategies and techniques in contemporary LIS research. Revised taxonomies, which include previously unspecified strategies and techniques such as ethnography and transaction log analysis, are suggested for future content analyses of LIS research.

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1. Introduction

Recent surveys in the United Kingdom (Morris, 2006), the United States, and Korea (Park, 2003, 2004) found that library and information science (LIS) departments offered a wide range of research methods courses. Many of the courses were not compulsory, and they emphasized different methodologies and methods. Among other things, this variation may reflect various research interests and expertise across LIS departments, as well as different topics and approaches of research students, at a particular point in time. (In contrast, Park (2004) found a lack of correspondence with research students' methods in some US courses). It is obviously important for research methods courses, particularly in doctoral programs, to cover in depth those methods likely to be appropriate for the research proposed by the students taking the courses. It is also important for syllabi to cover a broad range of methods so that students may select appropriate methods. This also gives students some grounding in methods that they may wish to use in the future, perhaps outside of a particular LIS department. A methods course in a doctoral program that focuses too acutely on a particular set of strategies and techniques, at the expense of other commonly used approaches, may end up creating a self-fulfilling prophecy—research students (and perhaps academics) who join the department might do so partly because of the emphasis placed on particular methodologies and research areas. MLS students

need exposure to a wide range of methods given the wide range of professional contexts in which future research may be carried out or encountered. On the other hand, no methods course could cover every method ever devised. When deciding which methods need to be covered, and to what depth, course developers may wish to consider which methods are the most commonly used in LIS research—or at least, those methods most commonly used in quality LIS research. In MLS programs, it may be appropriate to define LIS research primarily in terms of the research carried out by or for practitioners. In doctoral programs, research may be appropriately defined in terms of that carried out within the academy.

1.1. Problem statement

LIS researchers and research students need to be familiar with the strategies and techniques they are likely to encounter, and possibly select, as they go about their research. The problem is that LIS is a very broad discipline, or meta-discipline, that uses a wide variety of continuously evolving strategies and techniques. Researchers with a finite amount of time cannot fully master all the strategies and techniques on offer. They must therefore be selective and focused. To this end, it is important for them, and for those designing methods courses in LIS doctoral programs, to know which research strategies and techniques are being applied in current high-profile LIS academic research. Given that LIS methods courses generally focus on empirical research, this study does not cover non-empirical strategies, such as conceptual and mathematical methods. High-profile research was defined in terms of that reported in top-rated research journals.

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The two primary research questions were:

1. Which strategies and techniques are most used in current, high-profile LIS research?
2. What are the trends in the use of LIS research methods?

The second question was answered by comparison with earlier studies based on 1975 and 1985 literature.

2. Literature review

Several content analyses of LIS research literature have been conducted previously, though most of them are somewhat dated. Bernhard (1993) provided a helpful summary of earlier studies. She combined earlier results with a study of the coverage of methods in various textbooks and reference works to produce a list of thirteen methods considered the most important in the discipline. Her analysis shows a good deal of convergence among the earlier studies in terms of both classification and prevalence of methods. Most of the studies are based on journal literature, though some are based on secondary sources or dissertations. In addition, some compare different periods (generally defined as a year). Most examine other aspects as well as methodology, particularly subject.

Järvelin and Vakkari (1990) criticized some of the studies cited by Bernhard for a lack of refinement in their analysis of methodology and method. By contrast, their own study broke methodology and method down into four variables: type of investigation, research strategy, data collection method, and type of analysis. The type of investigation might be regarded as the general methodological approach—methodology types include empirical, descriptive, comparative, and conceptual. Although Järvelin and Vakkari (1990) also had a *no research* category, they defined research very broadly. For example, elsewhere, research papers might be distinguished from conceptual, descriptive, or professional papers. Most of the types of investigation correspond to one or more research strategies. The empirical type was the most subdivided, accounting for twelve strategies. In current methods language, these strategies would often be referred to as specific *methodologies* (Crotty, 1998). Järvelin and Vakkari (1990) went on to classify their empirical research strategies according to two other variables: first, in terms of data collection method (which elsewhere might be referred to as *technique*) and second, in terms of data analysis (qualitative or quantitative). These two additional variables appear to be a useful refinement because particular strategies do not necessarily entail particular collection or analytical techniques.

Bernhard (1993) included Järvelin and Vakkari's (1990) study and drew from their strategies for her list of research methods:

Content analysis
Information systems design
Survey
Bibliometrics
Comparative studies
Case studies
Ethnographic research—naturalistic enquiry
Evaluative studies
Experimental research
Historical research
Theory development
Delphi method
Operations research—systems analysis

Bernhard also offers definitions for each method, something surprisingly lacking in the reporting of most of the content analyses. Much of Bernhard's list is covered in the strategy classification devised by Järvelin and Vakkari (1990), including information systems design (which they placed outside of the empirical research strategies).

Ethnographic research and Delphi method were presumably covered by Järvelin and Vakkari's qualitative method and survey, while theory development was included in their conceptual research strategies (verbal argumentation and conceptual analysis). On the other hand, Järvelin and Vakkari (1990) did not list comparative studies as a strategy, only as a type of investigation. They did not list operations research at all.

Järvelin and Vakkari's (1990) analysis is one of the more recent and sophisticated, even though it is based on articles published in 1985. They used 37 core LIS journals, identified by such criteria as widespread distributions and international editorial boards. They argued that their exclusive use of journal articles would not significantly bias results, particularly because much of the research reported in monographic and other non-journal literature is also written up in journals. They examined a total of 449 research articles (according to their broad definition of research). They then classified the articles according to seven variables, including the four described above. For each of the variables, Järvelin and Vakkari designed categories to be mutually exclusive. Presumably they determined the primary strategy and technique in cases where mixed strategies and techniques were deployed and reported.

Kumpulainen (1991) followed up on Järvelin and Vakkari's (1990) study. She used the same classification scheme to investigate the research areas and methods of 359 research articles in LIS journal literature from 1975. Her list of 30 journals was based in part on Järvelin and Vakkari's list, though she revised it to reflect core journals from a decade earlier.

There has been little content analysis performed on more recent research literature with respect to research methods. Julien (1996) looked at methods reported in the information needs and uses literature from 1990–1994. Clyde (2004) examined school librarianship literature from 1991–2000. Blake's (1994) study of LIS dissertation abstracts from 1975–1989 revealed some differences in the distributions of methods used by library science and information science research students. Much more experimentation was performed by the latter, though the survey was still the most popular across LIS. Blake also detected greater methodological variation in information science, the demise of the historical method, and the general reduction in numbers of library science dissertations. Outside of content analysis, Powell (1999) identified some emerging trends in both qualitative and quantitative research. There has also been a fair amount of discussion about the place of research in the profession, culminating in the rise of evidence-based librarianship (Crumley & Koufogiannakis, 2002). Meanwhile, both Park (2004) and Morris (2006) have conducted a different kind of content analysis—analyzing the documented curricula themselves. Park examined methods subjects taught in the US and Korea, while Morris looked at UK courses. They both found wide variations across departments. Some emphasized qualitative methods; others emphasized quantitative methods. There were also marked differences in course length and subject depth. This appears to reflect the wide range of methods employed across the discipline, as Eldredge (2004) described in his inventory of LIS methods.

3. Research design

3.1. Construction of classification scheme

This paper describes a content analysis of contemporary LIS research literature, which aimed to identify the most common strategies and techniques employed by LIS researchers carrying out high-profile empirical research. The study utilized the relevant parts of Järvelin and Vakkari (1990) classification scheme. Their taxonomies were relatively refined. They were used by subsequent researchers and established with reference to empirical data, which allowed comparison with previous years—1975 (Kumpulainen, 1991) and 1985 (Järvelin & Vakkari 1990).

This study's strategy classification included Järvelin and Vakkari's (1990) eleven empirical research strategies, even though the secondary

analysis strategy overlapped with the other ten (and was not particularly useful). However, recent literature labels many of these strategies as methodologies rather than methods. Therefore, this study revised the terminology to avoid the term *method.* Also, one extra category was included: *mixed strategies.* This study excluded all of Järvelin and Vakkari's (1990) non-empirical strategies, including their system and software analysis and design and operations research strategies. All other strategies not specifically covered by the classification were classed under *other strategy,* unless they were qualitative—in which case they were classed under *qualitative strategy.* The classification includes categories which might be considered research designs or methods, as well as those that might be considered methodologies. However, the scheme was retained in order to facilitate comparison with the results of the earlier studies. All eleven categories are listed below.

> *Strategy*
> Historical research
> Survey
> Qualitative strategy
> Evaluation
> Case or action research
> Content or protocol analysis
> Citation analysis
> Other bibliometric analysis
> Secondary analysis
> Experiment
> Other strategy
> Mixed strategies

Some of the strategies in the classification have been variously defined and might be considered to overlap with other categories. To assist the analyst, the relevant definitions proposed by Bernhard (1993) were adopted. For the purposes of this study, action research is subsumed under Bernhard's case study definition. Protocol analysis is subsumed under her content analysis definition.

Corresponding definitions did not exist, however, for certain terms. *Citation analysis* and *other bibliometric analysis* were treated together by Bernhard, and *secondary analysis* and *qualitative strategy* were very generic categories. This study defined citation analysis in terms of Bernhard's definition for bibliometrics, where the principal unit(s) of measurement related to citations. *Other bibliometric analysis* used the same definition, but the principal unit(s) of measurement did not relate to citations. Where there was a mix of citation and non-citation biblio-metrics, *citation analysis* took precedence. *Secondary analysis* was defined narrowly as any form of method that was used to answer a research question of a previous study using the same data (i.e., pre-existing data).

Several of the other categories might be considered qualitative methods—at least sometimes. Therefore, the definition of *qualitative strategy* was any strategy based on the qualitative analysis of data that did not fall into one of the other categories (excluding the *other strategy* category). This strategy corresponded to the qualitative type of analysis, though it did not account for the only instances of it.

This study used two other parts of Järvelin and Vakkari's (1990) scheme to shed further light on the strategies and techniques employed in contemporary LIS research: the array of data collection techniques (which are sometimes termed *methods* in the literature) and the qualitative and quantitative categorizations under type of analysis. Essentially, the same nine categories were used to classify data collection. A further type of analysis was added, namely, that which was both qualitative and quantitative. The two arrays are listed below.

> *Data collection technique*
> Questionnaire, interview
> Observation
> Thinking aloud
> Content analysis
> Citation analysis
> Historical source analysis
> Use of data collected earlier
> Other technique
> More than one technique
> *Type of analysis*
> Qualitative
> Quantitative
> Both

The categories in each of the three classification facets were treated as mutually exclusive for the purposes of this analysis—an article was classed in only one category. Where there was clearly one primary strategy or technique, the article was classed in the corresponding category; where there was more than one primary strategy or technique, it was classed with the *mixed strategies* or *more than one technique* category. Similarly, if major parts of the analysis were quantitative but other major parts were qualitative, the *both* category was used.

3.2. Selection of literature

Not all high-quality research is reported in high-profile journals, nor do all the articles in high-profile journals necessarily represent high-quality research. Nevertheless, the study assumes that there is a great deal of overlap. It is worth identifying strategies and techniques used in high-profile research, even if it is not all high quality, as such research (or the reporting of such research) is likely to influence future research directions.

Following other studies, such as those of Järvelin and Vakkari (1990) and Kumpulainen (1991), this study examined only journal articles for practical reasons. This study assumed that the top journals in the LIS field were at least as influential as the top monographs, conference papers, reports, and dissertations. It also assumed that the journals are reasonably representative of current research (and probably more so than monographic literature), and that the journals selected represent a broad cross-section of LIS and related research. Järvelin and Vakkari (1990) and Kumpulainen (1991) selected core LIS journals in terms of importance and relevance. This study emphasized the criterion of importance in the senses of impact and profile. As the basis for selection, it used the ranked list of journals by impact factor in the 2005 Institute of Scientific Information (ISI) journal citation report for the field (Institute of Scientific Information, n.d.). All articles in 2005 issues (according to their chronological designations) of 20 of the top 30 journals were examined. (There was one exception where access to the last 2005 issue of a journal could not be gained, and so the last issue from 2004 was used instead). Nine of the other ten journals were unable to be analyzed due to lack of access to the full text, while another journal (*Annual Review of Information Science & Technology*) contained only review articles. The 20 journals examined are listed in Table 1.

For the analysis, the authors discounted articles that were less substantial, such as editorials, book reviews, obituaries, and brief communications. The authors also excluded historical reprints from the analysis. Of the remaining articles, those deemed not to report new empirical research were assigned to the separate category *no empirical research.* This category included discussion papers and essays, literature reviews, theoretical papers, and articles featuring conceptual analyses, information systems design, simulations, and so forth. All other articles were assigned one category from each of the three facets in the classification scheme outlined above.

It is assumed that these articles, by virtue of appearing in these top journals enjoy a relatively high profile. Although it has been argued that citation impact factors favor the harder sciences, whose distribution of research strategies and techniques is different from that of

Table 1
Journals examined

Journal	Impact factor	Rank
Management Information Systems Quarterly	4.978	1
Journal of the American Medical Information Association	4.339	2
Information Systems Research	2.054	4
Journal of the American Society for Information Science and Technology	1.583	6
International Journal of Geographical Information Science	1.562	7
Journal of Management Information Systems	1.406	10
College and Research Libraries	1.245	11
Journal of the Medical Library Association	1.225	12
Information Processing and Management	1.192	13
Information Society	1.018	14
Journal of Documentation	0.983	15
Library and Information Science Research	0.957	16
Journal of Information Science	0.747	19
Information Research	0.701	20
Library Quarterly	0.688	21
Information Systems Journal	0.559	23
Journal of Academic Librarianship	0.559	23
Library Resources and Technical Services	0.512	27
International Journal of Information Management	0.479	29
Research Evaluation	0.474	30

Table 2
Strategies used in 2005

Strategy	n	%
Historical research	7	1.2
Survey	173	30.5
Qualitative strategy (other)	31	5.5
Evaluation	23	4.1
Case or action research	48	8.5
Content or protocol analysis	27	4.8
Citation analysis	26	4.6
Other bibliometric analysis	32	5.6
Secondary analysis	4	0.7
Experiment	118	20.8
Other strategy	49	8.6
Mixed strategies	29	5.1
Total	567	100.0

the softer sciences, they have been employed extensively across the broad spectrum of disciplines as indicators of quality. Given this amount of use, they are perhaps even better approximations of reputation. In any case, of the 20 journals examined, at least 6 hail from the softer, librarianship side of the discipline. Moreover, the list overlaps significantly (despite its being for 1985) with Järvelin and Vakkari's (1990) list of core journals, which was compiled on a more qualitative basis.

Another way in which the ISI list might be somewhat biased is in its greater coverage of publications from English-speaking countries. Although this may not be viewed as a major issue for LIS departments in English-speaking countries, it is worth bearing in mind.

3.3. Reliability testing

Parallel coding was conducted by the two authors for all the 2005 issues of four of the journals. A formative approach was adopted, whereby the authors discussed mismatches and assessed their rate of agreement as they progressed through the initial issues. In addition to percentage agreements of well over 80%, Cohen's kappa coefficient was used to assess the level of inter-coder agreement for the third and fourth journals, a total of 52 articles. The coefficients were 0.895 for the strategy variable, 0.788 for the technique variable, and 0.810 for the type of analysis variable. All three scores were considered sufficiently high for coding to proceed separately, particularly given the conservative nature of the kappa coefficient. By this time, it had also become apparent that further improvement in consistency would be curbed by some fuzziness in the strategy taxonomy, which gave rise to instances in which both authors considered that a case could be made for more than one category. This matter is discussed further in the last section of this paper. The remaining coding of the other journals was shared equally by the two authors. Both authors found it necessary to access the full text of all articles in order to identify the various facets of each paper. All had abstracts, but in most cases they were insufficient to enable accurate coding.

4. Results

The overall counts for the three facets in the classification scheme are shown in Tables 2–4. The front-runner was the survey, with almost a third of the total. Experimentation was a clear second. The other strategies scored between 4 and 9%, apart from historical research and

secondary analysis, which both had very low numbers. The leading technique was questionnaire/interview, with about a third of the total. This was not surprising, given the popularity of the survey. The only other specific technique with more than 10% was content analysis. The use of pre-existing data, other techniques, and multiple techniques all scored between 14 and 17%. The relatively modest count for multiple techniques means that any difference in distribution among the individual techniques hidden within the coding for the *multiple techniques* category would likely have little bearing on the overall scores for particular techniques; the same may be said for *mixed strategies*. For type of analysis, about two-thirds of the research was quantitative, a long way ahead of qualitative research and research using both types of analysis.

The proportion of articles reporting no empirical research was 32.0% (267/834). This high figure is due to many discussion papers, some theoretical papers, and some papers in the information sciences that featured modelling and simulation exercises (particularly those overlapping with computer and management sciences).

The journals examined represent a wide range of fields spanning the whole spectrum of LIS, as well as some journals that overlapped with other disciplines (such as computer science and management science). Therefore, the authors decided to compare the results from journals that focus primarily on librarianship with the results from those that do not. The librarianship journals were defined as those focused primarily on topics pertaining to libraries (or a particular type of library) and included *College & Research Libraries, The Journal of the Medical Library Association, Library & Information Science Research, Library Quarterly, The Journal of Academic Librarianship,* and *Library Resources & Technical Services*. The comparison is shown in Tables 5–7. Interestingly, the proportion of articles reporting no empirical research in the librarianship journals was 33.0% (69/209), compared with 31.7% (198/625) in the other journals. There was no significant difference, despite an expectation that librarianship journals might contain more discussion papers and essays.

Finally, the overall results for 2005 were compared with those for 1985 and 1975 produced by Järvelin and Vakkari (1990) and

Table 3
Data collection techniques in 2005

Data collection technique	n	%
Questionnaire, interview	184	32.5
Observation	21	3.7
Thinking aloud	1	0.2
Content analysis	59	10.4
Citation analysis	26	4.6
Historical source analysis	7	1.2
Use of data collected earlier	95	16.8
Other technique	81	14.3
More than one technique	93	16.4
Total	567	100.0

Table 4
Types of analysis in 2005

Type of analysis	n	%
Qualitative	112	19.8
Quantitative	367	64.7
Both	88	15.5
Total	567	100.0

Kumpulainen (1991). These are shown in Tables 8–10 . The mixed strategies category was discounted from the 2005 analysis because it was not employed in the earlier analyses. Secondary analysis was also discounted because its result was not shown in the earlier figures. Similarly, for type of analysis, the *both* category was omitted from the 2005 figures.

5. Discussion

5.1. Comparison of distributions

With respect to the distributions of strategies reported in the librarianship and non-librarianship journals, the degree of correlation was no more than fair. This indicated some significant differences in the research approaches adopted by librarianship researchers and other LIS researchers. The proportions differed significantly for several strategies. The survey was even more prevalent in the librarianship journals, accounting for more than half of the research. Conversely, there were no experiments recorded in the librarianship journals—dramatically different from the 27.6% in the other journals. Historical research and content analysis occurred a little more often in the librarianship journals, whereas non-citation forms of bibliometrics occurred less.

For the techniques, the degree of correlation between librarianship and non-librarianship was fair, but again, it could have been higher. Given the prevalence of surveys in the librarianship journals, it was not surprising that questionnaires and interviews also featured very prominently. Another notable statistic was that non-librarianship journals had a far greater proportion of research using data collected previously. This was partly due to the use of test collections in the information retrieval field, barely covered by the librarianship journals. There were several other often-encountered techniques that could not be specified in the analysis using Järvelin and Vakkari's (1990) categories. These included task analysis (the often-automated measurement of task accomplishments) and dataset construction for experimentation. These techniques were more often adopted by researchers publishing in the non-librarianship journals.

Quantitative research still accounted for more than half of the librarianship journal articles, though the percentage was higher in

Table 5
Librarianship and non-librarianship strategies

Strategy	Librarianship		Non-librarianship	
	n	%	n	%
Historical research	5	3.6	2	0.5
Survey	72	51.4	101	23.7
Qualitative strategy (other)	9	6.4	22	5.2
Evaluation	4	2.9	19	4.4
Case or action research	11	7.9	37	8.7
Content or protocol analysis	12	8.6	15	3.5
Citation analysis	8	5.7	18	4.2
Other bibliometric analysis	5	3.6	27	6.3
Secondary analysis	0	0.0	4	0.9
Experiment	0	0.0	118	27.6
Other strategy	7	5.0	42	9.8
Mixed strategies	7	5.0	22	5.2
Total	140	100.0	427	100.0

Table 6
Librarianship and non-librarianship data-collection techniques

Data collection technique	Librarianship		Non-librarianship	
	n	%	n	%
Questionnaire, interview	60	42.9	124	29.0
Observation	4	2.9	17	4.0
Thinking aloud	0	0.0	1	0.2
Content analysis	21	15.0	38	8.9
Citation analysis	8	5.7	18	4.2
Historical source analysis	4	2.9	3	0.7
Use of data collected earlier	6	4.3	89	20.8
Other technique	11	7.9	70	16.4
More than one technique	26	18.6	67	15.7
Total	140	100.0	427	100.0

non-librarianship journals. The proportions of qualitative research were similar (around 20%). The lesser amount of quantitative analysis in librarianship research was compensated instead by more research combining quantitative and qualitative analysis.

Some trends can be observed when comparing the 1975, 1985, and 2005 distributions. There is an extreme trend downwards for historical research, as well as marked trends against evaluation and survey. Considering the findings for the librarianship journals, the decreases in historical research and survey may well be linked, at least in part, to a decrease in the coverage of traditional librarianship concerns in the high-profile journal literature. Conversely, there was a very marked increase in experimentation, no doubt due in part to the abundance of articles in the areas of information retrieval and computer science. There are also significant increases, although from lower bases, for qualitative strategies (outside of history) and content analysis.

Somewhat surprisingly, the use of questionnaires and interviews appears to have increased even though the survey has declined. This can be explained, however, by the rise of qualitative research, which is often conducted through interviews. The use of historical source material has declined in correspondence to the decline in the historical research.

Interestingly, there does not appear to have been any great overall shift in the proportions of quantitative and qualitative research. An increase in the use of more sophisticated qualitative research methods has been balanced by the decrease in historical research and by an increase in experimentation.

It is also worth noting that the percentage of articles not reporting empirical research was 55.9 in the 1985 analysis, compared with 32.0 in 2005. It is quite possible that the earlier study covered articles that were not examined in the later study. However, the large difference suggests that certain types of article, such as discussion and descriptive articles, may be less likely to find their way into the top LIS journals today than in previous times.

5.2. Revision of classification scheme

Other strategies ranked third in the 2005 results, behind only surveys and experiments. Of the non-specified strategies, there were significant numbers of similar type. This study proposes that a revised classification scheme includes more specific strategies and clearer definitions so as to reduce the number of *others*.

Table 7
Librarianship and non-librarianship analyses

Type of analysis	Librarianship		Non-librarianship	
	n	%	n	%
Qualitative	32	22.9	80	18.7
Quantitative	72	51.4	295	69.1
Both	36	25.7	52	12.2
Total	140	100.0	427	100.0

Table 8
Trends in LIS research strategies (%)

Strategy	1975	1985	2005
Historical research	24.7	19.1	1.2
Survey	40.1	41.0	30.5
Qualitative strategy (other)	0.0	2.9	5.5
Evaluation	17.0	10.0	4.1
Case or action research	3.8	6.8	8.5
Content or protocol analysis	0.0	2.0	4.8
Citation analysis	3.8	5.9	4.6
Other bibliometric analysis	2.2	1.6	5.6
Experiment	7.7	2.9	20.8
Other strategy	0.5	8.1	8.6

As mentioned earlier, the overlap between strategies in the scheme limits the reliability of its use. Notwithstanding the definitions that were adopted for this analysis, experiments and surveys can also be evaluations, and so on, without such cases necessarily representing a mixed methods approach. Rather, an approach may simply reflect aspects of two or even three strategies. In addition to constructing tighter definitions (which is necessary), a way forward might be to establish an order of priority. However, it is difficult to justify any particular order. Instead, the fuzziness of the strategy categories needs to be recognized—distributions resulting from content analyses based on them can only be approximate representations of researchers' approaches. Similarly, it should be recognized that researchers often approach a problem or question in a multi-dimensional way.

A major problem with the strategy classification is the presence of categories that really represent techniques, as reflected in their duplication in the technique taxonomy. It is thus recommended that content analysis, protocol analysis (which need not be merged with content analysis), citation analysis, and other bibliometric analysis techniques are dropped from the list of strategies. This would also reduce the overlap problem.

The authors also do not see any need to amalgamate case study and action research; instances of case study were often quite distinct from instances of action research. It is recommended that action research forms a separate strategy category.

Another problem with the strategy classification was using *qualitative* as a catch-all category. There was significantly more qualitative analysis being carried out in 2005 than in 1985, the year for which the scheme was originally constructed. There is, in any case, no point in using a category which is defined solely on the basis of the analysis facet. Instead, it is proposed that the category be dropped and replaced by *ethnography*. This allows for other qualitative approaches, to be classed as *other strategy* if they are not covered by the other specific strategies in the array. Other quantitative approaches, as well as ones that are both quantitative and qualitative, would also be classified as *other strategy*. *Ethnography* would usually include studies based on participant observation, journal entries, unstructured interviews, and so on. *Case study research*, on the other hand, would focus on particular cases; it may or may not employ a sophisticated methodology such as grounded theory.

Table 9
Trends in LIS research techniques (%)

Data collection technique	1975	1985	2005
Questionnaire, interview	21	26	32.5
Observation	3	2	3.7
Thinking aloud	0	0	0.2
Content analysis	4	4	10.4
Citation analysis	4	7	4.6
Historical source analysis	25	19	1.2
Use of data collected earlier	12	9	16.8
Other technique	18	26	14.3
More than one technique	13	4	16.4

Table 10
Trends in LIS research analysis (%)

Type of analysis	1975	1985	2005
Qualitative	39.5	17.1	23.4
Quantitative	60.5	82.9	76.6

Finally, there seems little reason to retain *secondary analysis*—it is not in itself a research strategy and rarely occurs. In summary, it is recommended that the strategy facet be revised as below.

Strategy
Historical research
Ethnography
Case study
Action research
Survey
Evaluation
Experimentation
Other strategy
Mixed strategies

This array coincides to varying degrees with those methods covered in LIS textbooks. For example, it coincides with six out of Williamson's eight methods (Williamson, 2002), and four out of Powell and Connaway's (2004) nine methods (pp. 59–68). It shares only 2 or 3 of 22 methods in Eldredge's recent inventory (Eldredge, 2004). However, Eldredge includes some very broad methods, such as analysis and summing up, as well as some much narrower techniques. Powell and Connaway also included techniques that have been deleted from the new taxonomy recommended here.

Just as there were quite a few *other strategies* in our findings, so too were there a significant number of *other techniques*. Techniques that were not specifically covered but were sometimes reported included transaction log analysis, focus groups, task analysis, journal entries, and bibliometric techniques outside of citation analysis. Many other instances of *other technique* involved the construction of data sets for information retrieval experiments. Although citation analyses could largely be distinguished from other forms of bibliometric analysis, there seems little practical reason why they need to be categorized separately. Researchers recommend that *bibliometric analysis* be made a unifying category that embraces newer forms of webliometrics, such as link analysis.

There was less of a problem with overlap between technique categories than between strategies. However, certain categories encompassed fairly diverse techniques. *Observation* was used for certain ethnographic studies but also for usability inspections and the like. Researchers propose adding the category *inspection* instead. This category would often be undertaken by experts or users and would often involve the use of checklists, etc. *Use of data collected earlier* often meant the use of test collections for information retrieval experiments, but a range of other data was used. However, given the nature of the technique—using previously collected and processed data—it does not seem necessary to break this category down any further.

In summary, it is recommended that the technique facet be revised as below.

Data collection technique
Historical source analysis
Questionnaire, interview
Focus groups
Journal entries
Observation
Inspection
Protocol analysis
Content analysis

Bibliometric analysis
Transaction log analysis
Task analysis
Dataset construction
Use of data collected earlier
Other technique
More than one technique

There appears to be no particular need to revise the type of analysis facet beyond the revision made for this study (i.e., adding a *both* category). The authors' coding rarely disagreed for this facet.

5.3. Future research

There are various ways to replicate this content analysis. It would, of course, be interesting to see what the distributions of research strategies and techniques look like in 2015, given the changes exposed in this study. It would also be interesting to see what they look like for lower-profile research and that featured in the professional literature. The latter is the kind of research more likely to be undertaken by practitioners, towards whom research methods courses in MLS programs are probably best geared. Given that one of the chief purposes of this research was to provide an indication of what courses students need to cover for LIS research, it would also be worthwhile to perform a parallel content analysis on the current course syllabi to gauge the extent to which they are in step with current research practice.

6. Conclusion

The results of the content analysis suggest that LIS researchers who publish in the top journals today mostly rely on a couple of strategies: survey and experimentation. However, researchers also used a wide range of other strategies in fairly significant numbers, demonstrating the broad church that the discipline (or group of disciplines) embodies. Qualitative approaches including case studies and ethnography are now well established, but quantitative techniques such as bibliometrics still figure as valuable tools of investigation. Indeed, the largely quantitative technique of transaction log analysis has grown rapidly to become a major instrument for those researching the performance of very large databases and related information retrieval issues.

It is thus recommended that coverage is given to at least the following strategies in LIS doctoral programs: survey, experimentation, case study, ethnography, and evaluation. This would ensure that certain techniques closely associated with certain strategies are covered, including questionnaires, interviews, content analysis, bibliometrics, and transaction log analysis.

Comparison with earlier studies indicates a discipline (or set of disciplines) that continues to evolve and utilize new approaches and techniques as they emerge. The emphasis on empirical research appears stronger than ever as LIS seeks to cement its position in the academic community. The diversity and sophistication of strategies and techniques currently applied by LIS researchers bodes well for the future, with a healthy mix of quantitative and qualitative approaches reflecting the many kinds of research question that LIS addresses. LIS researchers need to be keenly aware of this methodological diversity in order to build on it.

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