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Editor's analysis

An Analysis of the Most Cited Articles in Software Engineering Journals - 1999

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Abstract

Citations and related work are crucial in any research to position the work and to build on the work of others. A high citation count is an indication of the influence of specific articles. The importance of citations means that it is interesting to analyze which articles are cited the most. Such an analysis has been conducted using the ISI Web of Science to identify the most cited software engineering journal articles published in 1999. The objective of the analysis is to identify and list the articles that have influenced others the most as measured by citation count. An understanding of which research is viewed as most valuable to build upon may provide valuable insights into what research to focus on now and in the future. Based on the analysis, a list of the 20 most cited articles is presented here. The intention of the analysis is twofold. First, to actually show the most cited articles, and second, to invite the authors of the most cited articles in 1999 to contribute to a special issue of Information and Software Technology. Five invited authors have accepted the invitation and their articles are appearing in this special issue. Moreover, the research topics and methods of the most cited articles in 1999 are compared with those from the most cited articles in 1994 to provide a picture of similarities and differences between the years.

1. Introduction

Citations are a common way of judging the most influential work in different fields. The most cited articles often provide new insights, open a new avenue of research, or provide a significant summary of the state-of-the-art in an area. Citations are the way to show how researchers build their work on existing research to evolve research further. Basically, they are the backbone of research and hence articles and authors being cited frequently deserve acknowledgment for their contribution. The analysis presented here is intended to highlight which articles are most cited in software engineering in a given year. The

analysis is intended to complement the work on ranking the most published scholars and institutions as done by Glass and Chen [Glass05].

The objective of the analysis presented here is to list the most cited journal articles in the field of software engineering recorded as published in 1999. The analysis is based on the ISI Web of Science [ISI3]. The ISI web covers the major journals in the field, creating a web of references that ensures that the overall picture obtained from the web is likely give a representative view of the most cited articles. In particular, it means that references from journals included in the ISI Web of Science also gets included in the web and hence included in information available from the created web of references.

The analysis is published as a list of the 20 most cited articles, or in case of ties the actual number of articles may be higher, for example, two articles may be tied for position 20 and hence the list would contain 21 articles. Authors of the top ranked articles have been invited to write a new article for this special issue. They have been asked to either write a follow-up article given that the previous work attracted high attention or some current research that they are conducting.

Two main issues should be kept in mind:

- The possible selection of journals is limited to what is available through the ISI Web of Science.
- The focus is on software engineering. This means that the actual selection of journals is based on selecting journals that are perceived as mainly publishing software engineering articles. All articles in these journals have been analyzed. This implies that no judgment has been made whether a specific article is within software engineering or not. The main reason being that it would not make the results from the analysis replicable and it would also create discussions of the borderlines between fields such as software engineering, computer science and information systems.

The intention is for the analysis provided here to be conducted and published on a yearly basis in a special issue of Information and Software Technology.

The article is structured as follows. Section 2 presents the ISI Web of Science and the actual selection of journals in the analysis. In Section 3, the analysis method is described. This includes some information about the ISI Web of Science in relation to the analysis method and a presentation of how the top 20 list was generated. Section 4 presents the results in relation to the top 20 list. In Section 5, a comparison between the most cited articles in 1994 and 1999 is presented. A short summary of the findings is provided in Section 6.

2. Selection decisions

A key issue when looking at citations is what to count. This includes both, which publications and which references. When it comes to the publications, any analysis is constrained by the support given by different databases or search engines. In the analysis presented here, it was decided to use the ISI Web of Science. The actual count of citations is further discussed in Section 3.

2.1. Tool support

The selection of which tool to use to count citations has a major impact on the actual outcome and hence on the trustworthiness of the findings. It is worth noting that bibliometric research is a field of its own. In this field, publication patterns are studied including both descriptive (for example counting the number of publications from an organization) and evaluative (for example counting citations as a measure of impact). The Institute for Scientific Information (ISI) has been leading in the field since its establishment in 1961 [McBurney02]. The metrics provided by ISI are being used for determining impact factors for journals [Glänzel02], assess and drive bibliometric research [Zitt05], and support studies like ours in other fields such as medicine [Jones05]. Sample checks with some of the author's publications confirmed that ISI strengths apply to the software engineering domain as well. Hence, the position of the ISI data as a leading source for bibliometric research and the actual use of it in other fields were decisive factors when determining to use this tool for this study of the most cited articles in software engineering.

2.2. Journals

The objective of the ISI as a database is to provide a comprehensive coverage of the most important and influential research. The information about ISI is based on [Thomson05]. The database includes in total more than 8500 journals and some other sources, for example, Lecture Notes in Computer Science. However, journals are here used as a reference to the content of the database. The journals cover three areas: science, social sciences and arts & humanities. The ISI staff reviews close to 2000 journals yearly, but only 10-12% makes it into the database. An interesting feature is how the references build a web. ISI captures the cited references and citation information that is included both from journals in the database and for those journals not included in the database but which are cited from journals included. This ensures a good coverage of citations and also that the data extracted provides a good picture of actual citations.

The objective was to make a selection of journals that provide as fair picture as possible of the most cited articles in software engineering. No database or tool support was found that was capable of including also all references in conferences papers and book chapters and hence the analysis is made under the assumption that journals provide a representative picture of the most cited articles.

The first column in Table 1 lists the journals selected from the database as a suitable set of software engineering journals. However not all of these journals were available in the database. Thus, the table also includes information about journals actually in the database in 1994, 1999 and 2004 respectively.

Table 1. Journals considered in the analysis.

Journal	1994	1999	2004
ACM Trans. on Software Engineering and Methodology (TOSEM)	No	Yes	Yes
Annals of Software Engineering	No	No	No
Automated Software Engineering	No	No	No
Empirical Software Engineering	No	No	Yes
IEE Proceedings of Software Engineering[1]	No	No	No
IEEE Software (Software)	Yes	Yes	Yes
IEEE Trans. on Software Engineering (TSE)	Yes	Yes	Yes
Information and Software Technology (IST)	Yes	Yes	Yes
International Journal of Software Engineering and Knowledge Engineering	Yes	Yes	Yes
Journal of Software Maintenance and Evolution - Research and Practice[2]	No	No	Yes
Journal of Software Maintenance – Research and Practice	Yes	Yes	No
Journal of Systems and Software (JSS)	Yes	Yes	Yes
Requirements Engineering Journal	No	No	No
Software Architecture	No	No	Yes
Software Engineering Journal	Yes	No	No
Software Process – Improvement and Practice	No	No	No
Software Quality Journal	Yes	No	Yes
Software Testing Verification & Reliability	No	No	Yes
Software – Concepts and Tools	Yes	Yes	No
Software – Practice and Experience (SPE)	Yes	Yes	Yes

Several things may be observed from the table and some issues are worth commenting. Some of the journals have started since 1994 and hence a "No" in the table means that the journal is not in the database; it does not say anything about its existence. A set of journals has stayed in the database for a number of years, which is indicated by "Yes" over the years. Some journals are added and may stay; this includes Software Testing Verification & Reliability (added in 2000), Empirical Software Engineering (added in 2003) and Software Architecture (added in 2004). Other journals have been removed from the database, but may re-enter. This may be exemplified by the fact that Software – Concepts and Tools is not present in the database since 1999. Journals may be borderline cases to be included. This seems to be the case for, for example, Software Quality Journal. It is included in 1994 and 2004, but not in 1999, although some issues are included from 1999, which is probably due to the fact that they are referenced by included journals. Finally, some journals have not been included into the database, which is indicated with "No" over the years, although some issues are included due to that they have been referenced from the journals in the database.

3. Method

The analysis is done focusing on the science part of the ISI Web of Science. The citation search is conducted as follows. The search is conducted for one specific year, for example, 1999. A list of journals is provided to the search engine within the Web of Science. This generates a complete list of articles published in the journals in 1999. It is then possible to sort the list based on the number of citations. Unfortunately, the sorting only works for fewer than 300 articles, and hence separate lists were generated.

[1] These proceedings replaced Software Engineering Journal from 1997.
[2] The name of the journal has changed, and hence it can be found in the database in all three years considered.

The most cited articles in each list were merged into one list which then was sorted. This resulted in a sorted list of the most cited articles in the journals listed in Table 1.

The list was generated on November 5th, 2004, and hence it may not be possible to exactly replicate the results presented below. The actual order of articles sorted according to citations may have changed due to that new citations are made and hence are added to the database. It may also be the case that some articles are referenced frequently shortly after publication, while other articles may rise in citation as the years pass. The latter may be the case when a particular article is novel and opens a new avenue of research. Such articles may show an increase in citation as time goes by, since the article becomes accepted as a landmark in a specific area.

It should also be noted that some articles in the list appear as having been published in 1998. However, they appear when searching for articles in 1999. The reason for this may be that a specific issue from one year was actually released the year after. Anyway, it was decided to not remove articles from the list, since this would cause other problems. If removing articles (due to that it shown as being published in 1998 although the ISI Web of Science lists it as being published in 1999) then there is a risk that some articles will not be covered at all in the analysis. Articles removed from 1999 will not appear when searching the database for 1998, and hence it was decided to use the list generated by the database.

Finally, self citations were removed. This was done manually, since no automatic way of filtering the citations was found. Self citation was defined as having at least one author in common with the original article. This means that research groups citing their own papers, but without any of the original authors have been kept.

Based on the rules above, the articles were sorted based on non-self citations and a “most cited” list emerged. When ties appear, the most cited article including self citation is listed first. However, the actual placement in terms of number in the list is not allowed to be affected by the self citations. It is worth mentioning that the removal of self citations only changed the internal order between articles slightly, and that the most cited articles were only marginally affected by removing the self citations. This is probably a result of that most researchers reference (for good reasons) their own work and hence no drastic changes in the list were observed when removing self citations.

4. Top 20 in 1999

The method described in Section 3 resulted in a list of the most cited articles in 1999 for software engineering. The list contains 23 articles, due to that seven articles are tied for position 17 on the list. No author is represented more than once on the list. The complete list can be found in the Appendix A. An excerpt of the list is presented in Table 2, where the six most cited articles are listed. The table shows the rank of each article, basic information about the article and the number of times the article has been cited. The basic information contains the normal information provided when referencing research articles.

Table 2. Most cited software engineering articles in 1999 (top six).

Rank	Author Title of article Journal reference	Citations
1	Buhr, RJA Use case maps as architectural entities for complex systems IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 24 (12): 1131-1155, DEC 1998	25
2	Kurtz, S Reducing the space requirement of suffix trees SOFTWARE-PRACTICE & EXPERIENCE, 29 (13): 1149-1171 NOV 1999	23
3	Briand, LC; Daly, JW; Wust, JK A unified framework for coupling measurement in object-oriented systems IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (1): 91-121 JAN-FEB 1999	21
4	Holland, CP; Light, B A critical success factors model for ERP implementation IEEE SOFTWARE, 16 (3): 30-+ MAY-JUN 1999	20
5	Kellner, MI; Madachy, RJ; Raffo, DM Software process simulation modeling: Why? What? How? JOURNAL OF SYSTEMS AND SOFTWARE, 46 (2-3): 91-105 APR 15 1999	18
6	Basili, VR; Lanubile, F Building knowledge through families of experiments IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (4): 456-473, JUL-AUG 1999	16

The number of citations is rather low. However, it should be noted that conference proceedings are very common in software engineering and references from conference papers to the journal papers are not included in the citation count. Moreover, the citation count is made after approximately five years (it depends slightly on when a specific article was made available) and the citations are expected to rise over the years. This becomes clear when looking at the citation counts from, for example, 1994. The most cited article in 1994 has been cited 186 times [Chidamber94], which is very high in comparison to the others on the list. However, it should be noted that self citations have not been removed from the analysis of 1994. This is not done due to that the removal of self citations is done manually and that the removal of self citations in 1999 only changed the ranking marginally. Thus, since the primary objective is not to create a ranked list but simply to make an informal comparison with 1999, it is not regarded as crucial. The article coming in second in 1994 is cited 65 times [Fenton94]. However, a citation count of 25 (as the most cited article in 1999) would be sufficient to be ranked in the lower end of the top 20 list from 1994. A comparison between the most cited articles in 1994 and 1999 is provided in Section 4.

To get some better understanding of how articles are cited, and in particular the most cited article, the article by Buhr was analyzed in some more detail. The analysis was done at the end of 2004 and the number of citations had at this time risen to 27 (from 25 in early November). The number of citations has varied over the years from two in 2002 to eleven in 2003. The last year, i.e. 2004, the number of references is five. This shows that the number varies over the years and that new citations are added every year. It is also interesting to note that the article by Buhr is referenced from ten articles in Lecture Notes in Computer Science and from 15 different journals. Only articles from one journal refer to this article more than once. Articles from Computer Networks refer to this paper three times. This also means that only one article in IEEE Transactions on Software Engineering, where the article by Buhr was published, refers to the article by Buhr.

Based on the list in Table 2, the first author was invited to contribute with an article to this special issue of Information and Software Technology. No requirements were put on the authors regarding the

content, but they were informed that all articles would go through the normal review process. In the process of inviting authors, it turned out that Dr. Buhr has retired and hence the special issue does not contain any contribution from him. In one case one of the co-authors was invited since the main author did not respond to the invitation. Thus five researchers accepted the invitation and their contributions can be found in this special issue, although in most cases with other co-authors than their article listed for 1999.

It is interesting also to study which journals appear on the list. It turns out that all articles listed among the top 20 are published in the journals also included in the study presented yearly by Glass and Chen [Glass05]. Thus, the six journals used by them are included in the plot in Figure 1, although one of them is not on the list of the most cited articles, i.e. TOSEM. It can be noted that the most cited articles are published in IEEE Transactions on Software Engineering, although its dominance is lower than five years earlier, which is further discussed in the next section. However, it is probably not a matter of that articles in this journal get cited more than others per se. It is more a matter of what is submitted to the journal. On the other hand, most software engineering researchers today have access to most journals in Table 1 electronically. For example, Information and Software Technology is accessible through ScienceDirect, which a large number of university libraries have access too and hence the researchers at those universities. This means that articles published in any of the journals listed in Table 1 stands a fair chance of being highly cited. Given this reasoning, it is somewhat surprising that none of the more specialized journals make it into the top 20 list, in particular since some of the highly cited articles very well could have been published in the more specialized journals given the content of the articles.

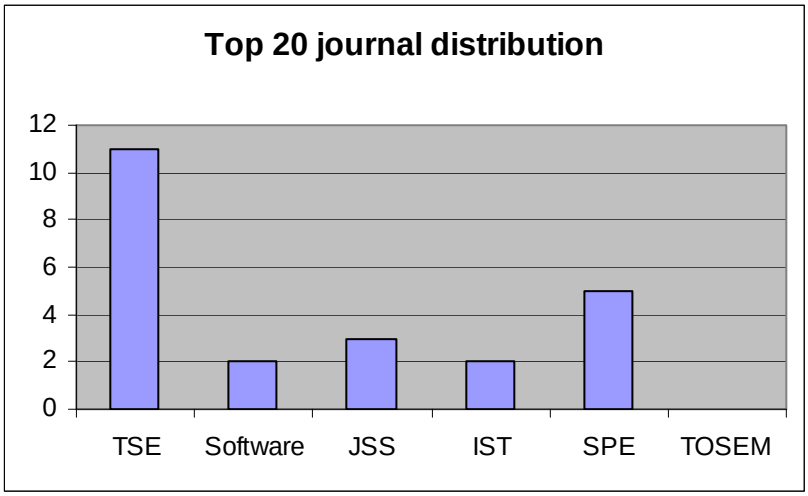

Figure 1. Distribution of the most cited articles across journals in 1999.

5. 1999 vs. 1994

5.1. Comparison of most cited journals

As a comparison to Table 2, the top six of the most cited articles in 1994 can be found in Table 3. It is interesting to note that four of the top six papers are related to requirements engineering and the other two are measurement papers. The paper ranked as number one is outstanding in terms of number of citations. This is obvious both from Table 3 and Figure 2. In Figure 2, the number of citations for the top 20 (including 21 articles due to that rank 20 is tied) is shown. As noted earlier, self citations have not been removed.

Table 3. Top six articles in 1994.

Rank	Author Title of article Journal reference	Citations
1	Chidamber, SR; Kemerer, CF A metrics suite for object-oriented design IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 20 (6): 476-493, JUN 1994	186
2	Fenton, N Software measurement – A necessary scientific basis IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 20 (3): 199-206 MAR 1994	65
3	Leveson, NG; Heimdahl, MPE; Hildreth, H; Reese, JD Requirements specification for process-control systems IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 20 (9): 684-707 SEP 1994	59
4	Nuseibeh, B; Kramer, J; Finkelstein, A A framework for expressing the relationships between multiple views in requirements specification IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 20 (10): 760-773 OCT 1994	52
5	Finkelstein, ACW; Gabbay, D; Hunter, A; Kramer, J; Nuseibeh, B Inconsistency handling in multiperspective specifications IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 20 (8): 569-578 AUG 1994	52
6	Potts, C; Takahashi, K; Anton, AI Inquiry-based requirements analysis IEEE SOFTWARE, 11 (2): 21-32 MAR 1994	51

It is worth noting that only two authors appear on the top 20 list for both 1994 and 1999. They are Norman Fenton and Chris Kemerer. They are authors of the two highest ranked articles in 1994 and they have also articles on the list for 1999, see Appendix A. In 1999, no author appears more than once on the top list. However, on the list for 1994, four authors appear twice. Norman Fenton has two papers on the list. Moreover, two papers jointly authored by Bashar Nuseibeh, Anthony Finkelstein and Jeff Kramer make it onto the list. These two papers even made it into top six as can be seen in Table 3.

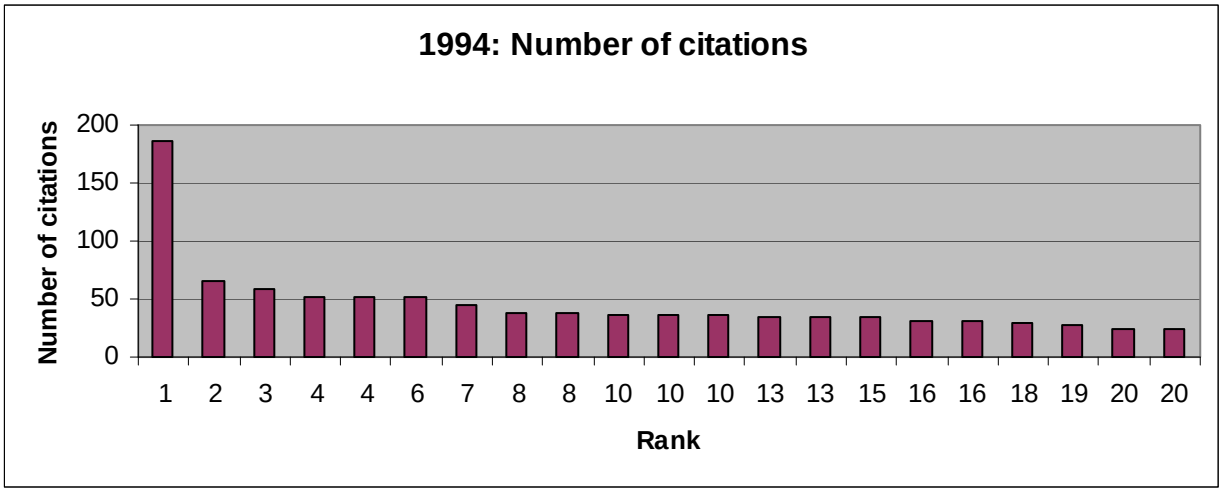

Figure 2. Number of citations for top 20 in 1994.

The top 20 articles are distributed across journals as shown in Figure 3. The same six journals as in 1999 have been included to simplify comparison. The top 20 list is even more dominated by the IEEE journals in 1994 than in 1999. A possible explanation is that the World Wide Web has made all journals more easily accessible. Before the advent of the Internet (or in its childhood), many researchers received

the IEEE journals as members of IEEE, but the other journals meant more expensive subscriptions. The Internet access to most journals through, for example, university libraries may be one explanation to that the picture has changed between 1994 and 1999. It will be interesting to see whether this change will continue in the next coming years or it will stabilize on a picture similar to the situation in 1999 (Figure 3).

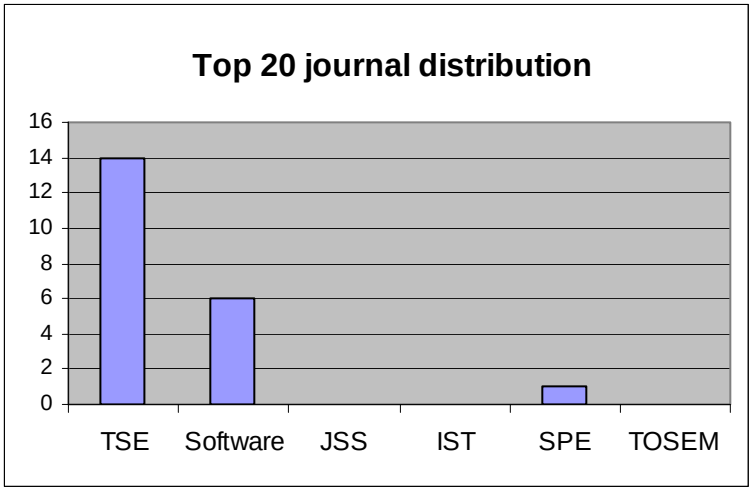

Figure 4. Distribution of the most cited articles across journals in 1994.

5.2. Comparison of research topic and research method

Software engineering articles have earlier been surveyed by researchers with respect to evaluation [Tichy95] and validation [Zelkowitz97]. Moreover, more recently a joint classification scheme for research in computer science, software engineering and information systems was proposed in [Vessey05]. An early version of this scheme was used to classify a number of articles in software engineering as reported in [Glass02]. To allow for comparison between the most cited articles in 1994, 1999 and the general findings reported in [Glass02], the scheme in [Vessey05] has been used to classify the articles on the top 20 list for 1994 and 1999 respectively. In [Vessey05], five different dimensions of classifications are suggested. Here, two of these dimensions are used.

The articles on the top 20 lists for 1994 and 1999 have been classified according to their research topic and research method. In many cases, articles may be classified into more than one category. As an example, articles propose a new method for specifying requirements. An article like this could potentially either be classified as contribution to “methods/techniques” or to “requirements engineering”, which is viewed as belonging to “software life-cycle engineering”. This is no surprise since many articles cut across software engineering. In these cases, it is necessary to interpret what the main contribution is and then also to be consistent. An advantage in this example is that the two possible classifications belong to the same main category, i.e. “systems/software concepts”. A similar situation occurs for the classification of research method. Many articles propose new ways of performing a task and then illustrate it in an example or a case study. The new proposal with a thorough analysis and explanation of the new concept would mean classifying the article into “conceptual analysis”, since it presents the new concept and explains how it would work. However, depending on the importance and how extensive the case study is, the paper could potentially be classified as “case study”. Once again, it is a matter of judgment when it comes to the classification.

The distribution across research topics is shown in Figure 5 and research methods are shown in Figure 6. The legend to the two figures can be found in Table 4. The topics are presented as nine main

categories. Several sub-categories are available in [Vessey05], although they are not used here. The 15 methods listed in Table 4 are the methods that are reported in [Glass02] as having some percentage of articles in software engineering. [Vessey05] includes four more methods, but they are reported as having 0% articles in the sample examined in [Glass02]. The main reason for the very low percentage figures for some methods are most likely due to the ambition to create a joint classification for software engineering, computer science and information systems, and some research methods may be used more in one of the disciplines than in the others.

Table 4. Legend for research topics and methods.

Topic	Explanation
1	Problem-solving concepts
2	Computer concepts
3	Systems/software concepts
4	Data/information concepts
5	Problem domain specific concepts
6	Systems/software management concepts
7	Organizational concepts
8	Societal concepts
9	Disciplinary issues

Method	Explanation
CA	Conceptual analysis
CI	Concept implementation (proof of concept)
CAM	Conceptual analysis/mathematical
LH	Laboratory experiments (human subjects)
CS	Case study
DA	Data analysis
ES	Descriptive/exploratory survey
SI	Simulation
LR	Literature review
LS	Laboratory experiment (software)
FE	Field experiment
FS	Field study
GT	Grounded theory
HE	Hermeneutics
MP	Mathematical proof

In Figure 5, the research topics are listed in numeric order according to Table 4. The table shows three bars for each topic category. It shows the percentages of each category for the top lists of 1994 and 1999 as well as the distribution reported in [Glass02].

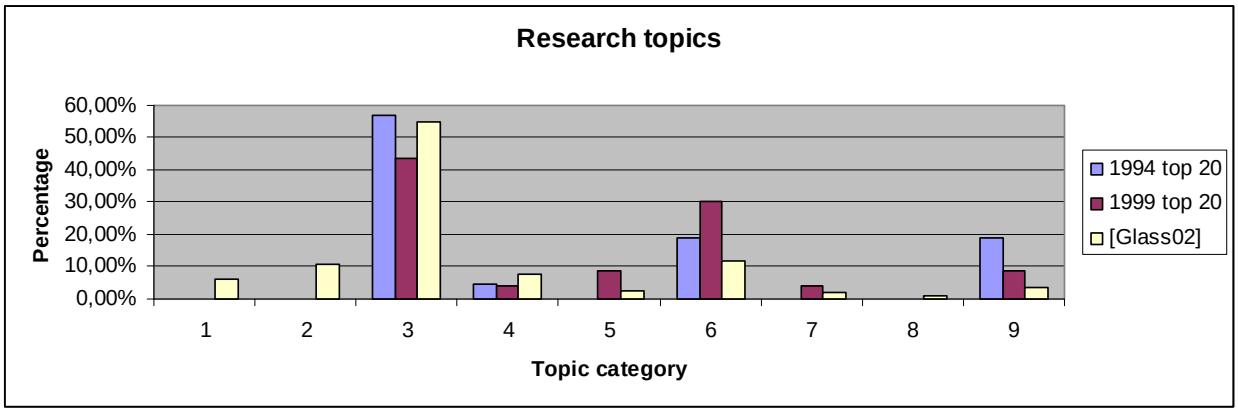

Figure 5. Distribution of research topics into different categories.

Minor differences between the different bars in Figure 5 may be due to the small samples that the top lists represent. Moreover, each classification is a matter of judgment. Having said this, some remarks may be appropriate regarding Figure 5. In all three samples, it is clear that "systems/software concepts" dominate when it comes to articles in software engineering. "Systems/software management concepts" and "Disciplinary issues" seem to be overrepresented on the top lists in comparison to the more general sample studied in [Glass02]. The "Disciplinary issues" represent articles that address, for example, how to conduct research in software engineering. It is no surprise that these articles become highly cited, in particular if your research follows the advice. There are differences between 1994 and 1999, although no major differences can be identified. Bottom-line is that the research topics do not seem to have shifted considerably between 1994 and 1999.

In Figure 6, the research methods are listed in percentage order according to [Glass02]. Once again three columns are shown. Here, it should be noted that the percentages in [Glass02] does not sum to 100% and hence the percentages have been re-scaled to be comparable to the findings from the top lists.

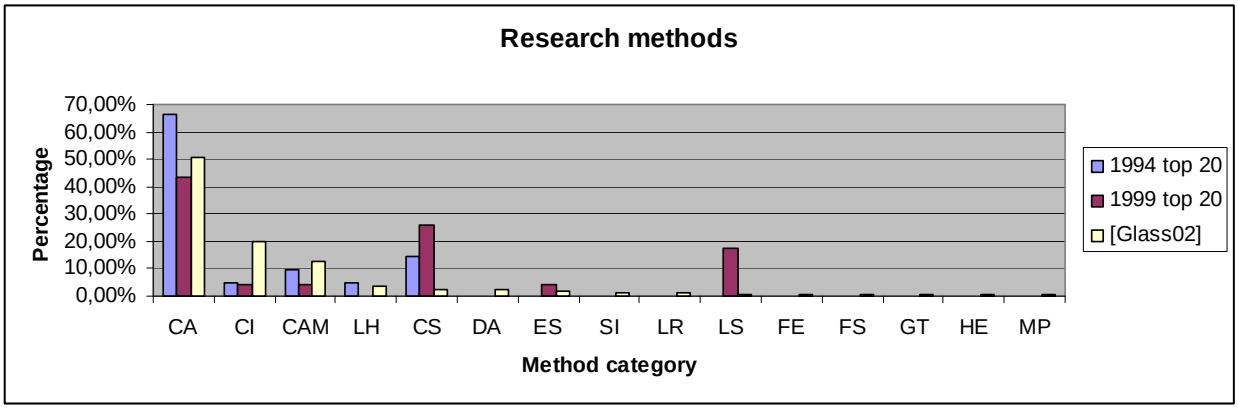

Figure 6. Distribution of research methods into different categories.

The bars from the top lists are not that different from the findings in [Glass02]. Conceptual analysis is by far the most used approach both in general and on the lists. The most interesting observation is that case studies in both 1994 and 1999 are more frequent than in the sample analyzed by [Glass02]. It may also be noted that laboratory experiment (software) is well-represented on the top list in 1999 in comparison to the general sample. In [Zelkowitz97] it is reported that the number of articles without any

validation has decreased over the years. Their study covers 1985, 1990 and 1995. Thus, it is good to see that the trend seems to continue when comparing the top lists for 1999 and 1994, or at least that researchers show their appreciation of empirical evaluation and cite articles with an evaluation. The need for a more scientific approach to software engineering, including measurement and empiricism, is also emphasized in papers on the top list in Table 3 [Fenton94] as well as based on studies of the literature as represented by [Tichy95].

6. Summary

The analysis here is intended to highlight and acknowledge the articles attracting most citations. Insights into what is viewed as important to build upon may provide valuable insights into both what research is important and where the field of software engineering is heading. The ISI Web of Science has been used to identify the most cited software engineering journal articles. The analysis has been focused on 1999, although a comparison to 1994 was presented. A top 20 list (including 23 articles) has been presented. The authors of the most cited articles in 1999 were invited to contribute to a special issue of Information and Software Technology.

It is concluded that more journals are represented on the top list of 1999 than in 1994. No major differences could be identified when it comes to changes in topics. However, it is identified that more empirical articles are on the top list in 1999 than in 1994.

The objective is to make this type of analysis on a yearly basis and invite the most cited authors to contribute to a special issue of Information and Software Technology. This means that next year's analysis will focus on the most cited software engineering journal articles in 2000. In addition, the objective is to analyze which software engineering articles are most cited in general without considering a specific year of publication. The intention is to study which articles are the most influential in general.

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Appendix A: Top 20 cited software engineering articles in 1999

The list in Table A1 shows a ranking of the most cited software engineering articles in 1999. The citations count was made 5 November 2004. The objective was to provide a top 20 ranking, but due to ties the total number of articles in the list is 23.

Table A1: Ranking of most cited articles.

Rank	Author Title of article Journal reference	Citations
1	Buhr, RJA Use case maps as architectural entities for complex systems IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 24 (12): 1131-1155, DEC 1998	25
2	Kurtz, S Reducing the space requirement of suffix trees SOFTWARE-PRACTICE & EXPERIENCE, 29 (13): 1149-1171 NOV 1999	23
3	Briand, LC; Daly, JW; Wust, JK A unified framework for coupling measurement in object-oriented systems IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (1): 91-121 JAN-FEB 1999	21
4	Holland, CP; Light, B A critical success factors model for ERP implementation IEEE SOFTWARE, 16 (3): 30-+ MAY-JUN 1999	20
5	Kellner, MI; Madachy, RJ; Raffo, DM Software process simulation modeling: Why? What? How? JOURNAL OF SYSTEMS AND SOFTWARE, 46 (2-3): 91-105 APR 15 1999	18
6	Basili, VR; Lanubile, F Building knowledge through families of experiments IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (4): 456-473, JUL-AUG 1999	16
7	Chulani, S; Boehm, B; Steece, B Bayesian analysis of empirical software engineering cost models IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (4): 573-583, JUL-AUG 1999	14
8	Myrtveit, I; Stensrud, E A controlled experiment to assess the benefits of estimating with analogy and regression models IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (4): 510-525, JUL-AUG 1999	13
8	Seaman, CB Qualitative methods in empirical studies of software engineering IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (4): 557-572, JUL-AUG 1999	13
10	Sutcliffe, AG; Maiden, NAM; Minocha, S; Manuel, D Supporting scenario-based requirements engineering IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 24 (12): 1072-1088, DEC 1998	12
10	Hoogerbrugge, J; Augusteijn, L; Trum, J; Van de Wiel, R A code compression system based on pipelined interpreters SOFTWARE-PRACTICE & EXPERIENCE, 29 (11): 1005-1023 SEP 1999	12

10	Fenton, NE; Neil, M Software metrics: successes, failures and new directions JOURNAL OF SYSTEMS AND SOFTWARE, 47 (2-3): 149-157 JUL 1 1999	12
10	Linberg, KR Software developer perceptions about software project failure: a case study JOURNAL OF SYSTEMS AND SOFTWARE, 49 (2-3): 177-192 DEC 30 1999	12
10	Kemerer, CF; Slaughter, S An empirical approach to studying software evolution IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (4): 493-509, JUL-AUG 1999	12
10	Birman, KP A review of experiences with reliable multicast SOFTWARE-PRACTICE & EXPERIENCE, 29 (9): 741-774 JUL 25 1999	12
16	Reps, T Program analysis via graph reachability INFORMATION AND SOFTWARE TECHNOLOGY, 40 (11-12): 701-726 NOV 10, 1998	10
17	van der Aalst, WMP Formalization and verification of event-driven process chains INFORMATION AND SOFTWARE TECHNOLOGY, 41 (10): 639-650 JUL 15, 1999	8
17	Demartini, C; Iosif, R; Sisto, R A deadlock detection tool for concurrent Java programs SOFTWARE-PRACTICE & EXPERIENCE, 29 (7): 577-603 JUN 1999	8
17	Haumer, P; Pohl, K; Weidenhaupt, K Requirements elicitation and validation with real world scenes IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 24 (12): 1036-1054, DEC 1998	8
17	van Lamsweerde, A; Willemet, L Inferring declarative requirements specifications from operational scenarios IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 24 (12): 1089-1114, DEC 1998	8
17	Cardelli, L; Davies, R Service combinators for Web computing IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, 25 (3): 309-316, MAY-JUN 1999	8
17	Keepence, B; Mannion, M Using patterns to model variability in product families IEEE SOFTWARE, 16 (4): 102-108 JUL-AUG 1999	8
17	Offutt, AJ; Jin, ZY; Pan, J The dynamic domain reduction procedure for test data generation SOFTWARE-PRACTICE & EXPERIENCE, 29 (2): 167-193 FEB 1999	8