| : What are the most cited DSS articles and books? |
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*Decision Support Research:*

*Most Cited Articles and Books*

by Daniel J. Power

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Research and scholarship about Decision Support Systems (DSS) for managers began about 50 years ago, cf., Scott Morton, 1967. Decision Support Systems are information systems originally intended to support managerial decision makers in semi-structured decision situations, cf., Gorry and Scott Morton, 1971. More broadly DSS are interactive computer-based systems or subsystems designed to help decision makers. Over the years, many articles, chapters, and books have been written discussing fundamental DSS concepts, theories, technology developments, and reports of empirical research including case studies and design science. One might reasonably ask what is a quick way to familiarize someone new to the decision support research field? A good approach is to encourage the person to read/skim the most cited prior literature. This prioritization approach is especially useful because most research builds upon accepted theory and influential previous articles, results, and studies. This article provides a starting point to help familiarize a person interested in learning about DSS research, especially management decision support systems, cf., McCosh and Scott Morton, 1978.

Extensive data is now available about academic article citations and references, i.e., who an author credits for ideas and information. This data can help one understand how knowledge has been disseminated and shared, but screening and assessing search results and citation counts remains challenging and difficult. After 50 years of scholarship, now seems like an appropriate time to summarize citation data for the management decision support literature. This review ranks DSS articles and books identified using search results and citation data from Google Scholar, scholar.google.com. Google Scholar is primarily a search engine for academic articles, books, and papers.

**Method**

A search of Google Scholar using the phrase "Decision Support Systems" returned about 703,000 results; for the singular "Decision Support System" about 545,000 results. A search with the phrase "Decision Systems" returned 64,600 results and without quotes returned about 1,980,000 results. A quick skim showed extensive overlap of results using various search phrases. The first 25 pages of results for the search phrase "Decision Support Systems" (the results pages most relevant to the keywords) were manually checked for usefulness. Also, the first few results pages for other relevant

search phrases were manually checked. Google Scholar searches were also conducted for well-known decision support authors to identify any missed DSS articles/books. Search was conducted in related fields using terms like "Decision Analysis", "Business Intelligence", and "Analytics" to identify any additional relevant literature.

Some of the reference and citation data was "noisy", with a search result lumping together multiple editions of a textbook or combining different but similar articles/papers into a single entry. For example, the important book by Scott Morton (1971) is very poorly indexed and cited. The ACM Digital Library has an author of Morton M. Scott with an incorrect date of publication (cf., https://dl.acm.org/citation.cfm?id=577614). Also, his last name is sometimes incorrectly hyphenated as Scott-Morton when cited which causes confusion. The citation count for Scott Morton (1971) is approximately 508. There is also the domain problem, what is considered management DSS? The textbook by Peterson and Silver (1979) has a high citation count (multiple editions cited by 2416), but the book is not generally considered management decision support. This was also true for Holtzman (1988). Articles and books in Agriculture and Medical/Clinical DSS were similarly excluded (see note 1.). Domain expertise was used to make these and similar judgments to stay focused on DSS for managers.

Also, in identifying articles there was a keyword search term problem. For example, the Gorry and Scott Morton (1971) article that introduced the concept of decision support system to the academic literature is hard to identify because the title does not use the phrase decision support system and the authors' last names and article title vary across citations. Finally, directed search is challenging for some excellent articles because of where they were published, e.g., in an academic proceedings or non-IS journal. Even if one was aware of the article/paper it may remain difficult to find a copy, examples are King (1983) and Pomerol and Adam (2004). Some articles from reference disciplines are relevant to decision support and are frequently cited, but the articles were excluded because they are not actually about the management decision support phenomenon, cf., Tversky and Kahneman (1974), Keeney and Raiffa (1976; 1993), and Kahneman (2003).

In general, the Google Scholar raw citation data determined the ranking. The following list has been reviewed for reasonableness and relevance, but not reviewed in detail for the accuracy of the citation counts. Citations help identify popular materials from the past and don't necessarily indicate continued relevance to contemporary research and scholarship. Referencing and citing are vital components of academic practice (Dunleavy, 2017). Some authors and researchers consider citations as a measure of academic productivity, or as a measure of research impact, still others consider citations as a measure of worth, influence or importance, cf., Green (2015); Patience, et al. (2017). Citations help document the evolution of ideas and support conclusions.

Compared to more general and more popular business topics and more widely studied research areas, the total citations for the most highly cited management decision support articles are low. For example, Michael Porter's popular book **Competitive Strategy** (1980) has had more than 65,000

citations, compared to 5,650 citations for multiple editions and versions of Turban's DSS textbook(s). Based upon Google Scholar citation data, the following are the 30 most cited articles, books, and chapters about Decision Support Systems (DSS) for managers on July 4, 2018. The first entry on the list, Simon (1960), is an important conceptual precursor to the DSS field. The list includes only a single empirical research study involving a DSS artifact, cf., Sharda, Barr, and McDonnell (1988). Two empirical literature reviews examine multiple research studies related to DSS, cf., Arnott and Pervan (2005) and Alavi and Joachimsthaler (1992). Overall, there are 16 journal articles, 12 books, 1 book chapter, and one web article on the DSS most cited list (see Table 1). In general, articles listed should be available as PDF documents.

**Table 1: Rank Ordered DSS Literature Most Cited List**

1. Simon, H. A., **The New Science of Management Decision**, New York: Harper and Row, 1960 PDF at URL https://babel.hathitrust.org/cgi/pt?id=uc1.b3376401;view=1up;seq=7 (Book Cited by 7537).

2. Turban, E., R. Sharda, D. Delen, J. E. Aronson, and T. P. Liang, **Decision Support and Business Intelligence Systems**, Pearson Prentice Hall, citations of multiple editions (Textbook Cited by 5650).

3. Desanctis, G., and R. B. Gallupe, "A foundation for the study of group decision support systems," Management Science, Volume 33, Issue 5, 1987 pp. 589 - 609 (Article Cited by 2659).

4. Keen, P.G.W. and M.S. Scott Morton, **Decision Support Systems: An Organizational Perspective**, Reading, MA: Addison-Wesley, 1978 (Book Cited by 2507; *Citation data is approximate*).

5. Sprague Jr, R.H. and E. D. Carlson, **Building Effective Decision Support Systems**, Prentice Hall Professional Technical, ISBN:0130862150, 1982 (Book Cited by 2378).

6. Gorry, G. A. and M.S. Scott Morton, "A Framework for Management Information Systems", Sloan Management Review, Vol. 13, No. 1, Fall 1971, 56-79 (Article Cited by 2226; Research Gate 703 citations; 1989 reprint with 229 citations).

7. Sprague, R. H., "A framework for the development of decision support systems,"
MIS Quarterly, Vol. 4, No. 4, December 1980, pp. 1-26 (Article Cited by 1455).

8. Shim, J. P., M. Warkentin, J. F. Courtney, D. J. Power, R. Sharda, and C. Carlson, "Past, present, and future of decision support technology," Decision Support Systems, Volume 33, Issue 2, June 2002, Pages 111-126 (Article Cited by 1449).

9. Alter, S., **Decision Support Systems: Current Practice and Continuing Challenges**, Reading, Mass.: Addison-Wesley, 1980 (Book Cited by 1204).

10. Marakas, G. W., **Decision Support Systems in the 21st Century**, 2003 (Text Book Cited by 1011).

11. Poole, M.S. and G. DeSanctis, "Understanding the Use of Group Decision Support Systems: The Theory of Adaptive Structuration," Chapter 8 in Organizations and Communication Technology, edited by J. Fulk and C. W. Steinfield, 1990 (Chapter Cited by 970).

12. Bonczek, R. H., C. W. Holsapple and A. B. Whinston, **Foundations of Decision Support Systems**, New York: Academic Press, 1981 (Book Cited by 960).

13. Power, D. J., **Decision Support Systems: Concepts and Resources for Managers**, New York: Quorum/Greenwood Press, 2002 (Cited by 880).

14. Power, D. J., "A brief history of decision support systems," DSSResources.COM, World Wide Web, http://DSSResources.COM/history/dsshistory.html, version 4.0, March 10, 2007 (Web article Cited by 839).

15. Courtney, J. F., "Decision making and knowledge management in inquiring organizations: toward a new decision-making paradigm for DSS," Decision Support Systems, 2001 (Article Cited by 664).

16. Arnott, D. and G. Pervan, "A critical analysis of Decision Support Systems research", Journal of Information Technology, 20, 2, June, 2005, pp. 67-87 (Article Cited by 588).

17. Sharda, R., S. H. Barr, and J. C. McDonnell, "Decision support system effectiveness: a review and an empirical test," Management Science, Volume
34, Issue 2, 1988, pages 139-159 (Article Cited by 553).

18. Sprague Jr, R.H. and H. J. Watson, **Decision Support Systems: Putting Theory into Practice**, 1986 (Book Cited by 549).

19. Brans, J.P. and B. Mareschal, "The PROMCALC & GAIA decision support system for multicriteria decision aid," Decision Support Systems, 12(4-5), November 1994, pp. 297-310 (Article Cited by 536).

20. Scott Morton, M. S., **Management Decision Systems: Computer-based support for decision making**, Boston, MA: Division of Research, Graduate School of Business Administration, Harvard University, 1971 (Book Cited by 505).

21. Alavi, M. and E. A. Joachimsthaler, "Revisiting DSS Implementation Research: A meta-analysis of the literature and suggestions for researchers," MIS Quarterly 16(1), 1992, pp. 95–116. (Article Cited by 503).

22. Keen, P.G.W., "Value Analysis: Justifying Decision Support Systems," MIS Quarterly, March 1981, Vol. 5 Issue 1, pp. 1-15. (Article Cited by 478).

23. Holsapple, C.W. and K.D. Joshi, "Organizational knowledge resources," Decision Support Systems, Volume 31, Issue 1, May 2001, pp. 39-54 (Article cited by 433).

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25. Keen, P.G.W., "Decision support systems: The next decade," Decision Support Systems, Volume 3, Issue 3, September 1987, pp. 253-265 (Article Cited by 407).

26. Little, J. D. C., "Decision support systems for marketing managers," The Journal of Marketing, Vol. 43, No. 3 (Summer, 1979), pp. 9-26 (Article Cited by 397).

27. Turban, E. and P.R. Watkins, "Integrating expert systems and decision support systems," MIS Quarterly, Vol. 10, No. 2 (Jun., 1986), pp. 121-136 (Article Cited by 390).

28. Silver, M. S., **Systems that support decision makers: description and analysis**, New York, NY: John Wiley & Sons, Inc. 1991 ISBN:0-471-91968-3 (Book Cited by 351).

29. Power, D.J. and R. Sharda, "Model-driven decision support systems: Concepts and research directions," Decision Support Systems 43 (3), 2007, pp. 1044-1061 (Article Cited by 337).

30. Watson, H. J. and P. Gray, **Decision support in the data warehouse**, Prentice Hall Professional Technical Reference, 1997 ISBN:0137960794 (Book Cited by 314).

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According to Google Scholar results, the three earliest management DSS research articles, Scott Morton and Stephens (1968), Scott Morton and McCosh (1968) and Ferguson and Jones (1969), have been infrequently cited and are hence not ranked in the top 30. Scott Morton and Stephens (1968) has been cited 18 times and Scott Morton and McCosh (1968) has been cited 30 times. Both articles are challenging to locate which likely explains the low citation rate. Finally, Ferguson and Jones (1969) published their article in a well-known journal, *Management Science*, and it has been cited more often, but only 114 times. Licklider (1960) is also an important precursor article. Licklider's article on man-computer symbiosis discusses themes similar to those of Simon (1960). Licklider (1960) has been cited at least 1850 times, but it is not on the DSS most cited list because the technical material is outdated.

Two articles related to group DSS (GDSS) and communications-driven DSS are in the list of most

frequently cited DSS scholarship, #3 Desanctis and Gallupe (1987) and #11 Poole and DeSanctis (1990), but the two earliest group support articles, Joyner and Tunstall (1970) and Turoff (1971) have had few citations. Joyner and Tunstall's (1970) article reported testing of their Conference Coordinator computer software. Turoff's (1971) article introduced the concept of Computerized Conferencing. Diverse reasons account for the low citations of these and other articles, papers and books. A case can be made for excluding GDSS articles from the DSS list based upon the branching of research in the 1980s. For this reason, even though the conceptual article by Huber (1984) is frequently cited, it does not address DSS issues.

To help insure completeness of this summary, Eom, Lee, and Kim's (1993) review was consulted. They identified the following 10 Foundation references for the field of DSS: Simon (1960), Scott Morton (1971), Gorry and Scott Morton (1971), Alter (1977), Keen and Scott Morton (1978), Blanning (1979)*, Alter (1980), Sprague (1980), Bonczek, Holsapple and Whinston (1981), Sprague and Carlson (1982). An (*) in the Eom, et. al (1993) list *indicates the reference is not in the current recommended list. See note 2.* Also, the DSS literature review articles by Arnott and Pervan (2005; 2014) provides their perspective on the "nature and state of decision support systems (DSS) research". Arnott and Pervan (2005) reported a "detailed analysis of 1,020 DSS articles published in 14 major journals from 1990 to 2003". The updated article sample contained 1,466 articles in 16 journals for the period 1990-2010. Hosack et al (2012) also provide a commentary on the "historical importance of decision support to the information systems (IS) field" and discuss future trends. Adam (2012) examined 20 years of decision making and decision support research published by the Journal of Decision Systems.

**Conclusions**

Understanding a specific corpus of research and literature is more complex today because of the increasing volume of scientific articles and materials, but it is also easier to search because of tools like Google Scholar. Citations depend upon many factors including the visibility of a journal, marketing efforts by publishers, relevance to other research, and accessibility. The Web has increased accessibility to Decision Support Systems scholarship and there are more outlets for publication. Popular textbooks are sometimes cited about the fundamentals of a field, but some might question including citations across editions. Today, there are many means to communicate scientific ideas, materials and research including websites, e-newsletters, Linkedin, Twitter and individual emails. There is some judgment involved in compiling this list of most cited article, books, etc., but overall the list reflects facts about citation counts. Harzing (2013) argues the actual citation record could "be a more objective way to measure research impact. ... citations to ones work are the collective 'verdict' of the market, where a far larger number of users decide on the impact of ones work."

The overriding purpose of this article has been to familiarize those interested in reviewing DSS research or in starting new DSS research projects. Returning occasionally to classic, highly cited

articles and books can alter or reinforce our thinking. Popularity among other researchers is often the best indicator of where to start reading the literature in a particular field. DSS authors indicate what was important to them from other sources when they cite specific sources. In effect, authors provide evidence about what influenced their analysis and thinking. Citations are indicators of influence, relevance and impact. Raw citations do not tell the whole story -- text books, scholarly books, and journal articles differ and some would remove textbooks from a "scholarly" review. The sole textbook in the list is an evolving work of scholarship with multiple revisions, editions and a changing set of authors, cf., Turban et al. Textbooks help standardize a field of study. A good textbook aggregates, structures and introduces the basic ideas that can excite future researchers. Longevity also influences citations. More recent scholarship is disadvantaged in a citation analysis, but we have an obligation to acknowledge our intellectual debt to prior scholarship when we contribute to the literature. More recent articles will be cited in the future if they influence our thinking about decision support. Methods articles are the most cited scientific articles (Pendlebury, 1988), and review articles are often cited. This data-informed review ranked the intellectual importance of prior DSS articles and books based upon the citing behavior of subsequent academic authors.

One should assume most decision support and analytics academic researchers are familiar with most, and have read many, of the articles and books listed in this summary.  I must confess that I have not read Brans and Mareschal (1994) and Little (1979). So perhaps some of us can check for gaps in our knowledge. Finding the books in the list will most likely require some effort and Inter-Library loan. I do have them in my personal library, and a PDF of Power (2002) is available for free by email for active decision support and analytics researchers. Finding most of the articles online is much easier.

In 1960, Nobel Laureate Herbert Simon wrote in **The New Science of Management Decision**, "We should allow neither our anxiety nor our fascination to capture all our attention for the developments in automation arising from our growing knowledge of the problem-solving process. At least as important are the possibilities that are opened up for improving substantially human problem-solving, thinking, and decision-making activity (p. 34)."

We are in the midst of a journey to improve our own thinking processes. Critical, informed, systems thinking can improve outcomes. Many decisions are now interdependent and complex. Using computing resources to help managers in these situations seems both reasonable and sensible.

This review article is more than a ranked list, it broadly summarizes 50 years of scholarship, and it showcases the articles and books that academic DSS authors have cited most frequently. The ranking is not the end of a journey, but rather a time to collect our thoughts and inform others of where we have been and with hope motivate new researchers to build on the cumulative decision support knowledge of the past 5O years. The intellectual foundation for future decision support research is sturdy and well-built. We can do so much more!

Note 1: *This citation review did **not** include the medical/clinical DSS or Agriculture DSS literature. For example, Bright, T.J., A. Wong, et al., "Effect of Clinical Decision-Support Systems: A Systematic Review," Annals of Internal Medicine, 157(1), 2012, pp. 29-43 DOI: 10.7326/0003-4819-157-1-201207030-00450 (Article Cited by 480). Also, Jones, J. W., Hoogenboom, G., Porter, C. H., Boote, K. J., Batchelor, W. D., Hunt, L., . . . Ritchie, J. T. (2003). The DSSAT cropping system model. European Journal of Agronomy, 18(3), 235-265 (Article Cited by 2420). The review/ranking does not include the literature of DSS/Data Warehouse practice, cf., Inmon, (1992) and Inmon and Hackathorn (1994). Inmon asserted the "data warehouse forms the foundation of all other forms of DSS processing."*

Note 2: *The exclusion of Blanning (1979) is based upon current citation data. He has published a number of interesting articles on model management, but none of his published work has been frequently cited.*

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Daniel J. Power's Google Scholar profile is at
scholar.google.com/citations?user=-6btWBgAAAAJ&hl=en.

**Cited DSS Article Abstracts**

3. Desanctis, G., and R. B. Gallupe, "A foundation for the study of group decision support systems"
Abstract

"Technical developments in electronic communication, computing, and decision support, coupled with new interest on the part of organizations to improve meeting effectiveness, are spurring research in the area of group decision support systems (GDSS). A GDSS combines communication, computing, and decision support technologies to facilitate formulation and solution of unstructured problems by a group of people. This paper presents a conceptual overview of GDSS based on an information-exchange perspective of decision making, Three levels of systems are described, representing varying degrees of intervention into the decision process. Research on GDSS is conceived as evolving over time from the study of simple "shell" systems, consisting of menus of features available for selection by a group, to consideration of sophisticated rule-based systems that enable a group to pursue highly structured and novel decision paths. A multi-dimensional taxonomy of systems is proposed as an organizing framework for research in the area. Three environmental contingencies are identified as critical to GDSS design: group size, member proximity, and the task confronting the group. Potential impacts of GDSS on group processes and outcomes are discussed, and important constructs in need of study are identified."

6. Gorry, G. A. and M.S. Scott Morton, "A Framework for Management Information Systems"
Summary

"Despite the importance and cost of information systems to many organizations, there is very little

perspective on the field and the issues within it. A framework is needed to provide a more efficient allocation of resources in this area." ... "The framework is a way of looking at managerial activities. It is a way of looking at decisions made in an organization. Information systems should exist only to support decisions ..."

7. Sprague, R. H., "A framework for the development of decision support systems" Abstract

"This article proposes a framework to explore the nature, scope, and content of the evolving topic of Decision Support Systems (DSS). The first part of the framework considers (a) three levels of technology which have been designated DSS, (b) the developmental approach that is evolving for the creation of a DSS, and (c) the roles of several key types of people in the building and use of a DSS. The second part develops a descriptive model to assess the performance objectives and the capabilities of a DSS as viewed by three of the major participants in their continued development and use. The final section outlines several issues in the future growth and development of a DSS as a potentially valuable type of information system in organizations."

8. Shim, J. P., M. Warkentin, J. F. Courtney, D. J. Power, R. Sharda, and C. Carlson, "Past, present, and future of decision support technology" Abstract

"Since the early 1970s, decision support systems (DSS) technology and applications have evolved significantly. Many technological and organizational developments have exerted an impact on this evolution. DSS once utilized more limited database, modeling, and user interface functionality, but technological innovations have enabled far more powerful DSS functionality. DSS once supported individual decision-makers, but later DSS technologies were applied to workgroups or teams, especially virtual teams. The advent of the Web has enabled inter-organizational decision support systems, and has given rise to numerous new applications of existing technology as well as many new decision support technologies themselves. It seems likely that mobile tools, mobile e-services, and wireless Internet protocols will mark the next major set of developments in DSS. This paper discusses the evolution of DSS technologies and issues related to DSS definition, application, and impact. It then presents four powerful decision support tools, including data warehouses, OLAP, data mining, and Web-based DSS. Issues in the field of collaborative support systems and virtual teams are presented. This paper also describes the state of the art of optimization-based decision support and active decision support for the next millennium. Finally, some implications for the future of the field are discussed."

14. Power, D. J., "A brief history of decision support systems" Summary

"Information Systems researchers and technologists have built and investigated computerized Decision Support Systems (DSS) for approximately 40 years. This article chronicles and explores the developments related to building and deploying DSS. The journey begins with building model-driven DSS in the late 1960s, theory developments in the 1970s, and implementation of financial planning systems, spreadsheet-based DSS and Group DSS in the early and mid 1980s.

Data warehouses, Executive Information Systems, OLAP and Business Intelligence evolved in the late 1980s and early 1990s. Finally, the chronicle ends with knowledge-driven DSS and the implementation of Web-based DSS beginning in the mid-1990s. The field of computerized decision support is expanding to use new technologies and to create new applications."

15. Courtney, J. F., "Decision making and knowledge management in inquiring organizations: toward a new decision-making paradigm for DSS" Abstract

"Organizational decisions of the future may include social, environmental, and economic concerns, and be much more "wicked" [Policy Sciences, 4 (1973) 155], complex and interconnected than those of the past. Organizations and their decision support systems must embrace procedures that can deal with this complexity and go beyond the technical orientation of previous DSS. Singerian inquiring organizations [Australian Journal of Information Systems, 6 (1) (1998) 3; http://www.cba.uh.edu/~parks/fis/fis.htm (1998); Proceedings of 3rd Americas Conference on Information Systems, Indianapolis, August 1997, p. 293; Proceedings of the 1999 Meeting of the America's Conference on Information Systems, Milwaukee, August 1999; Special Issue of Information Systems Frontiers on Philosophical Reasoning in Information Systems Research (in press)], based on Churchman's [The Design of Inquiring Systems: Basic Concepts of Systems and Organization, Basic Books, New York, NY, 1971] inquiring systems and Mitroff and Linstone's [The Unbounded Mind: Breaking the Chains of Traditional Business Thinking, Oxford Univ. Press, New York, 1993] unbounded systems thinking (UST), are designed to deal with wicked decision situations. This paper discusses DSS and knowledge management in Singerian organizations and calls for a new decision-making paradigm for DSS."

16. Arnott, D. and G. Pervan, "A critical analysis of Decision Support Systems research" Abstract

"This paper critically analyses the nature and state of decision support systems (DSS) research. To provide context for the analysis, a history of DSS is presented which focuses on the evolution of a number of sub-groupings of research and practice: personal DSS, group support systems, negotiation support systems, intelligent DSS, knowledge management-based DSS, executive information systems/business intelligence, and data warehousing. To understand the state of DSS research an empirical investigation of published DSS research is presented. This investigation is based on the detailed analysis of 1,020 DSS articles published in 14 major journals from 1990 to 2003. The analysis found that DSS publication has been falling steadily since its peak in 1994 and the current publication rate is at early 1990s levels. Other findings include that personal DSS and group support systems dominate research activity and data warehousing is the least published type of DSS. The journal DSS is the major publishing outlet; US 'Other' journals dominate DSS publishing and there is very low exposure of DSS in European journals. Around two-thirds of DSS research is empirical, a much higher proportion than general IS research. DSS empirical research is overwhelming positivist, and is more dominated by positivism than IS research in general. Design science is a major DSS research category. The decision support focus of the sample shows a well-balanced mix of development, technology, process, and outcome studies. Almost half of DSS papers did not use judgement and decision-making reference research in the design and analysis of their projects and most cited reference works are relatively old. A major omission in DSS scholarship is the poor identification of the clients and users of the various DSS applications that are the focus of

investigation. The analysis of the professional or practical contribution of DSS research shows a field that is facing a crisis of relevance. Using the history and empirical study as a foundation, a number of strategies for improving DSS research are suggested."

17. Sharda, R., S. H. Barr, and J. C. McDonnell, "Decision support system effectiveness: a review and an empirical test" Abstract

"Despite the increasing popularity of decision support systems (DSS), effectiveness of such systems remains unproven. Past research claiming usefulness of the DSS has relied largely on anecdotal or case data. The relatively few laboratory experiments report mixed results regarding the effects of a decision aid. This study reviews the results of prior investigations and examines the effectiveness of DSS-aided decision makers relative to decision makers without a DSS over an eight-week period. An executive decision making game was used in two sections of a business strategy course. Three-person teams in one section used a DSS while the teams in the other section played the game without such an aid.

Various measures of decision quality were recorded. Overall, the groups with access to the DSS made significantly more effective decisions in the business simulation game than their non-DSS counterparts. The DSS groups took more time to make their decisions than the non-DSS groups at the beginning of the experiment. However, the decision times converged after the third week.

The DSS teams reported investigating more alternatives and exhibited a higher confidence level in their decisions than the non-DSS groups, but these differences were not statistically significant."

19. Brans, J.P. and B. Mareschal, "The PROMCALC & GAIA decision support system for multicriteria decision aid" Abstract

"PROMCALC & GAIA is the last development of the interactive decision support system based on the PROMETHEE and GAIA methodology. In the first section, the fundamental characteristics of multicriteria problems are recalled and requisites are formulated for an appropriate multicriteria decision aid methodology. Based on these requisites, the PROMETHEE methods are then introduced, including newer developments such as PROMETHEE V (multicriteria optimization under constraints) and the GAIA visual modelling method. The actual implementation of the proposed methodology in the PROMCALC & GAIA software is then detailed and a numerical example is developed to illustrate the possibilities of the system."

21. Alavi, M. and E. A. Joachimsthaler, "Revisiting DSS Implementation Research: A meta-analysis of the literature and suggestions for researchers" Abstract

"Information systems are becoming increasingly critical to the daily operations and success of many firms. This, combined with the rising investments in design and development of these systems, make implementation a high priority research topic. Although information systems implementation has been a topic of interest to researchers over the past two decades, the extent to which the

existing body of research reflects substantial and cumulative development is not entirely clear.

The objective of this study is to conduct a rigorous and quantitative review of the empirical DSS implementation literature as a basis for providing guidelines for implementation management and conduct of future research. Meta-analysis of 144 findings from 33 studies indicates that user-situational variables (involvement, training and experience) are more important than psychological factors to DSS implementation success and that user-situational variables can improve the implementation success by as much as 30 percent. Furthermore, the meta-analytic findings regarding the methodological characteristics of studies provide useful insights for the design of future research studies of implementation. The findings also allow us to put into perspective the incremental contribution of additional substantive and empirical studies in this area. Additionally, several specific domains (e.g., construct validation research on user involvement and causal modeling) might profit most form future research efforts."

22. Keen, P.G.W., "Value Analysis: Justifying Decision Support Systems" Abstract
"Managers face a dilemma in assessing DSS proposals. The issue of qualitative benefits is central, but they must find some way of deciding if the cost is justified. A general weakness of the cost-benefit approach is that it requires knowledge, accuracy, and confidence about issues which for innovations are unknown, ill-defined, and uncertain. The benefit of a DSS is the incentive for going ahead. The complex calculations of cost-benefit analysis are replaced in value analysis by rather simple questions about its usefulness."

23. Holsapple, C.W. and K.D. Joshi, "Organizational knowledge resources" Abstract

"Decision-making episodes are knowledge intensive processes, operating on and adding to organizational knowledge resources. Decision support systems (DSS) perform some of the knowledge management (KM) that is integral to these episodes. Interest in the field of KM, among both practitioners and researchers has mushroomed in the late 1990s. Initiatives that aim to deliberately, explicitly manage organizations' knowledge resources have become commonplace. A basic prerequisite for fully understanding how an organization can, could, or should conduct KM is an appreciation of the kinds of knowledge resources it has. In this paper, a framework of knowledge resources is introduced, focusing on identifying and organizing basic classes of knowledge resources, and supplemented by the identification of attribute dimensions for characterizing knowledge across these classes. Developed via a Delphi methodology involving an international panel of practitioners and researchers, this framework is assessed as being relatively successful in terms of completeness, accuracy, clarity, and conciseness criteria. The result is a basis for investigating effects of alternative knowledge resource portfolios, and for studying how an organization does, could, or should conduct its KM — including its decision-making episodes."

24. Alter, S., "A taxonomy of decision support systems" Abstract

"Computer systems for decision making and decision implementation vary widely in terms of what they do and how they do it. The decision support system is not a homogeneous category. Through a

series of case examples, the author develops a taxonomy of seven distinct types of decision support systems. The end result is a guideline for designing and implementing systems, and a framework for further communication and research."

25. Keen, P.G.W., "Decision support systems: The next decade" Introduction

"The field of Decision Support is now well over ten years old. The first decade saw immense changes in the nature and costs of information technology. It also saw the diffusion of the use of computer-based tools across the entire office landscape. In 1976, Decision Support represented a radical concept of the use of information systems and analytical tools. Now, it is part of the mainstream. This paper reviews where we stand in terms of both research and practice in the DSS field and highlights the agenda for the next decade."

26. Little, J. D. C., "Decision support systems for marketing managers" Abstract
 "In the past 10 years, a new technology has emerged for assisting and improving marketing decision making. We define a marketing decision support system as a coordinated collection of data, models, analytic tools, and computing power by which an organization gathers information from the environment and turns it into a basis for action. Where such systems have taken root, they have grown and become increasingly productive for their organizations."

27. Turban, E. and P.R. Watkins, "Integrating expert systems and decision support systems" Abstract

"Expert systems are emerging as a powerful tool for decision making. Integrating expert systems with decision support systems may enhance the quality and efficiency of both computerized systems. This article examines possible connections between the two technologies and discusses some issues related to their integration."

29. Power, D.J. and R. Sharda, "Model-driven decision support systems: Concepts and research directions" Abstract

"In some decision situations, quantitative models embedded in a Decision Support System (DSS) can help managers make better decisions. Model-driven DSS use algebraic, decision analytic, financial, simulation, and optimization models to provide decision support. This category of DSS is continuing to evolve, but research can resolve a variety of behavioral and technical issues that impact system performance, acceptance and adoption. This article includes a brief survey of prior research. It focuses on model-driven DSS built using decision analysis, optimization, and simulation technologies; implementation using spreadsheet and web technologies; issues associated with the user interface; and behavioral and technical research questions."
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## : What are the most cited DSS articles and books?

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