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ABSTRACT

This paper reports and analyzes the nature, content, and trends exhibited by DSS papers presented at the four major annual or biennial IS/DSS conferences during 1980-1985. (Three of the conferences held their first meeting during this period.) It then compares the findings from this analysis with those obtained with a different database, namely all DSS articles published in 22 professional journals during this same period. Inferences are drawn concerning (1) the perceived roles and benefits of conferences versus those of journals and (2) the apparent state and direction of the DSS field.

INTRODUCTION

In any young and developing field it is important, if not crucial, to pause occasionally and reflect upon what has been done in the past and what should be done in the future. Are we just discussing the same issues over and over without new insights; or are new, fresh ideas actually being developed and investigated? Do conferences offer new content about theory and practice (or, as cynics suggest, do they offer only the opportunity to attain and retain one's position in a social/professional network)?

The purpose of the research reported here is twofold: (1) to develop a comprehensive 'state of the field' report on the DSS field that will a) spot trends that have developed in DSS research, b) promote informed discussion and debate, and c) help researchers direct their efforts in the wisest manner possible; and (2) to analyze and compare the issues appearing at conferences with issues appearing in journals. Our overall hypothesis is that the content of issues appearing at conferences is different from those appearing in journals (perhaps because editorial and program committees follow different policies regarding new and/or controversial issues.)

Beyond this our thoughts are more speculative, e.g., a higher ratio of conceptual pieces will appear at conferences than in journals.

RESEARCH METHODOLOGY

The research methodology used for this study is identical to that used by the authors in a previous review of DSS articles appearing in major IS journals for the period 1975-1985 (Elam, Huber, Hurt, 1986). For completeness, a brief description of the methodology is repeated here.

Database

The universe of papers from which the database was drawn consisted of all papers presented at the four major annual or biennial IS/DSS conferences for the period 1980-1985. Each conference met two conditions: 1) it was a major IS conference, and 2) the majority of papers presented went through a referee process. Table 1 contains a complete listing of those meetings included.

Table 1. Conference Meetings Included in Database.

Conferences	1980	1981	1982	1983	1984	1985
Decision Support Systems* (DSS-8x)	X	X	X	X	X	X
Hawaiian International Conference on System Sciences (HICSS)	X	X	X	X	X	X
International Conference on Information Systems* (ICIS)	X	X	X	X	X	X
International Federation for Information Processing Working Group 8.3* (IFIP 8.3)	**		X		X	

* Conference started in 1980.

** The first meeting of IFIP 8.3 (1980) was not included in the data base as all papers were invited.

One of the authors reviewed the universe of papers and selected those that appeared to meet at least one of the following conditions:

- It discussed the development, implementation, operation, use or impact of DSSs or DSS components. It discussed research on any of the above topics.

- It discussed material drawn from a DSS-supporting discipline and the author(s) of the paper explicitly related the paper to the development, implementation, operation, use or impact of DSSs or DSS components.

The definition of DSS used in applying these conditions was:

A DSS is a computer-based system that is 1) interactive, 2) intended for hands-on use by decision makers and/or their staffs, 3) clearly focused on supporting decision making in an organizational environment, and 4) designed such that its logic and outputs can be understood and intellectually validated by the decision makers.

The abstract and first page of every paper selected was copied in preparation for later examination.

Classification Process

In a series of meetings, each author independently read the abstract and first page of each paper and evaluated the appropriateness of each paper for inclusion in the database and, if deemed appropriate, each independently classified the paper according to the taxonomy discussed next. Each paper was then discussed by the group and consensus decisions were made concerning its appropriateness and taxonomic classification. Usually this was done in batches of approximately 20 papers at a time in order to avoid fatigue. In those cases where it was felt that there was not enough information available for classification, the complete paper was obtained. Only one author classified the applications and descriptions by **functional area**, as this categorization was straightforward. As a result of the review process, 246 papers were classified and included in the final database.

THE TAXONOMY

The taxonomy has 3 sets of categories, each described in detail in Appendix A. This

taxonomy, developed and used in the previously mentioned study, is based on those developed by Ives, Hamilton, and Davis (1980) and Vogel and Wetherbe (1984). The first set, referred to as **paper type**, was used to distinguish among the various types of papers. This set split into two broad categories: (1) those papers oriented towards practice which included applications, descriptions, tutorials, conceptual pieces, and other; and (2) those papers oriented towards research, which included conceptual pieces, case studies, surveys, user observation, and other. The second set, referred to as **information systems topic**, was used to further classify the major topic of the paper into the subcategories of individual use, organization use, hardware and software development, design features, design process, role and function of the DSS, and other. The third set, **functional area**, further classified those papers identified as applications and descriptions as either manufacturing and operations, marketing, finance, policy setting, medical, project management, information systems management, design, and development, and DSS generator/generic DSS.

RESULTS AND DISCUSSION

Conference Database

Reliability Checks. A measure from 0 to 3 was assigned to each paper as an indicator of agreement among the authors concerning **paper type** and **IS topic**. Measures of 1-3 correspond to the number of authors with the same categorization as the group consensus.[1] A measure of 0 represented the case where the group discussion of a paper resulted in a categorization that did not match any author's independent categorization. Table 2 shows the percentage of papers for each measurement level.

Overall, the initial agreement among the raters was fairly high, with initial unanimity or near unanimity occurring in most instances. Lack of initial agreement can be attributed to several factors. First, only the abstract and first page was reviewed. This presented a problem when

there was not sufficient description of the contents of the paper, and in some instances, the abstract presented a description different from that included in the text of the paper. As a result, interpretations differed. Second, some papers addressed several topics in the IS Topic set, and it was unclear which one represented the major thrust of the paper. Third, conceptualization of a system, description of a system, and the application of a system represent a continuum of development. It was sometimes difficult to place a paper in just one of these categories, although this was required by the established review procedures.

Table 2. Percent of Total Papers by Category.

Category	0	1	2	3
Paper Type	1.5%	18.2%	32.3%	48.0%
	(27.0%)	(28.0%)	(70.0%)	
IS Topic	—	14.8%	48.1%	37.0%
	(3.0%)	(51.0%)	(46.0%)	

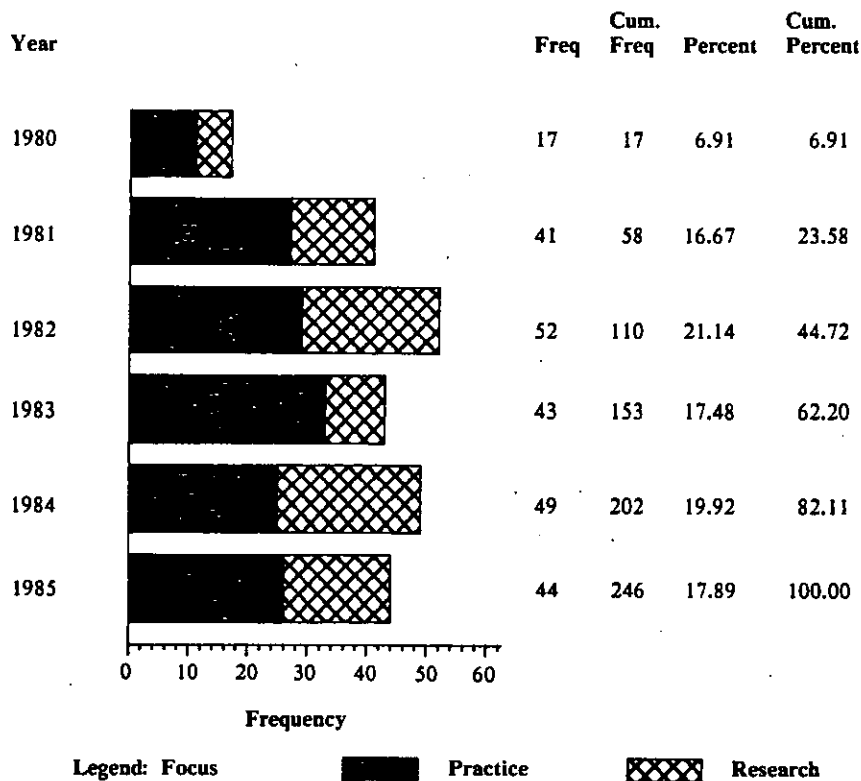* Reliabilities of articles classified by two authors are shown in parentheses.

Types of Papers. The number of papers by paper type and year for all conferences excluding the two biennial IFIP conferences is shown in Table 3. The number of papers by paper type and year for the IFIP conferences is shown in parentheses.

The overall percentage of practice-oriented papers (61%) exceeded the percentage of research-oriented papers (39%). However, in 1984, the number of research-oriented papers outnumbered the practice-oriented papers; in 1982 the practice-oriented papers outnumbered research-oriented papers only by six papers. This was a result of the IFIP 8.3 meetings in those years which tended to be research oriented.

Figure 1 shows the number of papers split along this practice/research dichotomy for all the conferences, while Figures 2-5 show the number of papers split along this dichotomy for each conference. The primary audience for the DSS-8x conferences is the practitioner - either IS manager, DSS analyst, DSS end-user, etc. The types of papers presented at this conference strongly support this orientation.
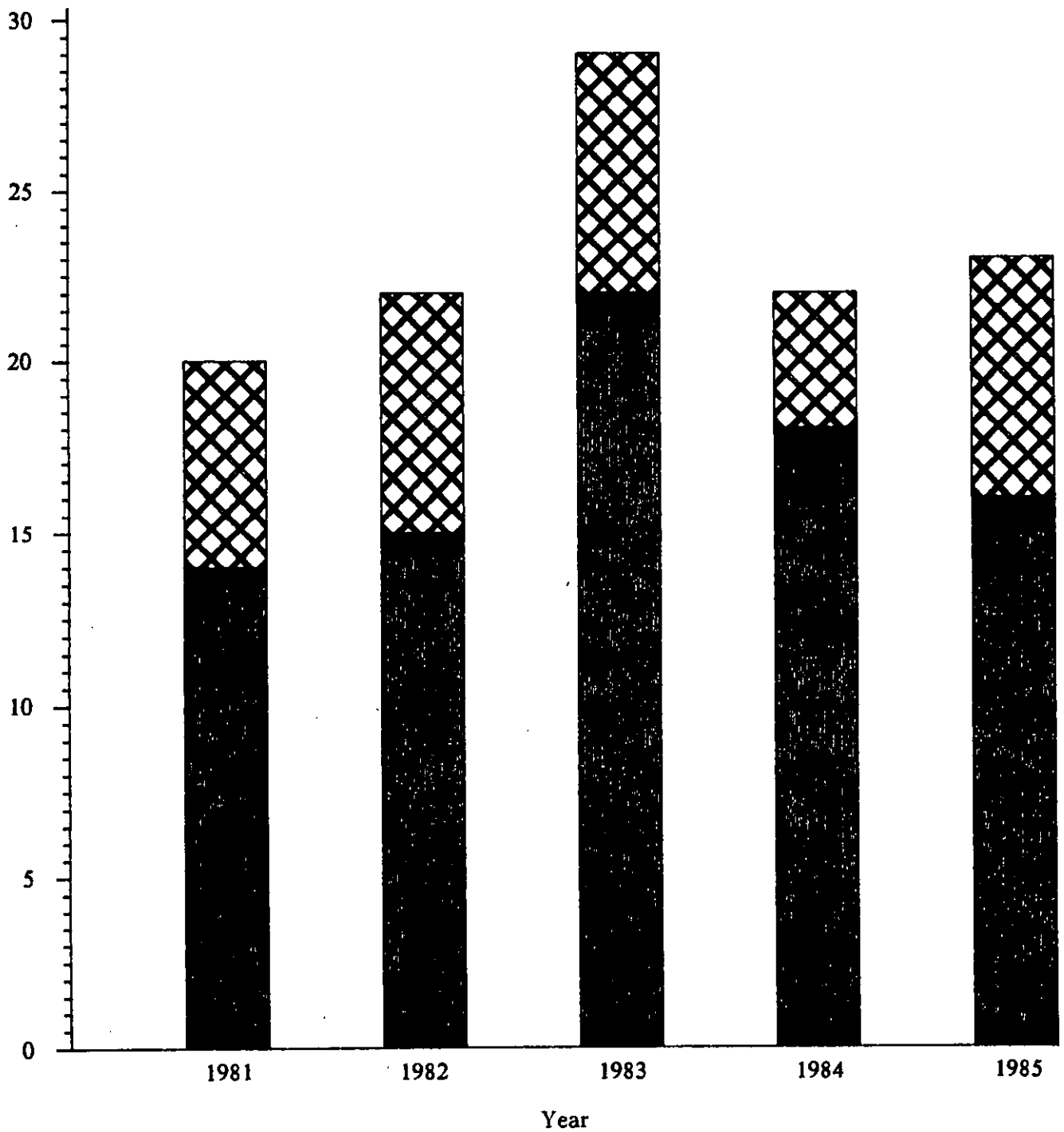
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[1]A subset of papers (30 out of 246 covering the 1980, 1981, and 1983 meetings of the HICSS conference were revieerd by only 2 authors. These papers were assigned a measure from 0-2.

Table 3. Number of DSS Papers by Paper Type and Year.

Type	1980	1981	1982		1983	1984		1985	Total	
Oriented Toward Research										
Conceptual	2	7	5	(4)	2	6	(9)	11	33	(13)
Case Study	2	1	1	(2)	1	2	(1)	–	7	(3)
Survey	1	2	2		4	5		2	16	
User Observ.	1	2	4	(1)	2	1		3	13	(1)
Review	–	1	–		–	–		1	2	
Other	–	1	3	(1)	1	–		1	6	(1)
Oriented Toward Practice										
Conceptual	7	13	13	(2)	15	9		13	70	(2)
Application	2	4	2	(1)	7	6		3	24	(1)
Description	1	6	4	(4)	3	4		6	24	(4)
Tutorial	1	2	–	(1)	1	–		2	5	(1)
Other	–	2	2		7	6		2	20	
Total	17	41	36	(16)	43	39	(10)	44	220	(26)

Year		Freq	Cum. Freq	Percent	Cum. Percent
1980		17	17	6.91	6.91
1981		41	58	16.67	23.58
1982		52	110	21.14	44.72
1983		43	153	17.48	62.20
1984		49	202	19.92	82.11
1985		44	246	17.89	100.00

Frequency

Legend: Focus ■ Practice ⬚ Research

Figure 1. Number of Articles by Practice/Research Orientation

30

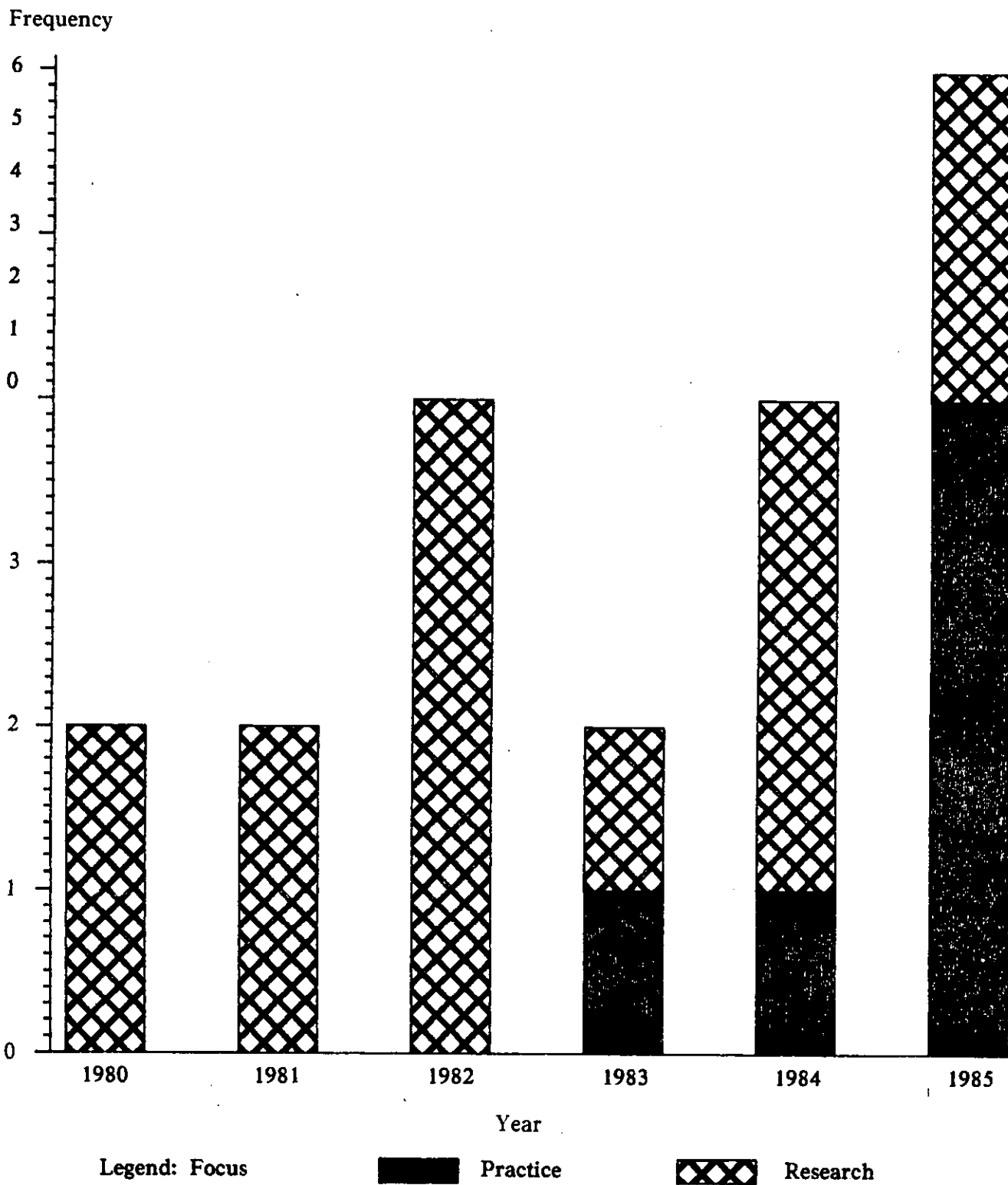**Figure 2.** For the DSS-8X Conference

Frequency

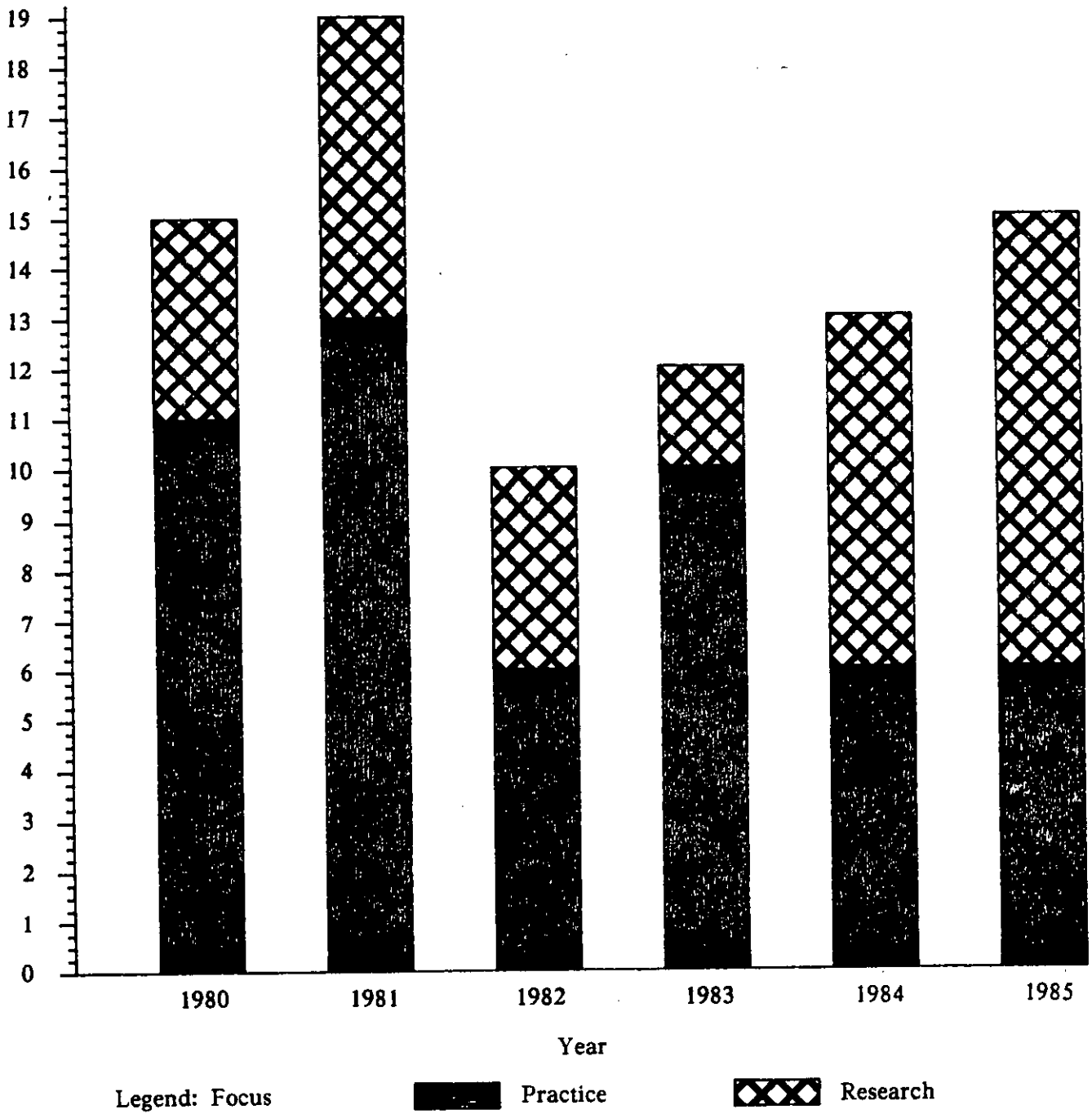Figure 3. For the ICIS Conference

Frequency

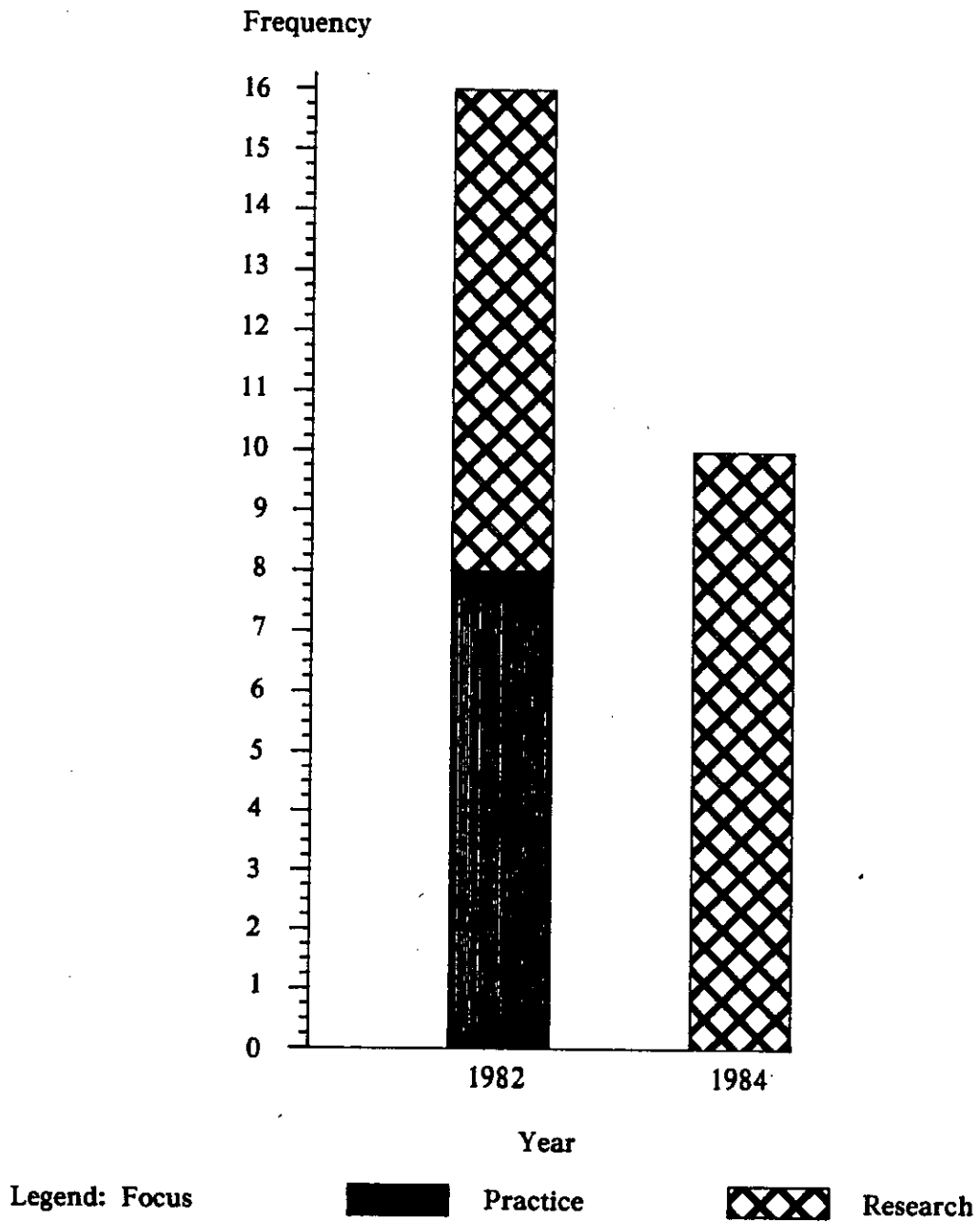**Figure 4.** For the HICSS Conference

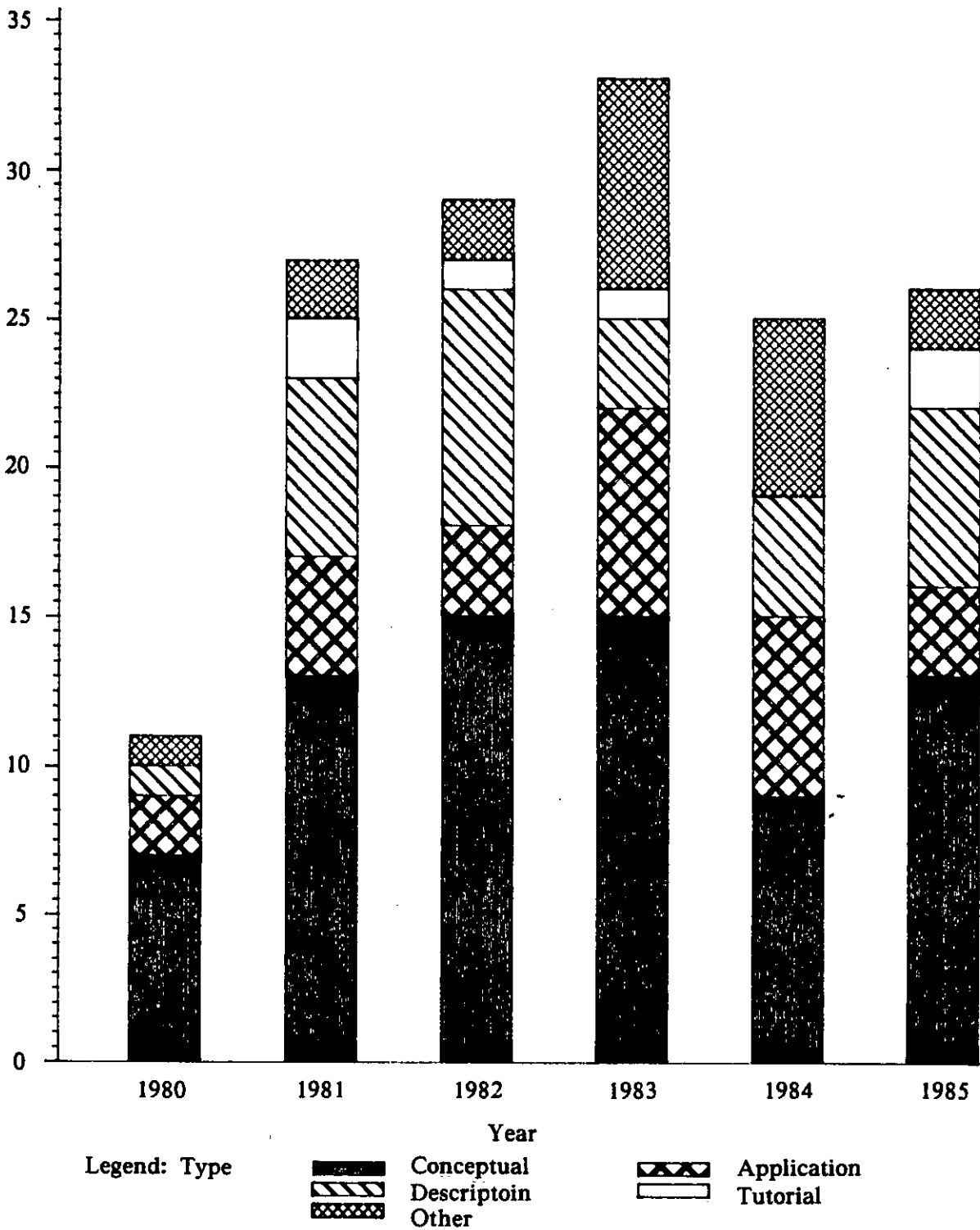**Figure 5.** For the IFIP 8.3 Conference

Frequency

Figure 6. Number of Practice-Oriented Articles Each Year
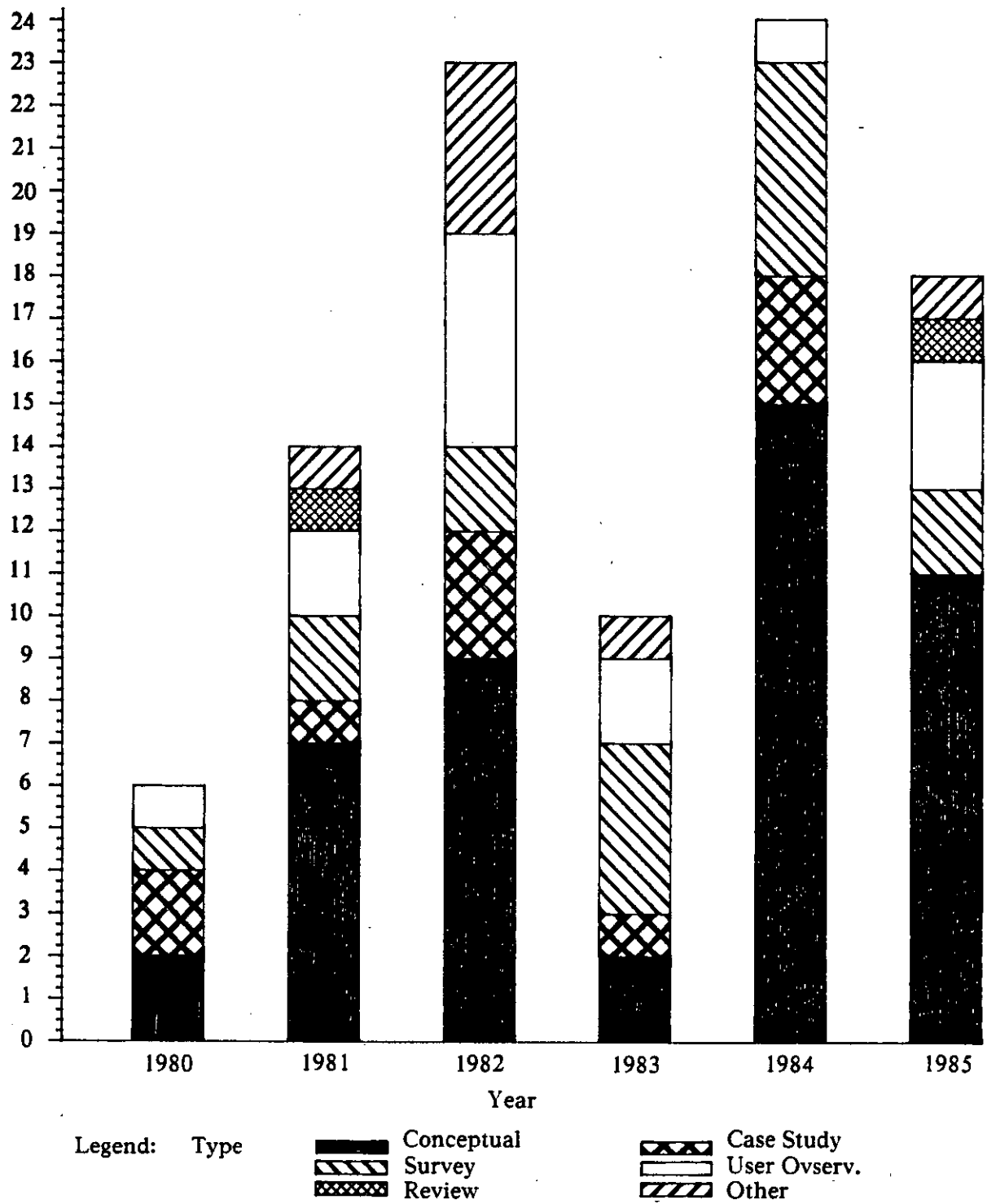
Frequency

Figure 7. Number of Research-Oriented Articles Each Year
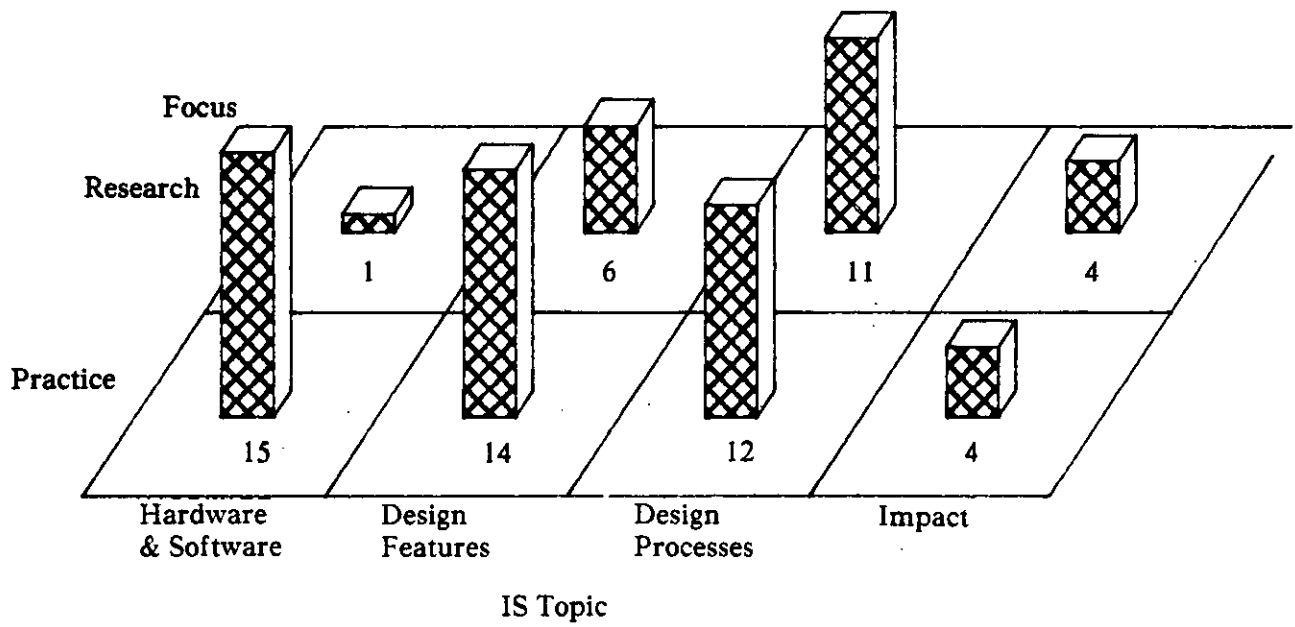
Frequency Block Chart

Figure 8. Number of Articles by Practice/Research Focus and IS Topic.
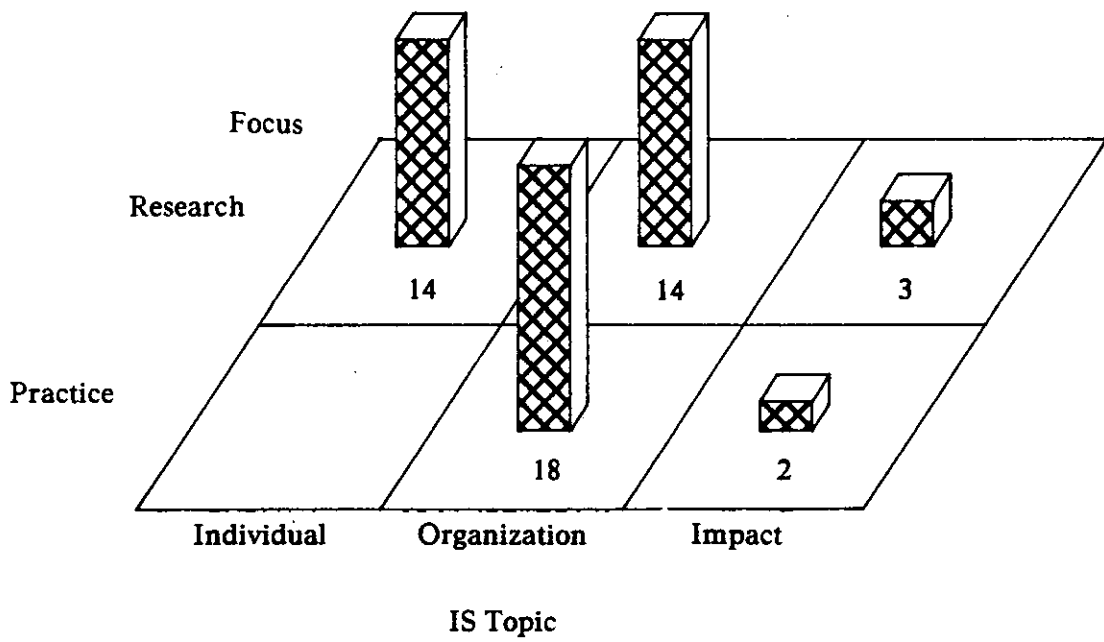
Frequency Block Chart

Figure 8. cont... Number of Articles by Practice/Research Focus and IS Topic.

The primary audience for ICIS is the academic community, and the papers presented at ICIS from 1980-1984 showed a strong research focus. The focus shifted in 1985. It will be interesting to see if this is an anomaly or the start of a change in the nature of this conference. The articles appearing in the IFIP 8.3 conferences are representative of the themes - DSS processes and tools (1982) and knowledge representation (1984). The mix of articles found in the HICSS proceedings seems to fall between the mix found in DSS-8x and the ICIS proceedings.

Figure 6 shows a more detailed breakdown of papers classified as being oriented towards practice for all the conferences. Conceptual papers, applications and descriptions are dominant themes, with conceptual papers making up 48% of these type papers, followed by descriptions (19%) and applications (17%). The remaining 16% are in tutorials and other.

A similar breakdown of research-oriented papers by type is given in Figure 7. As with the practice-orientation, conceptual papers are the dominant category. Compared to all other types of research, they represent 48% of the papers, followed by surveys - 17%, user observation - 15%, and case studies - 11%.

IS Topic. The number of papers represented by practice/research orientation and IS topic is shown in Figure 8. (The practice orientation is represented exclusively by conceptual papers, i.e., applications, descriptions, etc. are not included.)

Practice-oriented papers were mainly concerned with organizational use (18 papers), design features (18 papers), hardware and software development (20) and design processes (12 papers). Research-oriented papers were more diverse; they focused on hardware and software development (23 papers), design features (19 papers), organizational use (14 papers), individual use (14 papers), and design processes (11 papers). The practice orientation had no papers dealing with individual use, and impact and evaluation was barely touched by either orientation.

Overall, hardware and software development and design features have been the most heavily covered IS topic. Hardware and software developments have recently emerged as a major IS topic since M. Scott Morton in his 1983 review of the DSS field found little evidence of research in this topic. We expect the emphasis on hardware and software development and design features to continue because new applications for DSSs continue to arise, and the development of new hardware and software tools makes new features possible. Organizational use of DSSs has also received considerable attention in the conference proceedings. Because our definition incorporates many sub-topics, we expect the amount of effort in this category will and should remain high. It is interesting to note that technical-oriented topics far outnumber the more qualitative topics such as organizational use, individual use, and impact and evaluation.

Articles addressing design processes have taken up roughly 10% of the conference literature. The relatively small number of papers on this topic could be due to the limited number of ways DSSs can actually be designed or could signal the acceptance of the DSS field of standard design approach. Papers written on this topic in the future will probably be mainly concerned with improvements to existing methodologies.

Looking at the fact that all the work on individual use shows up in research-oriented papers, it appears that this topic is of interest to many researchers. The lack of practice-oriented papers on this topic could be because, by its nature, the topic individual use implies a rigorous research approach. The results of research on individual use will show up in practice-oriented papers on design features, organizational use or hardware and software development.

A seemingly overlooked issue is the impact and evaluation of DSSs. The obvious defense of this has been that DSSs haven't been around long enough. We think this reason is no longer valid, and we strongly recommend that more work in this area should be undertaken in the future.

Functional Area. The number of DSS applications and descriptions by functional area and year are shown in Table 4.

Although a large number of applications and descriptions appear in the financial area, this functional area represents only 30% of the total examined. This differs from the Scott Morton finding that the "vast preponderance of model use is in the financial area," (Scott Morton, 1983).

Table 4. Number of DSS Applications and Descriptions by Functional Area.

Area	Number
Manufacturing and Operations	10
Marketing	4
Finance	16
Policy Setting	1
Medical	2
Information Systems	5
Project Management	2
DSS Generator/ Generic DSS	14
Total	54

Conferences vs. Journals

Data Comparisons. The DSS articles appearing in IS journals for 1975-1985 were reviewed in Elam, Huber, and Hurt (1983). A list of the journals included in this review are included in Appendix B. For the purposes of this paper, only those articles appearing in 1980-1985 were used for comparison.

Seventy-three percent of the journal articles fell in the practice-oriented category (118 out of 161), and 26% fell in the research-oriented category (42 out of 161). This compares with 61% (151 out of 246) practice-oriented conference papers and 39% (95 out of 246) research-oriented conference papers. We find these figures interesting because we expected to find more research-oriented articles in both journals and conference proceedings. One might expect to see a predominance of research-oriented articles in journals because journals are traditionally oriented towards researchers and academics. With respect to conference proceedings, one might expect more research-oriented papers since less rigorous research standards are applied for acceptance (compared to journals). The purpose of conferences, after all, is to provide a forum for new ideas, new research, etc.

In the journal articles reviewed, approximately 43% (69 out of 161) were conceptual pieces, with only 13% of those actually oriented towards research; this compares with 48% (118

out of 246) of the conference papers. More significant, 39% of those conceptual pieces were oriented toward research which supports our previous statement regarding the purpose of conferences. (It would be interesting to check the papers that did not get accepted into conferences - perhaps their ideas were too new or too controversial.) These and other differences are summed up in Table 5.

Although conceptual pieces, applications and descriptions are dominant themes in both conference proceedings and journal articles, there are some differences. It is interesting to note that the percentage of applications and descriptions is less at conferences than in journals. Journals also seem to have a different emphasis in terms of IS topics covered. In journals, design processes, design features, and hardware and software development rank first, second and third. In conferences, hardware and software development ranked first, followed by design features and organizational use.

Although more articles appear in journals concerning impact and evaluation (12), this topic was the least studied in either database. Scott Morton observed this same lack of research in 1983 and commented, "If this lack is real, and not simply an error of our literature search, it is a sad commentary to make on the state of the field... [the review] indicates that those in the field make declarative statements and build interesting new tools which are never tested by practical use, comparative evaluation, or user opinion," (Scott Morton, 1983). We found only 3 studies on this topic in the two to three years since his review, thus it appears that the absence of work on impact and evaluation of DSS has not changed significantly.

CONCLUSIONS AND IMPLICATIONS

Before undertaking the study reported here, we hypothesized that the IS topics covered by DSS papers in conference proceedings would differ significantly from the IS topics covered by DSS

Table 5. A Comparison of Conference Proceedings
and Journal Articles.

	Conference Papers	Journal Articles
Total	246	161
Practice-Oriented	151 (61%)	118 (73%)
Research-Oriented	95 (39%)	43 (27%)
Conceptual Pieces	118 (48%)	69 (43%)
Applications & Descriptions	48 (20%)	48 (30%)
IS Topics Covered*	167	103
Hardware & Software Development	43 (26%)	16 (16%)
Design Features	37 (22%)	20 (19%)
Organizational Use	32 (19%)	15 (15%)
Design Processes	23 (14%)	23 (22%)
Individual Use	14 (8%)	10 (10%)
Impact & Evaluation	5 (3%)	12 (12%)

* Only the research-oriented papers and conceptual practice-oriented papers covered specific IS Topics; therefore applications, descriptions, and other are not included.

articles appearing in academic journals. While this hypothesis seems to be supported by our data, we found that the variability across years was so great relative to the differences in topics between conferences and journals that we could not conclude it to be correct, overall, with any reassurable degree of confidence. Whether our hypothesis is appropriate, or whether it is appropriate as the field matures, seems like an issue worth debating.

Based on our review of these 246 conference papers and 161 journal articles, and especially our finding that approximately two-thirds of the articles were practice-oriented papers, we conclude that in order for the DSS field to survive and mature as a respected academic discipline, more research-oriented work needs to be reported, especially in the topic of impact and evaluation. If this conclusion, or some variant is correct, it has implications for researchers, editorial boards, and program committees dealing with DSS material.

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Vogel, D. and Wetherbe, J. "MIS Research: A Profile of Leading Journals and Universities," *Database,* Fall 1984.

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APPENDIX A. CATEGORY DESCRIPTIONS

PAPER TYPE

Application: An application article describes a DSS whose actual use in an organizational setting is reported.

Description: A description article describes either a proposed DSS or a prototype that has not actually been used in an organization. Articles describing DSS tools, either proposed or implemented, are included in this category.

Tutorial: A tutorial article instructs about a particular subject. The author of a tutorial is generally an acknowledged expert in the subject.

Conceptual Oriented Toward Practice: Conceptual articles oriented toward practice contain the author's views on, for example, DSS design or implementation tasks. These articles are based primarily on opinion, speculation, and personal experiences rather than systematic planned observation or theory.

Conceptual Oriented Toward Research: Conceptual articles oriented toward research contain the author's views on how the cumulative body of knowledge about DSS could be systematically advanced. Frameworks, procedures, and algorithms based on systematic planned observation or theory representative of this category.

Case Study: A case study is an examination of a particular instance in an institutional setting. The case study attempts to answer specific questions or hypotheses without an explicit experimental design or controls.

Survey: A survey article reports the results of a study involving the systematic collection of data from a group of individuals or organizations. A survey usually employs an experimental design but no controls to answer a limited number of specific questions or hypotheses. Independent variables are not manipulated. Analyses is primarily statistical although clinical analyses can be used.

User Observation: An user observation article reports the results of individual behaviors either in a laboratory or in the field. User observation is based on an experimental design with a high degree of control. The independent variable(s) in the experiment are explicitly manipulated.

Review: A review article is a survey article on a given subject that contains organizing frameworks and provides analyses and insights into the subject being reviewed.

Other: Articles such as those drawing on actual experiences in discussing some specific DSS issue or ones that discuss the teaching of DSS or report on the development of research tools and methodologies would fit in this category.

INFORMATION SYSTEM TOPIC

Individual Use: Articles which examine how a user interacts with a DSS, and how individual differences such as cognitive style and level of knowledge effect usage and performance would be representative of this topic.

Organizational Use: This topic covers the following types of concerns: the relationship between the developers of traditional information systems and DSS; organizational strategies for facilitating the use of an existing DSS; evaluation of organizational benefits; redefinition of organizational roles and responsibilities to support DSS.

Hardware and Software: Research and development oriented toward the development of hardware, such as joysticks or mice, or software components such as modeling languages, color graphics packages, or window managers for use in a DSS are topics that are representative of this category.

Design Features: This topic is concerned with the outcome of a DSS design process. Issues involving such things as graphical display formats, data management functions, or DSS architectures would be representative of this topic.

Design Process: This topic encompasses issues involved in the development of a DSS--problem structuring, design, implementation, project management. A description of the stages in a particular DSS design process or a comparison of different DSS design processes would be representative of this category.

Impact and evaluation of the DSS: Articles that examine the actual impact of a DSS on organizational decision making or the impact of DSS on performance in a controlled experiment would be matched with this topic.

Other: Articles addressing major DSS issues or discussing with equal coverage several topic areas are included in other.

FUNCTIONAL AREA

Manufacturing and Operations: Manufacturing and operations functions include the following - scheduling, production planning, inventory forecasting, routing.

Marketing: Developing competitive marketing strategies or performing market research studies are functions supported by applications in this functional area.

Finance: Financial functions involve activities such as capital investments, program planning and budgeting, pricing strategies.

Policy Setting: Policy setting tasks include such things as labor negotiations, human resource management, and energy policy analysis.

Medical: Applications which directly support patient care through such functions as diagnosis or treatment scheduling are representative of this functional area.

Information Systems Management, Design, and Development: Typical tasks in this area include such things as database design and interface design. All descriptions of system development tools would fall in this category. Also included are tasks associated with the management of information systems such as chargeback schemes.

Project Management: Applications or descriptions dealing with the planning, scheduling, and control of projects.

DSS Generator/Generic DSS: Applications or descriptions involving software for creating specific DSSs or that dealt with supporting general functions such as creativity, utility assessments, etc.

Appendix B. Journals Included in Study

Journal Name	Volumes	Time Period
Academy of Management Journal (AMJ)	Vol. 18–28 quarterly issues	March, 1975–October, 1985
Academy of Management Review (AMR)	Vol. 1–10 quarterly issues	march, 1976–October, 1985
Accounting Review (AR)	Vol. L–LX quarterly issues	March, 1976–October, 1985
Administrative Science Quarterly (ASQ)	Vol. 20–30 quarterly issues	March, 1975–December, 1985
Communications of the ACM (CACM)	Vol. 18–28 monthly issues	January, 1975–December, 1985
Computer (CP)	Vol. 8–18 monthly issues	January, 1975–December, 1985
DATABASE (DB)	Vol. 6(3)–17(1) quarterly issues	Winter, 1975–Fall, 1985
Decision Sciences (DS)	Vol. 6–16 quarterly issues	Winter, 1975–Fall, 1985
Decision Support Systems (DSS)	Vol. 1 quarterly issues	1985
Harvard Business Review (HBR)	bimonthly issues	Jan/Feb, 1976–Nov/Dec, 1985
Interfaces (IF)	Vol. 5(2)–15(6) 1975–1983 monthly 1984–1985 bimonthly	January, 1976–December, 1985
Information and Management (IM)	Vol. 2–9	1979–1985 except 1978
Journal of Accounting Research (JAR)	Vol. 13–23 semi-annually	Spring, 1976–Autumn, 1985 except 1981, Autumn, 1985
Journal of Management Information Systems (JMIS)	Vol. 1–2 quarterly	Summer, 1984–Fall, 1985
MIS Quarterly (MISQ)	Vol. 1–9 quarterly	March, 1977–December, 1985
Management Sciences (MS)	Vol. 21(5)–31(12) monthly	January, 1975–December, 1985
Office: Technology, and People (OFT)	Vol. 2	1984
Omega (OM)	Vol. 3–13 bimonthly	Jan/Feb, 1975–Nov/Dec, 1985

Journal Name	Volumes	Time Period
Operations Research (OR)	Vol. 23–33 bimonthly	Jan/Feb, 1975– Nov/Dec, 1985
IEEE Transactions of Systems, Man and Cybernetics (SMC)	Vol. SMC-5–SMC-15 1975–1981 monthly 1982–1985 bimonthly	January, 1975– Nov/Dec, 1985
Sloan Management Review (SMR)	Vol. 19(2)–28(1) quarterly	Winter, 1975– Fall, 1985
Systems, Objectives, and Solutions (SOS)	Vol. 3–4	1983–1984