

Trends in the study of Group Support Systems

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Abstract

This research project was principally motivated by a concern for the direction and relevance of DSS and GSS research. The main areas of research focus are the decision and judgement theoretic base of the discipline, the research strategies used in published articles, and the professional relevance of the research. The project has analysed 298 GSS articles published in 14 major journals from 1990 to 2003. The findings indicate that GSS research is more dominated by positivist research than general information systems; is most often published in the Journal of Group Decision and Negotiation; is poorly grounded in contemporary judgement and decision-making research; and falls down in the identification of the nature of clients and users. Of great concern is the finding that GSS research has relatively low professional relevance. An overview of the direction of further analysis is presented.

1 Introduction

This paper critically analyses the nature and state of research in a key area of decision support systems (DSS) research, namely group support systems (GSS). The paper presents trends in GSS research individually and in comparison with DSS research in general. This investigation is based on the detailed analysis of 1,020 DSS articles published in 14 major journals from 1990 to 2003 from which 298 GSS articles have been identified and analysed. This sample forms the basis of a larger study of seven DSS types, namely personal decision support systems, group support systems, negotiation support systems, intelligent decision support systems, knowledge management-based DSS, executive information systems/business intelligence, and data warehousing [4].

The analysis focuses on a number of factors, including (a) general research factors such as epistemology, stage of theory, and article type (including conceptual focus, empirical vs. non-empirical, type of data collection method), (b) decision support system factors such as type of DSS, organizational level supported, decision support focus, and practical relevance, and (c) other factors such as system clients and users, and decision-making approach. The type of acknowledged funding support provided for GSS research is also analysed.

This project was principally motivated by a concern for the direction and relevance of DSS and GSS research. We suspected that research in decision support was increasingly being distanced from professional practice. We also felt that the research was addressing an overly narrow range of concepts and issues and in particular we were concerned about the decision

theoretic foundation of the area. Further, it seemed that unlike the general trend in information systems research, GSS was strongly dominated by a positivist, quantitative research orthodoxy. To explore these concerns we initiated the project described here. Arnott and Pervan [4] provided results for the overall DSS project based on the analysis of 1020 papers. This paper presents the first major report of the GSS part of the project. It presents descriptive results based on the analysis of 298 papers.

The paper is structured as follows: first, the background and rationale of the project are presented, followed by a brief history of GSS research. The research methodology and design is then defined. The following sections discuss the results in terms of general research approaches, GSS specific factors, and judgement and decision-making. Finally, some concluding comments are made and the future directions of the project are described.

2 Background and Rationale

A number of information systems researchers are concerned that there is a widening gap between research and practice, particularly in the systems development area [24]. Benbasat and Zmud [8] identified five reasons why information systems research lacks relevance. The first is an emphasis of rigor over relevance in order to gain the respect of other academic disciplines; the second is the lack of a cumulative tradition that yields strong theoretical models that act as a foundation for practical prescription; the third is the dynamism of information technology, which means that practice inevitably leads theory; the fourth is a lack of exposure of IS academics to professional practice; and the fifth is the institutional and political structure of universities which limits the scope of action of IS academics. DSS research, as part of IS research, is likely to be subject to all five forces.

3 A Brief History of GSS Research

A GSS “consists of a set of software, hardware, and language components and procedures that support a group of people engaged in a decision-related meeting” [30]. This definition can be expanded to include communication and information processing [32]. GSS are typically implemented as electronic meeting systems (EMS) [19] or group decision systems (GDS) [42]. The place of GSS in DSS evolution is demonstrated in Figure 1 below which shows that these systems evolved from personal decision support systems by using networked microcomputers and theories of group behaviour and processes and behavioural decision theory [4].

Group environments that require the support of GSS can be classified by the time duration of the meetings (either synchronous or asynchronous) or the space occupied by the group (either face to face or dispersed) [20]. In the early 1980s, GSS research initially focused on “decision rooms” (synchronous and face to face) such as those facilities established at the University of Arizona [31], University of Minnesota [20], and Southern Methodist University [26]. Software to support group work in these decision rooms included Mindsight, Facilitator (now MeetingWorks), Plexsys (now GroupSystems), SAMM and TeamFocus [48]. Over time GSS technologies and research have expanded to include all four categories of the time/space classification through software such as Lotus Notes/Domino [45] and now includes such sub-fields as GDS, EMS, CSCW (Computer-Supported Cooperative Work), and CMCS (Computer-Mediated Communication Systems) and are focused on supporting decision makers in a variety of tasks [21].

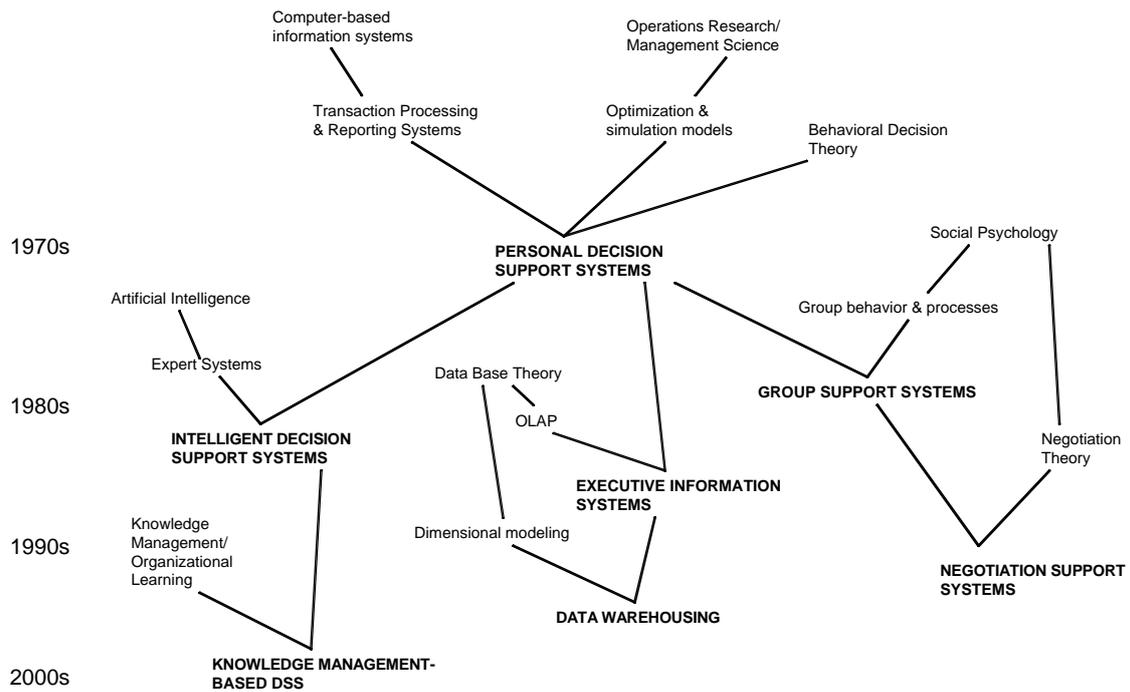


Figure 1: The Evolution of the Decision Support Systems Field (from [4])

A number of frameworks have guided GSS research. Figure 2 below shows that the group decision-making environment consists of a combination of characteristics of the group (including group history, member proximity, group size, national culture, leadership behaviour, and group cohesiveness), the task (including type of task, level of decision making, phases of decision making, degree of task structure, difficulty, and time synchronisation), the group and organizational context (including corporate culture and behaviour norms, maturity of the organisation, organisational size, time frame of decision making, management style, recognition and reward systems), and the system (EMS, GDS, CSCW). These influence the group process which finally leads to a group outcome (including measures of efficiency, decision quality, group consensus, and satisfaction) [39].

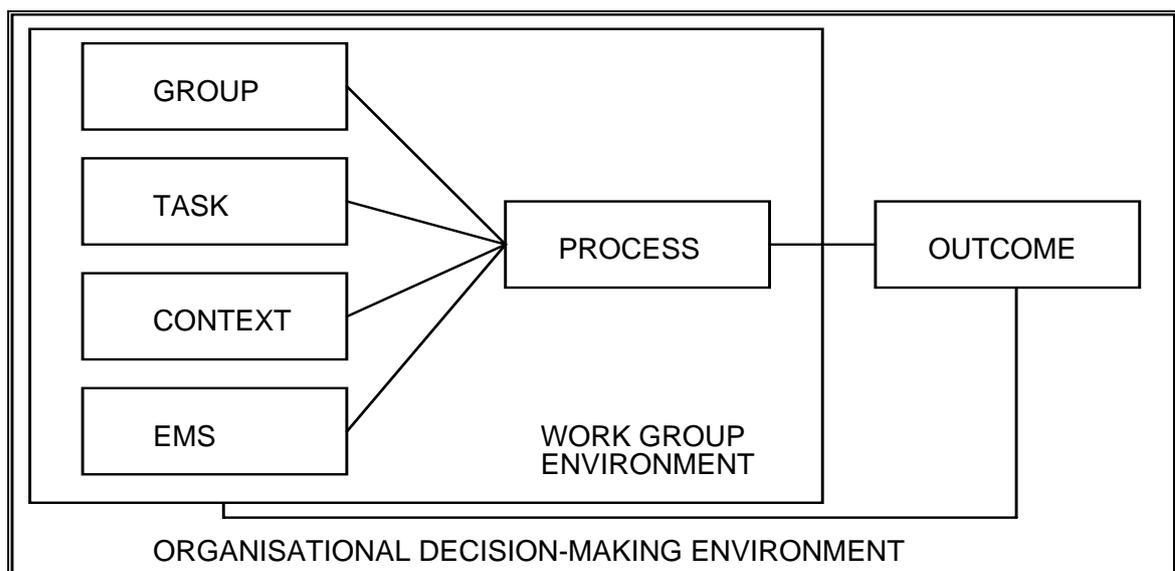


Figure 2. Framework for GSS Research [39]

Based on frameworks such as these, GSS researchers have conducted many experiments and a number of field studies which have looked at anonymity, group size, parallelism, process structuring, group development and many of the other characteristics of the GSS environment, as well as investigating theories of decision making, group process theories, communication theory, institutional theory, and coordination theories [18, 36].

4 Methodology and Design

The general research questions that guide this project are:

1. What strategies and methods are used in GSS research?
2. What is the decision support focus and professional relevance of GSS research?
3. What are the theoretic foundations of DSS research?

To answer these questions this project involves the analysis of relevant published research. This style of research has appeared under a number of descriptions in the information systems literature including 'review and assessment of research' [46], 'literature review and analysis' [3], 'survey' [35], and 'literature analysis,' [41].

4.1 Time Frame

The time period of published research chosen for this project is 1990 to 2003. While GSS began to evolve in the late 1970s and early 1980s, it was not until the end of the 1980s that the field could be regarded as relatively stable and mature. Further, the period 1990 to 2003 also marks an interesting period in the development of the information systems discipline as it seemingly witnessed a significant growth in the use of non-positivist research methods. In industry, the analysis period saw the deployment of several new generations of collaboration technologies such Lotus Notes/Domino. To reflect these generations the sample has been divided into three time periods: 1990 to 1994, 1995 to 1999, and 2000 to 2003.

4.2 The Article Sample

The sample of articles analysed is GSS research published between 1990 and 2003 in 14 journals: *Accounting, Management & Information Technologies/Information & Organization* (I&O); *Decision Sciences* (DS); *Decision Support Systems* (DSS); *European Journal of Information Systems* (EJIS); *Information & Management* (I&M); *Information Systems Journal* (ISJ); *Information Systems Research* (ISR); *Journal of Information Technology* (JIT); *Journal of Management Information Systems* (JMIS); *Journal of Organisational Computing & Electronic Commerce* (JOC&EC); *Journal of Strategic Information Systems* (JSIS); *Group Decision & Negotiation* (GD&N); *Management Science* (MS); and *MIS Quarterly* (MISQ).

Previous meta-analyses of information systems research have used a similar sampling approach [1, 7, 41]. Alavi and Carlson [1] used eight North American journals for their sample. However, Webster and Watson [51] have criticised the over emphasis on North American journals in review papers. In response we included three top-tier European information systems journals (*ISJ*, *EJIS*, *JIT*) and another (*JSIS*) which has a strong European connection. An alternative approach is to focus on a small number of influential papers [2] or to aim for a comprehensive sample of all published research in the area including journal papers, book chapters, and quality conference papers [51]. We adopted a large set of journals as a basis of the sample because we believe that this best represents the invisible college of GSS research. The articles were selected electronically by examining key words and titles. The first and second authors performed a manual check of the table of contents of each issue of each journal. In addition, the text of each potential article for analysis was examined to verify its group support content.

Table 1: Sample by Journal

Journal	1990 -	1994	1995 -	1999	2000 -	2003	Total	
	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Sample
I&O	2	1.9	1	0.8	2	3.1	5	1.7
DS	3	2.8	1	0.8	0	0.0	4	1.3
DSS	20	18.5	21	16.7	14	21.9	55	18.5
EJIS	1	0.9	3	2.4	2	3.1	6	2.0
I&M	10	9.3	12	9.5	8	12.5	30	10.1
ISJ	1	0.9	1	0.8	2	1.8	4	1.3
ISR	4	3.7	4	3.2	2	3.1	10	3.4
JIT	1	0.9	3	2.4	0	0.0	4	1.3
JMIS	16	14.8	21	16.7	8	12.5	45	15.1
JOC&EC	31	28.7	17	13.5	3	4.7	51	17.1
JSIS	0	0.0	0	0.0	0	0.0	0	0.0
GD&N	7	6.5	36	28.6	21	32.8	64	21.5
MS	5	4.6	2	1.6	0	0.0	7	2.3
MISQ	7	6.5	4	3.2	2	3.1	13	4.4
Total	108	100.0	126	100.0	64	100.0	298	100.0

The distribution of articles is shown in Table 1. The Journal of Group Decision and Negotiation (*GD&N*) leads the sample with 21.5% of articles overall and demonstrates a strong increasing trend (in the 2000-2003 period *GD&N*'s share was 32.8%). Other leading GSS journals are *DSS* with 18.5%, *JMIS* with 15.1% and *JOC&EC* with 17.1%. The discipline share of *JOC&EC* has fallen over time. The latter is probably due to that particular journal's initially strong, but now declining, interest in collaboration technology. The European journals have a surprisingly low GSS publication rate, perhaps indicating that GSS research is mostly a North American phenomenon.

4.3 Procedure

The protocol used to code each paper appears in the Appendix. Some papers, termed 'example articles', were selected as being representative of the various article types. To calibrate the coding process the example articles were coded independently by two researchers. In a meeting with a third researcher the two coders explained every code for every paper. A small number of changes to the initial assessments were made. The fourth researcher reviewed all responses. The articles were then coded by four researchers working independently. In coding each paper the emphasis was on the dominant attribute of each factor for each paper. Any uncertainty in coding was referred to one researcher for adjudication. The coding of citations of judgement and decision-making research was also reviewed by that researcher. The coded protocols were entered into an SPSS database for analysis by a second researcher. This researcher also performed consistency checks on the coding.

5 General Research Factors

In addressing the first research question (what strategies and methods are used in GSS research?) the general research factors considered were research paradigm, research stage, and article type. These factors are not independent but each is a useful lens for analysis in itself. The period of analysis 1990 to 2003 saw a significant move in general information systems research towards interpretivism [40, 50] and to a lesser extent, critical theory [29]. A major consequence of this paradigmatic trend was the rise of the case study as a major research strategy in information systems [49]. The movement to a more complex and sophisticated disciplinary structure also occurred in social science in general [27].

Table 2: Sample Empirical Papers by Research Paradigm

Paradigm	1990 -	1994	1995 -	1999	2000 -	2003	Total	
	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Sample
Positivist	68	94.4	80	86.0	43	82.7	191	88.0
Interpretivist	4	5.6	13	14.0	9	17.3	26	12.0
Mixed	0	0.0	0	0.0	0	0.0	0	0.0
Total	72	100.0	93	100.0	52	100.0	217	100.0

Table 2 shows the empirical papers in the sample coded for paradigm. GSS research is overwhelmingly dominated by the positivist paradigm with 88% of empirical studies following that approach. Chen and Hirschheim's [10] study of IS research from 1991 to 2001 reported that 81% of papers had a positivist orientation with 19% using an interpretivist approach. This means that GSS research is more dominated by positivism than general IS research. Examination of the temporal trends in Table 2 shows that interpretivism in GSS research is gradually expanding from its low base. Table 2 reveals that none of the GSS research adopted a mixed paradigm, in contrast to Mingers' [37] view that "research results will be richer and more reliable if different research methods, preferably from different (existing) paradigms are routinely combined together".

Galliers [23] proposed a framework (based on [22]) for understanding research and its interaction with theory by conceptualising the research process as a cycle of theory building, theory testing, and theory refinement. Table 3 shows the sample by the dominant stage in the research cycle. It shows that GSS research is dominated by theory building with 58.7% of papers, though it is decreasing. There is a significant proportion of theory testing papers (34.6%). However, given the supposed maturity of the GSS field, it could be expected that theory refinement would now have a much greater focus. In the sample, theory testing has significantly expanded, albeit from a low base.

Table 3: Sample by Dominant Research Stage

Research Stage	1990 -	1994	1995 -	1999	2000 -	2003	Total	
	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Sample
Theory Building	74	68.5	66	52.4	35	54.7	175	58.7
Theory Testing	27	25.0	51	40.5	25	34.6	103	34.6
Theory Refinement	3	2.8	5	4.0	3	4.7	11	3.7
Unclear	4	3.7	4	3.2	1	1.6	9	3.0
Total	108	100.0	126	100.0	64	100.0	298	100.0

Table 4. Sample by Article Type

Article Type		Number	Percentage	Example Article	
Non-Empirical	Conceptual Orientation	DSS Frameworks	13	4.4	Chidambaram & Bostrom (1997a) [11]
		Conceptual Models	6	2.0	Gavish et al. (2000) [25]
		Conceptual Overview	17	5.7	Chidambaram & Bostrom (1997b) [12]
		Theory	2	0.7	Zigurs & Buckland (1998) [32]
	Illustrative	Opinion & Example	7	2.3	Busch et al. (1991) [9]
		Opinion & Personal Experience	2	0.7	Lewis, Keleman & Garcia (1996) [34]
		Tools, Techniques, Methods, Model Applications	19	6.4	Balthazard et al. (1998) [5]
Applied Concepts	Conceptual Frameworks & Their Application	15	5.0	Lewis & Shakun (1996) [33]	
Empirical	Objects	Description of Type or Class of Product, Technology, Systems etc.	9	3.0	Press (1992) [45]
		Description of Specific Application, System etc.	30	10.1	Bardram (2000) [6]
	Events/Processes	Lab Experiment	92	30.9	Vician & DeSanctis (2000) [47]
		Field Experiment	10	3.4	Niederman & Bryson (1998) [38]
		Field Study	13	4.4	Dean et al. (2000) [17]
		Positivist Case Study	20	6.7	Corbitt et al. (2000) [13]
		Interpretivist Case Study	13	4.4	Pollard (2003) [43]
		Action Research	7	2.3	de Vreede & Dickson (2000) [16]
		Survey	7	2.3	Dasgupta et al. (2002) [14]
		Development of DSS Instrument	2	0.7	Davison (1999) [15]
		Secondary Data	14	4.9	Pervan (1998) [41]
		Simulation	0	0.0	No example article

There are a number of different approaches to classifying the type of research in addition to paradigm and stage of research. The approach used in this project is that used by Pervan [41] in his analysis of the leaders of published group support systems research. Pervan's taxonomy was amended from Alavi and Carlson [1]. The article type taxonomy and the distribution of papers are shown in Table 4. Also provided in the table is an example of each article type.

Table 4 shows that around one-quarter (27%) of GSS research is non-empirical, with the great majority (73%) empirical. Chen & Hirschheim's [10] analysis of overall IS research reported a significantly different split between non-empirical (40%) and empirical (60%). GSS research has significantly more empirical research than general IS.

Laboratory experimental research clearly dominates with almost 31% of published papers. There may be a number of reasons for this high usage of laboratory experimentation for GSS research. First, GSS research may be amenable to this style of research in that it offers various dependent variables to study (relating to process and/or outcome) which may be affected by a large range of variables associated with the group, the task, the process (including facilitation), or the technology. Studying one or two of these while controlling the others provides an enormous number of possible study combinations. Second, most of this research has been conducted in US universities where laboratory experimentation is well accepted as a research approach and is emphasized in their Ph.D. research programs. The two leading GSS institutions, Arizona and Minnesota, are typical examples. Third, as noted earlier, GSS publications mostly appear in North American journals which may follow editorial policies that would favour research of this type.

The next major approach is descriptions of specific applications or systems (sometimes referred to as 'design science' research [28]) reflecting an interest in the technology. Finally, there is a moderate number of positivist and Interpretivist case studies (6.7% and 4.4%, respectively), and a small, but identifiable, amount of action research

6 GSS Factors

In answering the second research question (what is the support focus and professional relevance of GSS research?) the GSS factors addressed were organisational level of support, support focus, and practical relevance.

Another way of classifying a GSS is by the unit of analysis of the research. The unit of analysis specifies the focus of the research project and is usually guided by the reference theories and previous domain research used by the researchers. As expected, GSS research was almost exclusively focused on groups (96.6%) with small numbers on divisions and whole organisations. Further there has been little change over time. This is perhaps surprising given the growth of collaboration technologies (that provide much wider support) such as Lotus Notes/Domino over the period of analysis.

Table 6 shows that the decision support focus of the papers was reasonably spread across system development, information technology, the impact of the systems on the organization, and the decision-making process. Over time researcher focus on development and technology has declined and research with a focus on decision outcome and organizational impact has substantially increased. Intuitively, this mirrors the increasing organizational and social focus of IS research in general, but also shows the maturity of GSS research from focus on the technology to focus on processes and outcomes.

Table 6: Sample by Decision Support Focus

Decision Support Focus	1990 - 1994		1995 - 1999		2000 - 2003		Total	
	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Sample
Systems Development	12	11.1	6	4.8	2	3.1	20	6.7
Information Technology	28	25.9	18	14.3	5	7.8	51	17.1
Decision Outcome/Org Impact	12	11.1	32	25.4	23	35.9	67	22.5
Decision-making Process	24	22.2	35	27.8	21	32.8	80	26.8
Many	30	27.8	34	27.0	13	20.3	77	25.8
Unclear	2	1.9	1	0.8	0	0.0	3	1.0
Total	108	100.0	126	100.0	64	100.0	298	100.0

The final GSS factor that was analysed was the practical relevance of the research in each article. Any professionally focused academic area (like GSS) needs a reasonable balance between theory development and application since research and practice inform each other [24]. The assessment of practical relevance is a subjective judgement that was informed by the aims and objectives of the paper, the nature of the discussion, and in particular the content of the concluding comments of each paper. The researchers spent considerable time in discussing and reviewing their coding of this factor to assist in calibrating the independent coding processes.

Table 7 shows that overall, only 7% of research is regarded as having high or very high practical relevance. On the other hand, 57% of research was regarded as having no or low practical relevance. Even though the high and very high practical relevance statistics show improvement over the time periods, the figures are so low as to constitute a potential crisis in the GSS discipline. While the project was initiated with a concern for the relevance of GSS research we were surprised by the strength of this adverse finding. We believe that all of the

factors identified by Benbasat and Zmud [8] are in play in GSS research. The relative lack of exposure of academics to contemporary professional practice is a particular problem for GSS.

Table 7: Sample by Practical Relevance

Practical Relevance	1990 - 1994		1995 - 1999		2000 - 2003		Total	
	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Sample
Very High	0	0.0	0	0.0	1	1.6	1	0.3
High	6	5.6	4	3.2	7	10.9	17	5.7
Medium	40	37.0	48	38.1	22	34.4	110	36.9
Low	52	48.1	58	46.0	26	40.6	136	45.6
None	10	9.3	16	12.7	8	12.5	34	11.4
Total	108	100.0	126	100.0	64	100.0	298	100.0

7 Decision Making

The third focusing research question was: What are the theoretic foundations of DSS research? This project identified the primary clients and users in DSS research by evaluating what organisational role was played, or was assumed to be played, by the primary client and user in each paper. Table 8 shows the results of the application of this classification to the sample. While a small proportion of the identified users are executives and managers (4.3%), the largest group of users are in the categories “professional” and “Many”, perhaps reflecting the use of EMS by middle-level workers. Of note are the very high figures in the unclear category: 91.3% for the primary client and 61.1% for the primary user. This lack of identification of the client or sponsor is particularly noteworthy as research has repeatedly found that executive and operational sponsorship are critical success factors for information systems that support managers [44]. This lack of identification of primary clients and users is a major shortcoming in GSS scholarship.

Table 8: Sample by Primary Client and Primary User

	Primary Client		Primary User	
	Frequency	Percentage	Frequency	Percentage
Executive	14	4.7	4	1.3
Non-Executive Manager	0	0.0	9	3.0
Professional	9	3.0	39	13.1
Other Knowledge Worker	3	1.0	14	4.7
Many	0	0.0	50	16.8
Unclear	272	91.3	182	61.1
Total	298	100.0	298	100.0

The general theoretical approach to decision-making can be classified in many ways. Two of the most common classifications are used in this project, with the first being the difference between descriptive and prescriptive approaches. A descriptive approach aims to describe how decisions are made in reality and these theories can be useful for understanding the context of decision support. Prescriptive theories, which are often called normative theories, aim to recommend the best or most appropriate way to make a decision. Table 10 shows that a prescriptive approach dominates GSS research.

Table 10: Sample by Decision-making Approach 1

	1990 - 1994		1995 - 1999		2000 - 2003		Total	
	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Sample
Descriptive	23	21.3	19	15.1	19	29.7	61	20.5
Prescriptive	56	51.9	72	57.1	31	48.4	159	53.4
Both	0	0.0	0	0.0	0	0.0	0	0.0
Unclear	29	26.9	35	27.8	14	21.9	78	26.2
Total	108	100.0	126	100.0	64	100.0	298	100.0

The second classification of decision-making approach as being economic or behavioural overlaps with the first. Economic approaches are usually aimed at maximising some objective subject to constraints and tend to be prescriptive while behavioural decision approaches, which come largely from psychology, are usually based on an understanding of actual behaviour. Nevertheless, behavioural approaches can be prescriptive and some economic approaches have descriptive aspects. Table 11 shows that a behavioural approach dominates DSS research.

Table 11: Sample by Decision-making Approach 2

	1990 - 1994		1995 - 1999		2000 - 2003		Total	
	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Period	No of Articles	% of Sample
Economic	8	7.4	8	6.3	4	6.3	20	6.7
Behavioural	38	35.2	68	54.0	39	60.9	145	48.7
Both	20	18.5	12	9.5	4	6.3	36	12.1
Unclear	42	38.9	38	30.2	17	26.6	97	32.6
Total	108	100.0	126	100.0	64	100.0	298	100.0

One issue of concern in Tables 10 and 11 is the high proportion of papers where the authors are unclear on their decision-making approach (26.2% and 32.6%, respectively). This demonstrates a lack of quality in the research (though it should be noted that the overall time trend is towards greater clarity).

One final assessment of the quality and solid theoretical foundations was to carefully review the number of papers actually used in providing a theoretical foundation to the research. This

was not a mere citation analysis, but was based on cited references actually being used to develop a theoretical model, form some hypotheses, or explain some results. Some 28.9% of papers cited no 'real' references, 18.1% cited one, and 16.8% cited two. Overall the average number of real citations per paper was 2.64 with a median of 2 and there was no significant improving trend. This demonstrates that much GSS research has little or no theoretical foundation.

7 Concluding Comments

This paper has reported the first major results of a project that aims to critically examine the nature and theoretical foundations of GSS research. Although the reported analysis is only descriptive it does throw some light on the issues and concerns that motivated the study. Amongst other findings, the analysis suggests that:

1. GSS research publication is strongly dominated by its specialist journal the *Journal of Group Decision and Negotiation*, though other significant avenues of publication are *DSS*, *JMIS* and *JOC&EC*.
2. GSS research is strongly dominated by empirical studies that adopt a positivist ontology and epistemology, while interpretivism is slowly gaining, but mixed paradigm studies are virtually non-existent. GSS research is more dominated by positivism than general IS research.
3. The most popular research methods used in this group of papers are experiments, and descriptions of specific applications and systems. There is some positivist and Interpretivist case study research and a small amount of action research.
4. There is a growing (healthy) trend away from a focus on the technology of GSS and towards studies which examine decision processes and outcomes.
5. GSS research is focused on small groups despite the domination of collaboration technologies which link much larger groups (divisional, organisational, and even inter-organisational).
6. The assessment of the practical relevance of GSS research shows a discipline that is significantly distanced from professional practice.
7. The lack of identification of the nature of the primary clients/sponsors and the primary users of GSS is a major shortcoming of GSS scholarship.
8. Much of published GSS research has little theoretical grounding.
9. Prescriptive and behavioural approaches to decision-making are the most cited in GSS research.

These findings provide GSS researchers with a call for reflection and reassessment of their discipline. It provides signposts for redefining research agendas to ensure that the discipline prospers. Without this reflection and redirection we believe that GSS will be increasingly distanced from professional practice, contemporary reference research, and other sub-specializations of IS. It is hoped that this stream of research can help GSS researchers in understanding the trends in GSS research, suggesting future research opportunities and improving the quality and relevance of their research.

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Appendix: Article Coding Protocol (for the overall DSS Project)

RESEARCH TYPE

R1. Dominant Research Stage:	Theory Building 1	Theory Testing 2	Theory Refinement 3	Unclear 4		
R2. Epistemology:	Positivist 1	Interpretivist 2	Critical 3	Mixed 4	Unclear 5	N/A 6
R3. Article Type (coded according to Table 4)	R4. Comments:					

DSS FACTORS

- D1. What type of DSS is the paper addressing?
- | | |
|--|---|
| 1. Personal DSS (includes modelling and analytics) | 2. Group support systems |
| 3. EIS (includes BI, OLAP and enterprise wide reporting) | 4. Data warehouse (includes data marts) |
| 5. Intelligent DSS (includes knowledge-based DSS) | 6. Knowledge management-based DSS |
| 7. Many | 8. Negotiation support systems |
- D2. What organizational level is addressed?
- | | |
|---------------|---|
| 1. Individual | 2. Small number of independent managers |
| 3. Group | 4. Department |
| 5. Division | 6. Organization |
| 7. Unclear | |
- D3. What is the decision support focus of the paper?
- | | |
|---|---------------------|
| 1. Development | 2. Technology |
| 3. Decision outcome/organizational impact | 4. Decision process |
| 5. Many | 6. Unclear |
- D4. What is the practical relevance of the paper?
- | | |
|--------------|---------|
| 1. Very High | 2. High |
| 3. Medium | 4. Low |
| 5. None | |
- D5. Comments:

JUDGEMENT and DECISION MAKING FACTORS

- J1. Who is the primary client?
- | | | | | |
|----------------|-------------------------------|-------------------|------------|--------------|
| Executive
1 | Non-executive
Manager
2 | Professional
3 | Other
4 | Unclear
5 |
|----------------|-------------------------------|-------------------|------------|--------------|
- J2. What is the primary user's functional area?
- Unclear
- J3. Who is the primary user?
- | | | | | | |
|------------------------|-------------------------------|-------------------|------------|--------------|---|
| Executive
Many
1 | Non-executive
Manager
2 | Professional
3 | Other
4 | Unclear
5 | 6 |
|------------------------|-------------------------------|-------------------|------------|--------------|---|
- J4. Is judgement and decision-making reference research cited?
- Yes No
- J5. If cited what reference theories? (author/date citations)

What general approach to decision-making is used?

J6. Descriptive Prescriptive Unclear
 1 2 3

J7. Economic Behavioural Both Unclear
 1 2 3 4

J8. Is a phase model of decision-making used? Yes No J9. If yes, then which
J10. Comments: