Research Methodologies In MIS: An Update

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Abstract:

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RESEARCH METHODOLOGIES IN MIS: AN UPDATE

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This article presents trends in published MIS research for an 11 year period, 1993-2003. It is an update of a previous article in CAIS (Volume 11, Article 16) that covered the period 1993-1997. All of the articles in seven mainstream MIS journals were examined in terms of subjects researched and methodologies employed to conduct research. Recent trends are presented and compared to those of the earlier study. The results clearly indicate the focus of efforts of researchers on information system usage and information systems resource management. The survey methodology still appeals to many researchers but increases in the use of mathematical models and laboratory experiments is an indication that the field is attaining maturity by using more rigorous research methods.

Keywords: management information systems research, research methodologies, MIS journals, meta analysis

I. INTRODUCTION

The primary objective of this study is to capture the continuation of trends in research being conducted in the Management Information Systems (MIS) field. The study was conducted by evaluating all of the articles in seven mainstream MIS journals over the 11 year period 1993-2003 based on the subject area of research and research methodologies. The study is an extension of a previous study conducted by Palvia et al (2003) which examined the period 1993-1998. Trends are discussed in light subjects and methodologies used between 1993-1997 and those used between 1998-2003..

Over the last few years, many studies and published articles identified and recognized the importance of metaanalysis in determining where we are moving as researchers in MIS. Culnan et al.[1986] examined the trends in MIS research for the period 1980 to 1984, and examined MIS'

relationship to three foundational fields: computer science, management science and organization science. Grover et al. [1993] conducted a study of MIS articles for the period 1980 to 1989 spanning 1336 articles. The Grover et al. study attempted to establish proper criteria and concluded that while there is a need for more methodological rigor along the guidelines suggested, there are some indications of the maturing of the IS field. Alavi and Carlson [1992] developed an overview of the intellectual structure of MIS through direct and systematic analysis of mainstream MIS articles published during 1968-1988.

More recently, Palvia et al. (2003) analyzed the trends in methodologies in MIS research by conducting an extensive analysis of articles in seven leading journals for the period 1993-1997. The study showed that survey methodology consistently ranked at the top; while frameworks and conceptual models, laboratory experiments, and case studies also found significant use among the MIS community. This article begins where the previous study left off, and studies the period 1998-2003. The focus of this article is on the subject areas under investigation and the research methodologies employed during the more recent period.

II. RESEARCH METHOD FOR THIS STUDY

Extensive content analysis was conducted for this study. MIS research articles published in leading academic MIS journals were read and coded to capture the necessary data. Table 1 lists the seven journals that were reviewed. Consistent with previous studies [Culnan and Swanson, 1986, Gillenson and Stutz, 1991 and Alavi and Carlson, 1992], these journals were selected because of their recognition for excellence in the MIS field. We acknowledge that the publications selected for the study publish mostly U.S. research and therefore the results reflect a U.S. bias.

Table 1. MIS Journals Studied

Communications of the ACM (CACM)
Decision Sciences (DS)
Information and Management (I&M)
Information Systems Research (ISR)
Journal of Management Information Systems (JMIS)
MIS Quarterly (MISQ)
Management Science (MS)

All articles published between 1998 and 2003 in these journals were reviewed. The content analysis was initiated in Fall 2003 and completed in early 2004. Following the procedure outlined by Grover, Lee and Durand (1993), MIS and related articles were selected by examining the title for Information systems keywords. A total of 1226 articles were selected, reviewed, and coded using the content analysis method (Weber, 1990). Table 2 is a snapshot of the scope of this study.

Table 2. Scope of the Study for 1998-2003

Journal (Total Issues/ yr)	# of Issues	From-To	# of articles
Communications of ACM (12)	72	Jan 98 41(1) – Dec 03 46(12)	329
Decision Science (4)	24	Winter 98 29(1) – Winter 2003 34(4)	71
Information&Management (6 - 8)	52	Mar 98 33(4) – Dec 03 41(2)	298
Information Systems Research (4)	24	Mar 98 9(1) – Dec 03 14(4)	128
Journal of Management Information Research (4)	23	Sum 98 15(1) – Winter 03 20(3)	190
MIS Quarterly (4)	24	Mar 98 22(1)-– Dec 03 27(4)	114
Management Science (12)	72	Jan 98 44(1)– Dec 03 49(12)	96
TOTAL			**1226**

The starting point for subject areas was the Barki, Rivard, and Talbot [1993] classification scheme. This scheme presents the most comprehensive classification of MIS topics and was used in previous studies (e.g., Alavi and Carlson, [1992]). The classification list contains seven levels. The first level presents the broadest topic classification while each lower level refines the topic incrementally. The three top levels of the scheme were selected as the base for the subject classification in this study. Continual developments in information technology broadened the scope of MIS to include subjects that were not listed in the Barki, Rivard, and Talbot classification over 10 years ago. Therefore, the classification in this article relied heavily on the scheme used by Palvia et al. [2003]. In addition, five new topics were added, as identified after the initial review. The final subject classification list for this study is presented in Table 3. Items 29 to 33 are the new subjects.

Table 3. Subject Classification

1.	Theory of MIS
2.	Artificial Intelligence /Expert System/Neural Networks/Knowledge Management
3.	Global Information Technology
4.	Hardware
5.	Software /Programming Languages
6.	Networks/ Telecommunications
7.	Internet
8.	Electronic Commerce /EDI
9.	Multimedia
10.	Databases/DBMS
11.	Internal/External Environment
12.	Organizational design /BPR/ Workflow Systems
13.	Innovation
14.	Resource Management /IS Management Issues
15.	IS Planning
16.	IS Staffing
17.	IS Evaluation
18.	Security
19.	IS Development/Methods and Tools
20.	IS Implementation
21.	IS Usage
22.	End User Computing
23.	Executive Information Systems

24.	Decision Support Systems
25.	Group Decision Support Systems
26.	IS Function Application
27.	IS Education
28.	IS Research
29.	Supply Chain Management (SCM)/ ERP
30.	Outsourcing
31.	IT Value
32.	Media and Communications
33.	Customer Relationship Management (CRM)

Note that an article may deal with multiple subjects. Therefore, the coding allowed for up to three subjects. Because of multiple subjects for many articles, the total subject count was 2020 for the 1226 articles studied.

The classification scheme for research methodologies was used as recommended by Palvia et al (2003). One addition made to their list was content analysis (Table 4).

Table 4. Methodologies in MIS Research

1	Speculation/commentary	Research that derives from thinly supported arguments or opinions with little or no empirical evidence.
2	Frameworks and Conceptual Model	Research that intends to develop a framework or a conceptual model.
3	Library Research	Research that is based mainly on the review of existing literature.
4	Literature Analysis	Research that critiques, analyzes, and extends existing literature and attempts to build new groundwork, e.g., it includes meta analysis.
5	Case Study	Study of a single phenomenon (e.g., an application, a technology, a decision) in an organization over a logical time frame.
6	Survey	Research that uses predefined and structured questionnaires to capture data from individuals. Normally, the questionnaires are mailed (now, fax and electronic means are also used).
7	Field Study	Study of single or multiple and related processes/ phenomena in single or multiple organizations.
8	Field Experiment	Research in organizational setting that manipulates and controls the various experimental variables and subjects.
9	Laboratory Experiment	Research in a simulated laboratory environment that manipulates and controls the various experimental variables and subjects.
10	Mathematical Model	An analytical (e.g., formulaic, econometric or optimization model) or a descriptive (e.g., simulation) model is developed for the phenomenon under study.
11	Qualitative Research	Qualitative research methods are designed to help understand people and the social and cultural contexts within which they live. These methods include ethnography, action research, case research, interpretive studies, and examination of documents and texts.
12	Interview	Research in which information is obtained by asking respondents questions directly. The questions may be loosely defined, and the responses may be open-ended.
13	Secondary Data	A study that utilizes existing organizational and business data, e.g., financial and accounting reports, archival data, published statistics, etc.
14	Content Analysis	A method of analysis in which text (notes) are systematically examined by identifying and grouping themes and coding, classifying and developing categories.

The articles were coded by three doctoral students (who are coauthors of this article) over a period of one semester. To ensure uniformity of coding and to reduce ambiguity, the coders were trained in the coding method as part of a seminar course on research methodologies. The inter-coder reliability was calculated over a two phase process. Under phase I, the three coders coded the same set of 50 articles independently. Table 5 presents the result of inter-coder reliability for these initial 50 articles for Subjects (S) and Methodologies (M).

Table 5. Phase I Inter-Coder Reliability

Coder	1	2	3
1			
2	94% (S) 65% (M)		
3	76% (S) 60% (M)	74% (S) 70% (M	

As is evident from Table 5, the inter coder reliability was not at the 90% target mark recommended in the literature. A discussion was held based on individual coding outcomes and consensus was reached regarding the final coding scheme. Under Phase II, the coders individually coded another set of 25 articles. Table 6 shows that this time they achieved adequate inter coder reliability. This method ensures that the coders were properly trained in the coding methodology and had a common understanding of the subjects and methodologies, thereby minimizing ambiguity from the coding process.

Table 6. Phase II Inter Coder Reliability

Coder	1	2	3
1			
2	93% (S) 95% (M)		
3	92% (S) 90% (M)	89% (S) 100% (M)	

III. RESULTS

MIS METHODOLOGY TRENDS

The trends in the methodologies being used by researchers in MIS research are consistent with the findings of previous research. Table 7 presents the rank of particular methodology being used for research for periods 1993-1997, 1998-2003, and the composite of both periods 1993-2003.

As is evident, among the journals studied in the time frame 1998-2003, the survey method was the most widely used methodology. The second most commonly used methodology was the mathematical model (note that a mathematical model may refer to any of a number of quantitative approaches such as a formulaic, econometric, optimization, or a descriptive simulation model). This finding is unique compared to many of the previous results. It points to the greater rigor being required in MIS research. Most of the articles appearing in *Information Systems Research* used mathematical modeling in some shape or form. *Management Science, Decision Science* and *The Journal of Management Informaion Systems* were other journals that used mathematical models. The higher use of speculation and commentary (5th in 1993-1997 and 3rd in 1998-2003) can be attributed to research efforts being directed to new and developing areas. Laboratory experiments, framework and conceptual models, case study and field study are also favored by IS researchers. It seems that content analysis, library research, and qualitative analysis have yet to capture the attention of the majority of IS researchers[1].

[1] Alternatively, the lack of work published by the seven journals studied may also reflect a lack of interest in them by their editors and editorial boards

Table 7. Rank of Research Methodology Based on Count and Percentage of Articles Using Specific Methodology

	1993-1997				1998-2003				1993-2003	
Methodology (Total)	Primary Methodo-logy Count	Secondary Methodo-logy Count	Total (%)	Rank by total	Primary Methodo-logy Count	Secondary Methodo-logy Count	Total (%)	Rank by total	Total (%)	Rank by total
Survey	211	32	243 (23.8%)	1	271	23	294 (24.1%)	1	537 (22.0%)	1
Frameworks and Conceptual Models	138	16	154 (15.1%)	2	122	12	134 (10.9%)	4	288 (11.6%)	2
Laboratory Experiment	110	16	126 (12.4%)	3	123	29	152 (12.5%)	5	278 (11.2%)	3
Case Study	91	15	106 (10.4%)	4	112	16	128 (10.4%)	6	234 (9.4%)	5
Mathematical Model	53	22	75 (7.4%)	5	159	23	182 (14.8%)	2	257 (10.3%)	4
Speculation/ commentary	64	4	68 (6.7%)	6	138	20	158 (12.9%)	3	226 (9.1%)	6
Literature Analysis	39	25	64 (6.3%)	7	45	7	52 (4.2%)	10	116 (4.6%)	8
Field Study	50	8	58 (5.7%)	8	84	20	104 (8.4%)	7	162 (6.5%)	7
Interview	16	21	37 (3.6%)	9	42	35	77 (6.3%)	8	114 (4.6%)	9
Library Research	16	14	30 (2.9%)	10	16	5	21 (1.7%)	13	51 (2.0%)	12
Secondary data	21	6	27 (2.6%)	11	46	38	84 (6.9%)	9	111 (4.5%)	10
Field Experiment	16	7	23 (2.3%)	12	36	7	43 (3.4%)	11	66 (2.6%)	11
Qualitative Research	1	7	8 (0.8%)	13	7	5	12 (1.0%)	14	20 (0.8%)	14
Content Analysis	N/A	N/A	N/A	N/A	25	8	33 (2.7%)	12	33 (1.3%)	13
Total	826	193	1019		1226	248	1474		2493	

Note: Content Analysis was added in the current study

Significant trends can be observed from the disaggregation of the data in Table 8, which shows the methodology preferences year by year over the period of 1998-2003. Survey is the preferred choice of researchers over the period. Mathematical model, after a minimal number in 1998, witnessed a steep rise. Although the number of articles using speculation and commentary was third over-all, most of thes, which points to the maturing of the field and move toward more established research methodologies. Preference towards case study was at peak in 1999 and has declined some since that time. There has been a noticeable decline in the use of field study methodology by researchers. From occupying the 2nd rank in 1998 it fell down to 6th place in 2003. Other methodologies remained more or less constant over the six year period.

Table 8. Methodology Trends over 1998-2003

Methodology	1998	1999	2000	2001	2002	2003	Total
Survey	36	52	37	52	61	56	294
Mathematical Model	15	34	32	37	28	36	182
Speculation/Commentary	56	25	16	38	11	12	158
Laboratory Experiment	18	28	19	20	33	34	152
Framework & Conceptual Models	11	6	32	12	29	44	134
Case Study	14	32	23	10	19	30	128
Field Study	38	13	9	8	13	23	104
Secondary Data	15	12	15	9	13	20	84
Interview	9	19	12	9	14	14	77
Literature Analysis	3	13	4	7	10	15	52
Field Experiment	7	7	8	8	5	8	43
Content Analysis	6	5	6	5	5	6	33
Library Research	2	5	4	4	2	4	21
Qualitative Analysis	0	4	0	2	4	2	12
Total	**230**	**255**	**217**	**221**	**247**	**304**	**1474**

Figures 1 and 2 represents the usage trend graphically from 1993-2003.

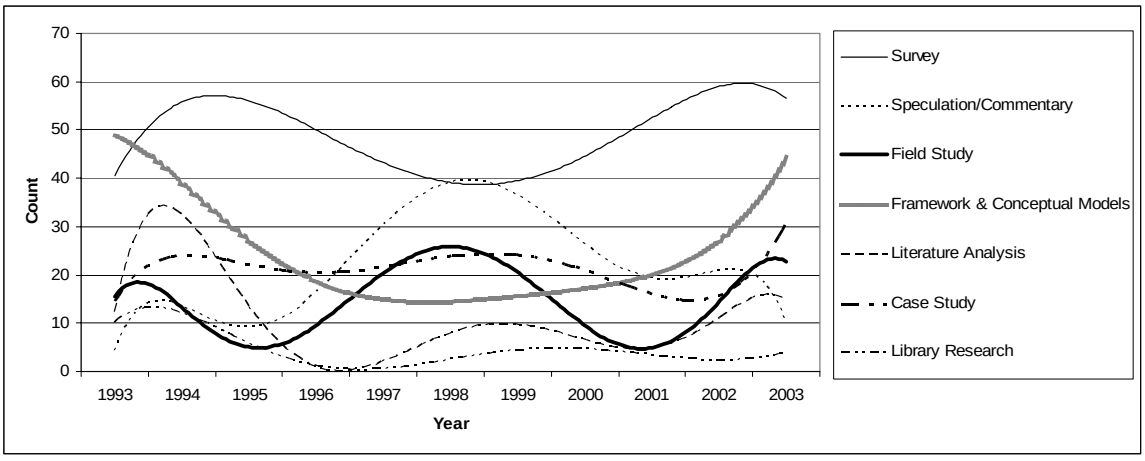

Figure 1. Methodology Usage Trends (1993-2003)

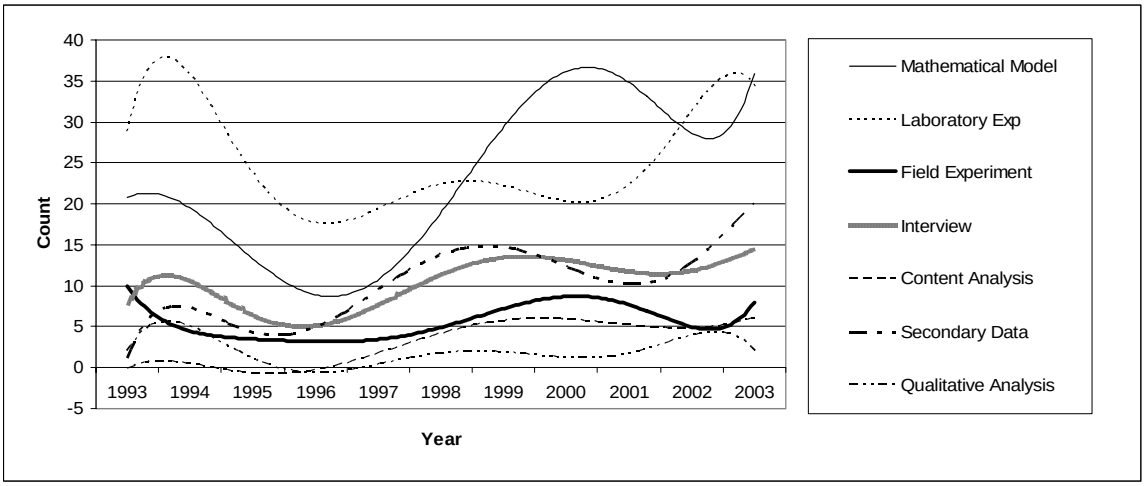

Figure 2. Methodology Usage Trends (1993-2003)

MIS SUBJECT TRENDS

The most written about MIS subject is Resource Management/IS Management Issues followed by IS Usage in second place, and Electronic Commerce in third place. Table 9 shows the frequency and order of subjects researched during the study period. Broad areas and macro management issues are at the top followed by specific micro level issues. It is no surprise that IS management is on the top of the list, as most people would argue that MIS really refers to "Management of IS".

Table 9. Subject Frequency 1998-2003

Subject	Frequency	Percentage
Resource Mgmt/ IS Issues	191	9.46%
IS Usage	191	9.46%
Electronic Commerce	140	6.93%
AI/ EX/ NN/ KM*	125	6.19%
IS Development	115	5.69%
Internet	107	5.30%
IS Evaluation/ Control	98	4.85%
Software/ Prog. Language	82	4.06%
GDSS	71	3.51%
Organization Design/ BPR	61	3.02%
Networks/ Telecom	59	2.92%
GIT	57	2.82%
SCM	55	2.72%
EUC	54	2.67%
IS Research	54	2.67%
Media & Communication	52	2.57%
DB/ DBMS	50	2.48%
IS Staffing	47	2.33%
Internal/ External Environment	46	2.28%
DSS	46	2.28%
IT Value	46	2.28%
IS Function Applications	42	2.08%

IS planning	41	2.03%
Innovation	39	1.93%
IS Implementation	38	1.88%
Security	30	1.49%
Multimedia	21	1.04%
Outsourcing	19	0.94%
IS Education	16	0.79%
Theory of MIS	9	0.45%
EIS	6	0.30%
Hardware	6	0.30%
CRM	6	0.30%
Total	**2020**	

AI/ EX/ NN/ KM = Artificial Intelligence /Expert System/Neural Networks/ Knowledge Management

The emergence of electronic commerce as a research area is due to the revolutionary changes made in the nature of IT with the emergence of the Internet in the mid-nineties. Much of the IS usage research was triggered by the enormous interest in IT diffusion research and the technology acceptance model published by Davis (1989).

In the middle of the list are subjects that are more specific in nature, and include the likes of Decision Support Systems (DSS), IS Staffing, and Business Process Reengineering (BPR). This is consistent with the fact that these subjects enjoy niches among researchers. Towards the end of the table are topics like Outsourcing, Multimedia, and Security which are new topics and have not caught the fancy of the majority of IS researchers. One somewhat surprising finding is the low rank of "Theory of MIS". While calls for an MIS theory have been repeatedly made, it has been elusive and researchers have marched on to more pressing needs.

Trends can be observed in Table 10, which shows the appearance of the topics in each of the 6 years. There is an increase in number of articles in electronic commerce, the Internet, supply chain management (SCM), DB/DBMS, artificial intelligence, neural networks and expert systems, and global information technology. The trend in the number of articles in e-commerce mimics somewhat (perhaps with a little lag) the rise and fall of the e-commerce business. The number was rising until 2002 but then it suddenly dropped in 2003. in The number of articles on hardware, telecommunications, multimedia and outsourcing decreased. While from an academic standpoint, less research has been published in these areas, IS practice is strong in the areas of hardware, telecommunications, networks, and outsourcing. Furthermore, many advances occurred in practice in such area as multimedia with the convergence of voice and data technologies over existing TCP/IP networks. Furthermore international outsourcing saw phenomenal growth in the last few years. The data reflect the time gap or lag between published research and current practice.

Table 10. Subject Trends Over Years

Subjects	1993	1994	1995	1996	1997	1993-1997	Rank (1993-1997)	1998	1999	2000	2001	2002	2003	1998-2003	Rank (1998-2003)	1993-2003	Overall Rank
Resource Mgmt/ IS Issues	19	29	23	43	38	152	1	28	21	26	40	28	48	191	1	343	1
IS Development	35	33	16	22	37	143	2	24	22	6	16	19	28	115	5	258	2
Theory of MIS	14	46	38	15	19	132	3	1	1	2	0	4	1	9	30	141	9
IS Evaluation/ Control	19	12	13	27	32	103	4	14	15	17	9	23	20	98	7	201	4
Networks/ Telecom	7	30	9	12	30	88	5	8	24	5	12	3	7	59	11	147	7
EUC	20	16	25	14	12	87	7	5	15	9	10	7	8	54	14	141	8
IS Function Applications	18	24	7	9	29	87	6	11	1	4	12	7	7	42	22	129	13
Int/ Ext Environment	11	19	7	17	32	86	8	10	5	4	12	6	9	46	20	132	12
IS Research	11	23	15	11	20	80	9	4	10	8	6	13	13	54	15	134	11
AI/ EX/ NN/ KM	20	14	17	11	6	68	10	10	15	24	24	20	32	125	4	193	5
DSS	24	16	10	8	9	67	11	8	13	7	11	5	2	46	19	113	16
IS planning	11	21	4	12	13	61	12	4	14	2	6	8	7	41	23	102	18
Software/ Prog. Language	7	15	11	9	15	57	13	17	21	14	12	7	11	82	8	139	10
GDSS	8	12	11	11	5	47	14	14	11	13	9	10	14	71	9	118	14
Organization Design/ BPR	6	13	1	11	13	44	15	9	19	9	9	5	10	61	10	105	17
IS Implemen-tation	10	15	2	8	6	41	16	8	6	9	4	3	8	38	25	79	20
IS Usage	11	7	3	9	7	37	17	46	21	10	32	33	49	191	2	228	3

DB/ DBMS	6	11	7	5	5	34	18	7	4	4	10	9	16	50	17	84	19
Innovation	2	8	1	6	13	30	19	4	8	5	11	4	7	39	24	69	23
IS Staffing	4	4	9	4	5	26	20	5	4	2	17	5	14	47	18	73	21
Security	5	3	3	3	5	19	22	4	6	1	8	5	6	30	26	49	26
IS Education	0	2	8	5	4	19	21	3	2	2	2	5	2	16	29	35	28
GIT	3	5	1	1	4	14	24	16	3	6	11	9	12	57	12	71	22
EIS	2	0	6	2	4	14	23	1	1	0	0	1	3	6	32	20	30
Electronic Commerce	1	6	4	1	1	13	25	9	20	19	21	48	23	140	3	153	6
Hardware	3	3	1	3	2	12	26	6	0	0	0	0	0	6	31	18	32
Multimedia	0	3	3	1	5	11	27	8	3	5	3	2	0	21	27	32	29
Internet	0	0	0	4	3	7	28	17	21	7	17	18	27	107	6	114	15
SCM/ ERP								2	5	5	9	19	15	55	13	55	24
Outsourcing								3	2	3	2	0	9	19	28	19	31
IT Value								2	4	19	8	4	9	46	21	46	27
Media & Communication								4	12	5	6	13	12	52	16	52	25
CRM								1	1	1	1	2	6	6	33	6	33
TOTAL														**2020**		**3599**	

IV. DISCUSSION

LIMITATIONS

We state some limitations of the study before discussing the results. The primary limitation is that only seven journals were examined the study. Nevertheless, it was a massive data collection effort. But the fact that all highly acclaimed top-tier journal were included is also a strength, as our study reflects the best practices in IS research. As an added caveat, it should be noted that our results are more reflective of U.S.- based research.

Another limitation is the classification scheme used for coding the articles. The coders experienced that the subject list was not completely exhaustive and some of the articles were not easy to fit into. Though some new subjects were added, the list was still not sufficient to accurately represent a few articles. Given the breadth of what can be called MIS, we had to draw the line someplace. Some of the results are also dependent on how the subject categories were divided or aggregated. For example, DSS, GDSS, and EIS were separated while KM was combined with AI, Expert Systems, and Neural Networks.

COMPARISON BETWEEN THE 1998-2003 STUDY AND THE 1993-1997 STUDY

One conclusion that can be drawn is the increasing scope of MIS research. This result is quite evident by comparing the of subject classification list of this study with that used in the previous study . The number of subjects in this study was 35 compared to 29 (but only 28 were ranked) in the prior study by Palvia et al. (2003). The additional seven subjects: SCM, Outsourcing, IT Value, Media and Communications, Workflow systems, ERP, and CRM, indicate a trend of widening scope of subjects being researched by the IS community.

Table 11 presents the rank comparison of subjects between 1993-1997 (Palvia et al. 2003) and 1998-2003 (the current study). A good number of changes can be observed. Of importance among them is the shift or change in the subjects which form the core of the MIS research. The topics which emerged as core in the previous study were resource management, IS development, functional applications, IS planning and software programming languages. In this study, the

Table 11. Subject Rank Comparisons

Subject	1993-1997	1998-2003
Resource Management/ IS Issues	1	1
IS Usage	17	2
Electronic Commerce	25	3
AI/ EX/ NN/ KM	10	4
IS Development	2	5
Internet	28	6
IS Evaluation/ Control	4	7
Software/ Programming Language	13	8
Group Decision Support Systems	14	9
Organization Design/ Business Process Reenginering/ Workflow Systems	15	10
Networks/ Telecommunications	5	11
Global Information Technology	24	12
Supply Chain Management/Enterprise ReRP	N/A	13
End User Computing	7	14
IS Research	9	15
Media & Communication	N/A	16

Data Base/Data Base Management Systems	18	17
IS Staffing	20	18
Decision Support Systems	11	19
Internal/ External Environment	8	20
IT Value	N/A	21
IS Function Applications	6	22
IS planning	12	23
Innovation	19	24
IS Implementation	16	25
Security	22	26
Multimedia	27	27
Outsourcing	N/A	28
IS Education	21	29
Theory of MIS	3	30
Customer Relationship Management	N/A	31
Executive Information Systems	23	32
Hardware	26	33

core of MIS shifted focus to IS usage, resource management, electronic commerce, IS development, artificial intelligence/neural networks/knowledge management, and software/programming languages.

MIS being 'Management of IS' has Resource Management/ IS Management Issues' subject articles on top of the list. The next ranked subject is IS usage, which was in 17th place in the previous study. This change can be explained by the interest of researchers in understanding IT adoption and acceptance by IS users. Much of it has been spurred by the publication of the TAM model by Davis (1989). There is a dramatic decline in the "Theory of MIS" research which was at 3rd rank in the previous study and is almost non-existent in the present study. Given its elusiveness, it seems researchers abandoned the quest for theory and instead have focused on more pressing business issues such as IS usage and management.

Another major but expected change in comparing with the previous study is the quantum increase in Internet and electronic commerce research. The analysis of the trends over the years shows a big jump in e-commerce research until the year 2002. Although there was a decline in 2003 perhaps due to the "dot-com" bubble burst in 2000, researchers seem to be investigating fundamental and long-term issues in e-commerce. We expect that research in e-commerce issues will sustain a high level of activity over many years to come.

Another important topic that emerged is global IT. Focus on this area increased because of the rapid expansion of business into global markets. The Internet by definition is global and thus much of the e-commerce activity has been global, crossing international boundaries. Information technology has had both an "enabler" and "driver" role in the globalization of business, so much so that IT is now an integral part of corporate strategy in many organizations. The importance of this area of research is exemplified by the emergence of an annual global IT management conference (http://www.gitma.org).

Other subjects showing upward trend are supply chain management (SCM), and media and communications. These new topics were added to the subject classification list of the previous article. The increase is clearly evidenced by the increased focus on efficiencies to be gained through inter-organizational linkages embedded in SCM and ERP systems.

Subjects that were at about the same level of research as the previous study include: IS Research, GDSS, IS Staffing, DBMS, Innovation, IS Implementation, Hardware, EIS and Security.

Figure 3 presents the top five subject gainers and top five losers in terms of change in their numeric positions from 1993-1997 to 1998-2003. As is clearly evident that E-Commerce and Internet are the top gainers and climbed 22 positions in terms of their rank. Theory of MIS lost most in terms of its position.

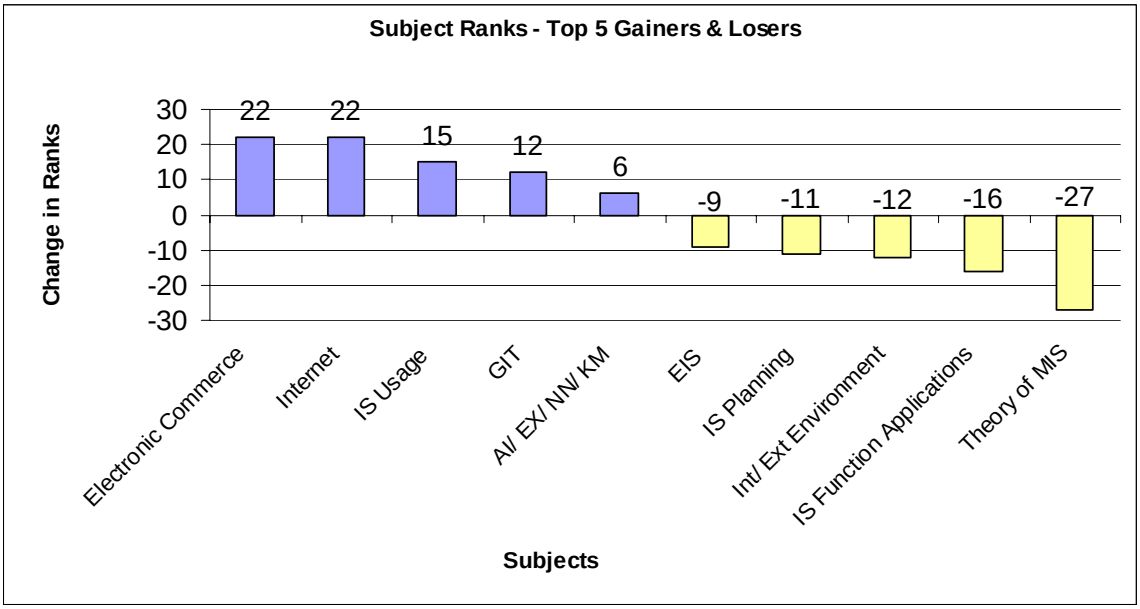

Figure 3. Top 5 Subject Rank Gainers and Losers

Striking observations can be made when examining methodologies. Table 12 displays the rank comparison of methodologies used in 1993-1997 and 1998-2003.

The most prevalent methodology used is the survey method with 19.95% (both primary and secondary) of the articles using this method over the time frame. This supports the previous work where surveys were also the most used method during the 1993-1997 timeframe. The previous article had suggested that the survey method was used because of the “newness” of the field. However, the survey method continues to be most widely used in spite of growing maturity. We argue that the most likely reasons are perhaps threefold:

1. the IT field changes rapidly, requiring constant and quick attention to new issues,
2. the external conclusion validity afforded by the survey method, and
3. a large number (perhaps the majority) of the current researchers in MIS are only trained in this method.

Table 12. Methodology Rank Comparisons

Methodology	1993-1997	1998-2003
Survey	1	1
Mathematical Model	6	2

Speculation/Commentary	5	3
Framework & Conceptual Models	2	4
Laboratory Exp	3	5
Case Study	4	6
Field Study	7	7
Interview	11	8
Secondary Data	9	9
Literature Analysis	8	10
Field Experiment	10	11
Content Analysis	N/A	12
Library Research	12	13
Qualitative Analysis	13	14

A methodology that has seen a steep rise is mathematical modeling. It was ranked 6th in the previous article and is now ranked 2nd. As stated earlier, most of the articles appearing in *Information Systems Research* use mathematical modeling in some shape or form. *Management Science* and *Communications of the ACM* were other journals that used mathematical models. The increase in this methodology indicates more rigor in MIS research.

Framework and conceptual models fell from being ranked 2nd in 1993-1997 to 4th in 1998-2003, with only 9.4% of the articles using this methodology. This decline is consistent with previous research which stated that journals now want to publish actual research more than frameworks that guide research. Another reason may be that we now have a good number of frameworks and conceptual models.. Again, it is an indication of the growing maturity of the field.

Qualitative research (excluding the case study method) exhibited low results consistent with previous research. It was stated in the previous research that many IS researchers who reported results between 1993 and 1997 were not trained in using this methodology and therefore reluctant to use it. It was expected that this methodology would gain acceptance in years to come, but the methodology is still does not find wide acceptance by the IS community.

Figure 4 shows the top 3 methodologies that gained most and lost most, in terms of their position

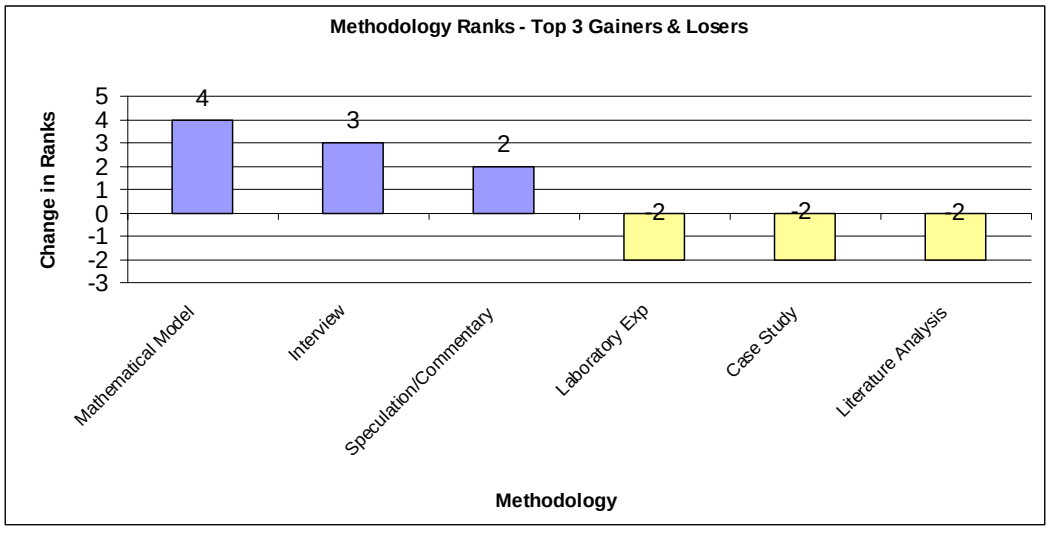

Figure 4. Top 3 Methodology Rank Gainers & Losers

change from 1993-1997 to 1998-2003. Mathematical modeling gained the most whereas laboratory experiments, case study and literature analysis lost moderately between the two periods. The differences in methodologies are much smaller than the differences in subject.

V. CONCLUSION

Continual self-introspection is useful for the MIS field to mature and thrive. The MIS field is still young and continues to show explosive growth in the technology itself. Our analysis of publication patterns and trends in leading academic MIS journals in the years 1998 to 2003 provides another snapshot of the state of MIS research. In the tradition of cumulative research, our study updates previous research which covered the period 1993-1997. We expect that similar work will be conducted on a periodic basis. Future work may also include non-top-tier journals as well as new and upcoming journals. This approach would lead to a more holistic review not just the best practices in MIS research.

The results include several implications for researchers and journal editors.

1. Researchers are made aware of the methodologies and subject domains that are in wide use. The data give them an opportunity to understand which subject areas that are growing in popularity and which are declining in interest.

2. It helps researchers assess the position of their own interests in the overall MIS domain

3. It allows researchers make necessary adjustments in their research portfolio.

4. More entrepreneurial researchers and editors may want to focus their attention on the subjects that are important yet ignored, as well as find a proper balance in the use of research methodologies.

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