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ABSTRACT

In pursuit of the need to continually examine the field of Management Information Systems (MIS), this article presents recent trends in MIS research. All the articles in the mainstream MIS journals were examined in terms of subjects researched and methodologies employed to conduct research. 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 increase in the use of mathematical models and laboratory experiments are indication towards the field attaining maturity by way of using rigorous research methods.

Keywords

Management Information Systems Research, Research Methodologies, MIS Journals, Meta Analysis.

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 the articles in mainstream MIS journals on the basis of subject area of research and research methodologies. The results thus obtained were compared with a similar study conducted by Palvia et al (2003). Trends are discussed in light of subjects and methodologies usage between the two studies.

Over the last few years, many studies and published articles have identified and recognized the importance of meta analysis in determining where we are moving as researchers in MIS. Culnan et al. (1986) examined the trends in MIS research for a period starting from 1980 till 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 a period starting 1980 till 1989 and spanning 1336 articles. Their 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's (1992) study yielded some interesting results with an objective to develop 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 1993-1997. The study showed that the 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 their 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 this period.

RESEARCH METHOD FOR THIS STUDY

On each page, your material (not including the header and footer) should fit within a rectangle of 18 x 23.5 cm (7 x 9.25 in.), centered on a US letter page, beginning 1.9 cm (.75 in.) from the top of the page. Please adhere to the US letter size only (hopefully Word or other word processors can help you with it). If you cannot do so, please contact the program chair for assistance. All final publications will be formatted and displayed in US letter size. Right margins should be justified, not ragged. Beware, especially when using this template on a Macintosh, Word may change these dimensions in unexpected ways.

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 relevant 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 due to their high acclaim in the MIS field.

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)

Table 1. Selected MIS Journals Used in this Study

All articles published between 1998 and 2003 in these journals were reviewed. The content analysis was conducted in Fall 2003; consequently not all journal issues were available for the 2003 year. 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 1099 articles were selected, reviewed and coded using the content analysis (Weber, 1990). Table 2 depicts a snapshot of the scope of this study.

Journal (Total Issues/ yr)	# of Issues	From-To	# of articles
CACM(12)	66	Jan 98 41(1) – Jun 03 46(6)	290
DS (4)	20	Wtr 98 29(1) – Fall 2002 33(4)	58
I&M (6 - 8)	52	Mar 98 33(4) – Sep 03 40(8	278
ISR (4)	19	Mar 98 9(1) – Dec 2002 13(3)	107
JMIS (4)	19	Sum 98 15(1) – Spr 2003 19(4)	165
MIS-Q (4)	24	Mar 98 22(1)– Dec 03 27(4)	114
MS(12)	66	Jan 98 44(1)– Jun 03 49(6)	87

Table 2. Scope of Study

For subject areas, the classification scheme by Barki, Rivard, and Talbot (1998) was the starting point. 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 incrementally refines the topic. The three top level 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. The classification also relied heavily on the scheme used by Palvia et al. (2003). In addition, several topics were added, as identified after initial the review process. The final subject classification list for this study is presented in Table 3.

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

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9.    Multimedia
10.   Databases/DBMS
11.   Internal/External Environment
12.   Organizational design /BPR
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)
30.   Outsourcing
31.   IT Value
32.   Media and Communications
33.   Customer Relationship Management (CRM)
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Table 3. Subject Classification

Note that an article may deal with multiple subjects.   Therefore, the coding allowed for up to three subjects. Because of possible multiple subjects per article, the total subject count was 1795.

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).

Number	Methodology	Definition
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 or optimization model) or a descriptive model

		(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.

Table 4. Methodologies in MIS Research

Note that each article may employ multiple methodologies. Therefore, the coding allowed for up to two methodologies. Because of possible multiple methodologies per article, the total methodology count was 1280.

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

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

Table 5. Phase I Inter-Coder Reliability

As is evident from Table 6, the inter coder reliability was not up to 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 we achieved adequate inter coder reliability. This method ensures that the coders were properly trained in the coding methodology and had a common of understanding of the subjects and methodologies, thereby minimizing ambiguity from the coding process.

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

Table 6. Phase II Inter-Coder Reliability

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.

Methodology	Frequency	Percentage
Survey	273	21.3%
Mathematical Model	160	12.5%
Speculation/Commentary	151	11.8%
Laboratory Exp	118	9.2%
Framework & Conceptual Models	110	8.6%
Case Study	105	8.2%
Field Study	88	6.9%
Interview	68	5.3%
Secondary Data	66	5.2%
Literature Analysis	46	3.6%
Content Analysis	33	2.6%
Field Experiment	32	2.5%
Library Research	20	1.6%
Qualitative Analysis	10	0.8%
Total	1280	

Table 7. Methodology Frequency

As is evident, among the journals studied in the time frame, the survey method was the most widely used research methodology. The second most commonly used methodology was the mathematical model. This is a unique finding compared to many of the previous results. It attests to the requirement of greater rigor in MIS research. Most of the articles appearing in *Information Systems Research* utilized the mathematical model in some shape or form. *Management Science* and *Communications of the ACM* were other journals that used mathematical models. The high use of speculation and commentary can be attributed to research efforts being directed to new and upcoming areas. Laboratory experiments, framework and conceptual models, case study and field study and are also favored by IS researchers. Content analysis, library research and qualitative analysis are yet to capture the attention of the majority of IS researchers.

Significant trends can be observed from Table 8 (and figures 1 and 2) which depicts the trends in methodology preferences over the period of six years. Survey is the preferred choice of researchers over the period. There is a decline in the number of articles using speculation and commentary, 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 4th place. Other methodologies have remained more or less constant over the six year period. Note that the low frequency count in year 2003 is because of the less number of articles coded for that year.

Methodology	1998	1999	2000	2001	2002	2003
Survey	36	52	37	52	62	34
Mathematical Model	15	35	34	38	28	10
Speculation/Commentary	56	25	16	38	11	5
Laboratory Exp	18	28	16	14	27	15
Framework & Conceptual Models	11	6	32	12	26	23
Case Study	14	32	22	9	19	9
Field Study	38	12	9	6	12	11
Interview	9	19	12	9	14	5
Secondary Data	13	10	13	8	12	10

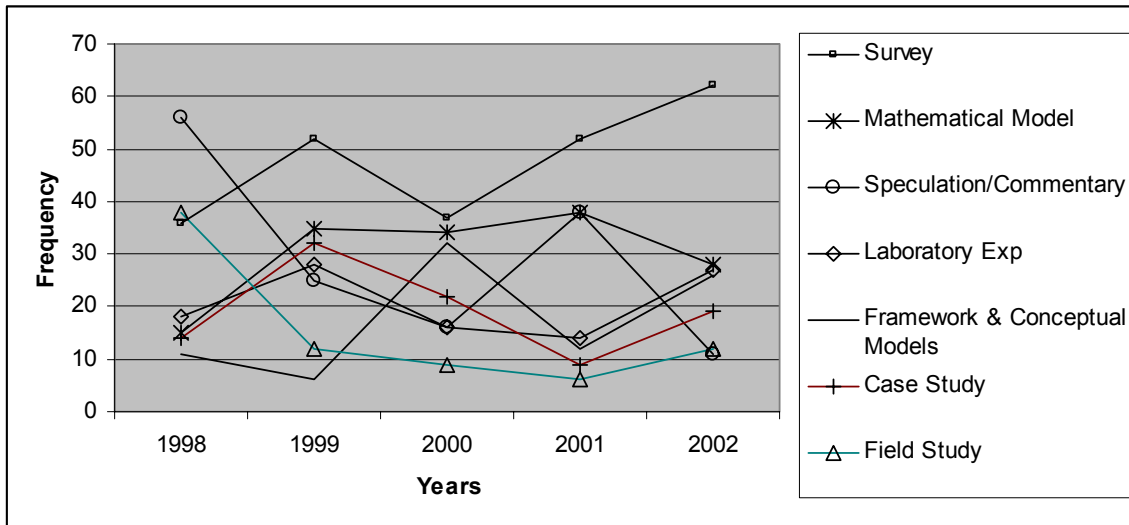| Literature Analysis | 3 | 13 | 3 | 7 | 9 | 11 |
Content Analysis	6	5	6	5	5	6
Field Experiment	5	6	7	8	3	3
Library Research	2	5	4	4	2	3
Qualitative Analysis	0	4	0	2	4	0
Total	226	252	211	212	234	145

Table 8. Methodology Trends Over Year

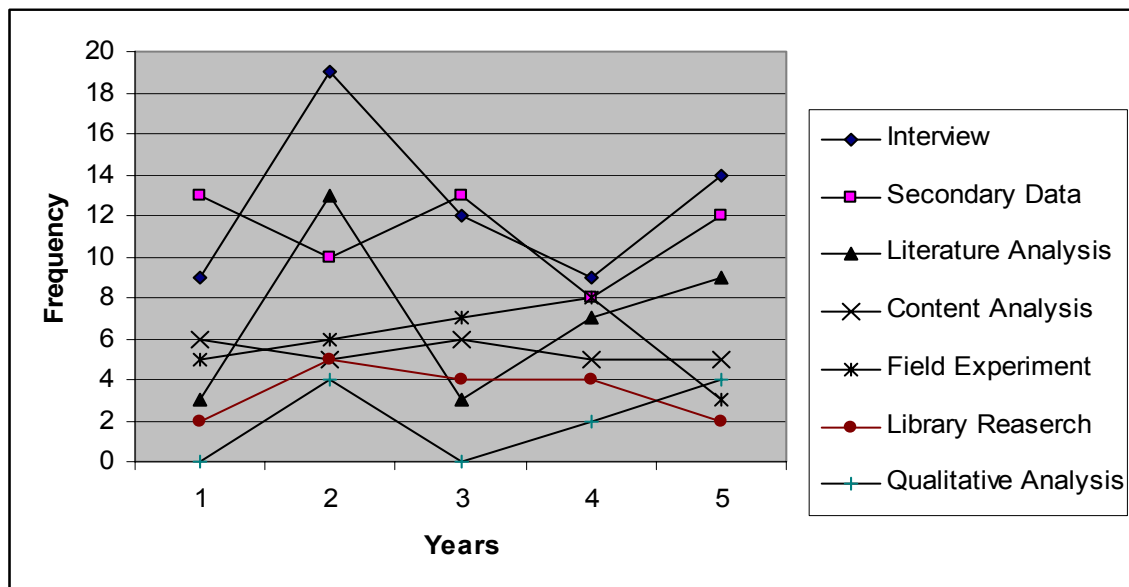**Figure 1. Methodology Usage Trend**

Figure 2. Methodology Usage Trend

MIS Subject Trends

The most written about MIS subject is IS Usage, followed by Resource Management/IS Management Issues 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 near the top of the list, as most people would argue that MIS really refers to "Management of IS". The emergence of electronic commerce as a research area is due to the revolutionary changes made in the nature of IT due to the emergence of the Internet in the mid-nineties. Much of the IS usage research has been 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.

Subject	Frequency	Percentage
IS Usage	164	9.14%
Resource Mgmt/ IS Issues	158	8.80%
Electronic Commerce	124	6.91%
AI/ EX/ NN/ KM	110	6.13%
IS Development	98	5.46%
Internet	95	5.29%
IS Evaluation/ Control	93	5.18%
Software/ Prog. Language	76	4.23%
GDSS	65	3.62%
Organization Design/ BPR	55	3.06%
Networks/ Telecom	53	2.95%
GIT	52	2.90%
EUC	52	2.90%
IS Research	49	2.73%
DSS	48	2.67%
SCM/ ERP	46	2.56%
Media & Communication	46	2.56%
Internal/ Ext Environment	43	2.40%
IS Staffing	42	2.34%
IT Value	42	2.34%
DB/ DBMS	41	2.28%
IS Planning	38	2.12%
Innovation	37	2.06%
IS Function Applications	37	2.06%
IS Implementation	33	1.84%
Security	24	1.34%
Multimedia	21	1.17%
IS Education	15	0.84%
Outsourcing	13	0.72%
Theory of MIS	9	0.50%
Hardware	6	0.33%
EIS	5	0.28%
CRM	5	0.28%
Total	1795	

Table 9. Subject Frequency

Interesting trends can be observed in Table 10, which shows the appearance of the topics by each of the 6 years. Note the year 2003 is not complete in terms of all the journal articles.

Subjects	1998	1999	2000	2001	2002	2003
Theory of MIS	1	1	2	0	4	1
AI/ EX/ NN/ KM	10	15	24	24	19	18
GIT	16	3	6	11	9	7
Hardware	6	0	0	0	0	0
Software/ Prog. Language	17	21	14	12	7	5
Networks/ Telecom	8	24	5	12	2	2
Internet	17	21	7	17	18	15
Electronic Commerce	9	20	19	21	48	7
Multimedia	8	3	5	3	2	0
DB/ DBMS	7	4	4	10	8	8
Int/ Ext Environment	10	5	4	12	6	6
Organization Design/ BPR	9	19	9	9	5	4
Innovation	4	8	5	11	4	5
Resource Mgmt/ IS Issues	28	22	26	40	30	12
IS planning	4	14	2	6	8	4
IS Staffing	5	4	2	17	5	9
IS Evaluation/ Control	14	15	17	9	23	15
Security	4	6	1	8	4	1
IS Development	24	22	6	16	18	12
IS Implementation	8	6	9	4	3	3
IS Usage	46	21	10	32	32	23
EUC	5	15	9	10	7	6
EIS	1	1	0	0	1	2
DSS	8	13	8	12	5	2
GDSS	14	11	13	9	9	9
IS Function Applications	11	1	4	12	7	2
IS Education	3	2	2	2	5	1
IS Research	4	10	8	6	11	10
SCM/ ERP	2	6	4	9	19	6
Outsourcing	3	2	3	2	0	3
IT Value	2	4	19	8	4	5
Media & Communication	4	12	5	6	13	6
CRM	0	1	1	1	1	1
Total	312	332	253	351	337	210

Table 10. Subject Trends Over Year

There is an increase in number of articles in electronic commerce, the Internet, supply chain management (SCM), and artificial intelligence, neural networks and expert systems, and global information technology. There is a decreasing trend in the number of articles about hardware, telecommunications, multimedia and group decision support systems (GDSS).

DISCUSSION

Limitations

We state some limitations of the study before discussing the results. The primary limitation is that only seven journals were targeted for the study. This is a massive data collection effort; we had to constrain it somehow. But the fact that all highly acclaimed top-tier journal were included could also be considered a strength of the study, as our study then focuses on the best practices in IS 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 it. 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 for the number of subjects to be included in the scheme.

Comparison with the Most Recent Study

One conclusion that can be drawn is the increase in scope of MIS research. This is quite evident by the comparison of subject classification list of this study with that used in previous similar studies. The number of subjects in this study was 33 compared to 29 in the prior study by Palvia et al (2003). The addition of five subjects: Electronic Commerce and EDI (merged as one subject), SCM, Outsourcing, IT Value, Media and Communications, and CRM, indicate a trend of widening scope of subjects under 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 trends 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 comprised of resource management, IS development, functional applications, IS planning and software programming languages. In this study the core of MIS has shifted focus to IS Usage, resource management, electronic commerce, IS development, artificial intelligence/neural networks/knowledge management, and software/programming languages.

The top ranked subject is IS usage, which was at 17th rank in the previous study. This can be explained by the interest of researchers in the understanding of 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 have abandoned the quest for theory and instead have focused on more pressing business issues such as IS usage and management.

Subject	1993-1997	1998-2003
IS Usage	17	1
Resource Mgmt/ IS Issues	1	2
Electronic Commerce	25	3
AI/ EX/ NN/ KM	10	4
IS Development	2	5
Internet	28	6
IS Evaluation/ Control	4	7
Software/ Prog. Language	13	8
GDSS	14	9
Organization Design/ BPR	15	10
Networks/ Telecom		11
GIT	23	12
EUC	6	13
IS Research	9	14
DSS	11	15
SCM/ ERP	N/A	16
Media & Communication	N/A	17
Internal/ Ext Environment	8	18
IS Staffing	20	19
IT Value	N/A	20
DB/ DBMS	18	21
IS Planning	12	22
Innovation	19	23
IS Function Applications	9	24
IS Implementation	13	25
Security	21	26
Multimedia	27	27
IS Education	22	28

Outsourcing	N/A	29
Theory of MIS	3	30
Hardware	26	31
EIS	24	32
CRM	N/A	33

Table 11. Subject Rank Comparisons

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 in the year 2002. thus while the "dot-com" bubble burst in 2000, researchers seem to be investigating more stable 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 topic of significant importance that has emerged is global IT. There has been an increased focus on this area 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 further underscored 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 were new topics added to the subject classification list of the previous article. The drastic increase is clearly evidenced by the increased focus on efficiencies to be gained through inter-organizational linkages embedded in SCM and ERP systems. Wal-mart is a leading example of a company which has invested millions in such systems.

Subjects that have been at about the same level of research as the previous study include: IS meta research, GDSS, IS Staffing, DBMS, innovation, IS implementation, hardware, EIS and Security.

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

Methodology	1993-1997	1998-2003
Survey	1	1
Mathematical Model	6	2
Speculation/Commentary	5	3
Laboratory Exp	3	4
Framework & Conceptual Models	2	5
Case Study	4	6
Field Study	7	7
Interview	11	8
Secondary Data	9	9
Literature Analysis	8	10
Content Analysis	N/A	11
Field Experiment	10	12
Library Research	12	13
Qualitative Analysis	13	14

Table 12. Methodology Rank Comparisons

The most prevalent methodology used is the survey method with 21.3% 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 the growing maturity. We argue that the most likely reasons are perhaps threefold: the IT field changes very rapidly requiring quick attention to new issues on a constant basis, the external conclusion validity afforded by the survey method, and last but not the least – the majority of the current researchers in MIS are only trained in this method.

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

Framework and conceptual models fell from being ranked second in 1993-1997 to 5th in 1998-2003, with only 8.2% of the articles utilizing this methodology. The decline in use of this methodology is consistent with previous research which stated that journals now want to publish actual research more than frameworks that guide research. Again, it is 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 them. It was expected that this methodology will gain acceptance in years to come, but the trend continues and this methodology is still to find wide acceptance by the IS community.

CONCLUSION

This type of 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 but one 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 would be conducted on a periodic basis. Future work may also include non-top-tier journals as well as new and upcoming journals. This would lead to an examination of not just the best practices in MIS research, but also a more holistic review.

There are several implications of this study for researchers and journal editors. Researchers are made aware of the methodologies and subject domains that are in wide use. This would give them ample opportunity to understand the subject areas that are growing in popularity and the ones that are declining in interest. It helps them assess the position of their own interests in the overall MIS domain and make necessary adjustments in their research portfolio. 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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