Research in MIS—Points of Work and Reference: A Replication and Extension of the Culnan and Swanson Study

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Abstract

This study replicates and extends Culnan and Swanson's study (1986) of bibliographic citations in MIS and its foundational fields in order to assess the emergence of MIS as a distinct discipline. Academic researchers, particularly those endeavoring to make advances in knowledge which build upon prior research, benefit by being able to recognize cumulative research traditions. Progress toward building an MIS identity and cumulative research tradition is measured through statistical analyses of reference patterns during the past decade in ten selected journals. Four hypotheses are tested which reveal that although MIS is still less established than its referent disciplines, maturation has occurred through systematic knowledge development and the existence of a cumulative body of research.
ACM categories: H.0, H.1.0, J.0, K.6.0
Keywords: management information systems, MIS research, bibliometrics

INTRODUCTION

The legitimacy of the MIS field has been defended and debated ever since its inception. Peter Keen raised the question of whether MIS could become a "classical research area" with its own "cumulative tradition" at the first International Conference on Information Systems in 1980. This question has since become the object of a study by MIS researchers. Studies on the evolution of MIS can be traced back to Hamilton and Ives (1982) examination of knowledge utilization among MIS researchers. Culnan (1986) conducted a co-citation analysis of the MIS literature from 1972-1982 in order to identify intellectual subfields. Farhoomand (1987) studied the evolution of MIS from a philosophical scientific perspective through the thematic analysis of research strategies of MIS articles. And Alavi, Carlson and Brooke (1989) investigated the absence of theories and lack of cumulative research tradition by analyzing and classifying major themes and types of MIS articles.

However, the only study that directly examines the fundamental question of the emergence of MIS as an independent scholarly field of study was conducted by Culnan and Swanson (1986). By using bibliometrics (citation count), they examined the extent to which research in MIS draws upon its reference disciplines and vice versa. This enabled an explicit assessment of MIS and its foundation fields. Their results suggested that while MIS was emerging as a distinct field of study, there was some uncertainty about its future. The study was conducted over the time period of 1980-1984. Given the significance of this line of research, this study undertook to replicate and extend the Culnan and Swanson study.

We sought to replicate that particular study for several reasons. In general, social sciences, like MIS, have viewpoints or scientific propositions which can be empirically tested. Replication research contributes to the scientific advancement of the social sciences since these viewpoints can be confirmed by replication (Amir and Sharon, 1991). A five-year period has elapsed since the Culnan and Swanson study, which is a significant time in the short lifespan of such a dynamic field. Culnan and Swanson's methodology— bibliometrics—is attractive because it is unobtrusive; analysis occurs after a paper has been published, without any direct con-tact with the author. Thus, the Culnan and Swanson study allows us to maintain a high level of procedural consistency with the original study. For these reasons, it is both possible and impor-tant to temporally extend the previous study.

THE CULNAN AND SWANSON STUDY

Culnan and Swanson's study investigated relationships between MIS and its referent disciplines as well as the extent to which a cumulative research tradition had been forged. In exploring the research questions, they developed four hypotheses using their own definitions of work and reference points. We used the four definitions as they were stated by Culnan and Swanson:

> "Any published MIS article may thus be characterized by its work point (the field represented by the journal in which the article appears), and by its reference point (the distribution of the article's bibliographical references to journals at the same and other work points). As a consequence, the relative frequency with which MIS articles are published at different work points, and the corresponding distributions of reference points for these same articles, provide a useful basis for the location of the MIS field." (p. 291)

The three work points (other than MIS) used by Culnan and Swanson were computer science, management science, and organizational science. They posit that each focuses upon foundational elements that are fundamental to the study of MIS.

The journals used to represent the MIS work point were the *MIS Quarterly* (MISQ) and the *Proceedings of the International Conference on Information Systems* (ICIS). The computer science work point was represented by *Communications of the ACM* (CACM). The management science work point was represented by *Management Science* (MS), and the organizational science work point was represented by the *Academy of Management Journal* (AMJ), the *Academy of Management Review* (AMR), and the *Administrative Science*

Quarterly (ASQ). Culnan and Swanson cautioned that their study might be strongly conditioned on the pool of selected journals.

The results of the Culnan and Swanson study generally supported the proposition that MIS was emerging as a distinct field of study with its own cumulative tradition, based on bibliometric analysis over the 1980-1984 period.

DIFFERENCES IN THIS STUDY

We extended Culnan and Swanson's work in terms of journal selection, time period covered, and statistical analysis employed. Individual biases regarding journal priorities within different disciplines can often be arbitrary. This problem is compounded in the case of a relatively less established field such as MIS. It was felt that Culnan and Swanson's base of journals needed to be expanded to enhance the validity of the study.

Table 1. Summary of Journals Used in Research on the MIS Discipline

Studies	MIS	MS	CS	OS	ACCT
Nolan & Wetherbe* (1980)	MISQ DB	MS INT	CACM COSU	HBR SMR BH	
Hamilton & Ives (1982)	MISQ DB I&M	MS DS	CACM COSU TDBS IBMSJ	HBR SMR AMJ AMR	AR JA
Hamilton & Ives (1983)	MISQ DB I&M DAMA JSM EDPA	MS INT DS	CACM COSU TDBS IBMSJ	SBR SMR AMJ	
Vogel & Wetherbe (1984)	MISQ DB I&M DAMA JDE SOS	MS DS	CACM COSU TDBS	HBR SMR AMJ	AR
Culnan & Swanson (1986)	MISQ ICIS	MS	CACM	AMJ AMR ASQ	
Culnan ** (1987)	MISQ	MS INT DS	CACM COSU	HBR SMR	AR

Legend:
AMJ—Academy of Management Journal
ASQ—Administrative Science Quarterly
COSU—Computing Surveys
DS—Decision Sciences
I&M—Information & Management
INT—Interfaces
JSM—Journal of Systems Management
SMR—Sloan Management Review

AMR—Academy of Management Review
BH—Business Horizons
DAMA—Datamation
EDPA—EDP Analyzer
IBMSJ—IBM Systems Journal
JA—Journal of Accountancy
MISQ—MIS Quarterly
SOS—Systems, Objectives & Solutions

AR—Accounting Review
CACM—Comm. of the ACM
DB—DATA BASE
HBR—Harvard Business Review
ICIS—Proceedings of the ICIS
JDE—Journal of Data Education
MS—Management Science
TDBS—Trans. on Database Systems

* Nolan & Wetherbe assess their MIS research framework in terms of its ability to relate to the existing 33 MIS articles, of which 32 are found in nine journals.
** Culnan identifies the 36 most frequently referenced MIS articles, of which 19 are published in nine journals.

To establish relatively more "objective" criteria for journal selection at the MIS work point, previous studies were examined that had faced a similar issue. Each study used a different set of journals. These are summarized in Table 1. Two journals were selected at least four times in the six studies. These were *MISQ* and *DATA BASE* (DB). Both of these are used in this current study. In additional the *Journal of Management Information Systems* (JMIS) is included because, while relatively new, it has gained recognition and stature (Ramesh and Stohr, forthcoming).

The computer science work point was expanded to include the prestigious *Computing Survey* (COSU), along with *CACM*. The management science work point included both *Management Science* (MS) and *Decision Sciences* (DS) in this study. Finally, the organizational science work point retained the core journal, AMJ, and added both the *Harvard Business Review* (HBR) and the *Sloan Management Review* (SMR). These journals, despite their practitioner orientation, have had significant impact on the MIS research and have consistently been selected in prior studies.

The original study is lengthened here into a ten-year study (1980-1989), as this decade represents a significant period in the history of the MIS field, with the first ICIS conference taking place in 1980. Trends tentatively identified in the original study between 1980 and 1984 are further supported or reassessed in this study. Bibliographic citation analysis is again applied. In order to enhance investigative power and insight, additional statistical techniques have been applied.

and support for articles at the MIS work point will be derived from sources external to established MIS publication outlets.

H3: The reference distance for the MIS work point is gradually decreasing.

It is postulated that articles appearing in MIS publications are increasingly referencing articles from MIS publications. Consequently, we can test if MIS is emerging from its foundation as an established field of study. Prior research by Hamilton and Ives (1982) has assumed that intra-disciplinary publication frequency is an indicator of interaction with prior research efforts. This hypothesis tests whether the MIS discipline is building a cumulative research tradition. Keen (1980) defines a cumulative research tradition as "one where researchers build on each other's and their own previous work."

H4: The reference points for the MIS and foundational work points are converging (while moving in the direction of the MIS work point).

It is posited that articles appearing in non-MIS publications are increasingly referencing articles from MIS publications. This hypothesis evaluates the level of diffusion of knowledge from the MIS work point into other disciplines. That is, it tests the level of MIS distinctness as evident in other discipline publications. This hypothesis was not supported in the original study.

HYPOTHESES

Culnan and Swanson's four hypotheses are used to investigate MIS research in order to assess its distinctness as a field with its own unique cumulative tradition.

H1: The reference point for any work point will lie nearer that work point than will the reference points associated with the other work points.

In other words, each work point can be differentiated by the predominant reliance on references to its own work point. This hypothesis is fundamental to the premise of this research. Rejection of this hypothesis suggests that references in a work point do not reflect its foundation base. That is, MIS articles in *Communications of the ACM* just charter a computer science publication outlet without any affiliation with the computer science discipline.

H2: The reference distance[1] for the MIS work point will be greater than the reference distances associated with the foundation work points.

That is, articles in MIS publications are more likely to rely on non-MIS publications for references than non-MIS publications. In essence, this hypothesis posits that the MIS discipline is less established than its referent disciplines. Research foundations

[1] Reference distance can be defined as the relative frequency with which work published at a work point are referenced by work published at the different work point.

METHODOLOGY

Research Sample

The article selection procedure identified 929 MIS articles published over the period 1980-1989 in the ten selected journals shown in Table 2, (except JMIS, which has only been published since 1984). The entire collection of articles from the three MIS journals were included. For the non-MIS journals, the selection of an MIS article is based on either the keywords for the article, or the journal section in which the article appeared. Keywords might include: information systems, information system design,

Table 2. Selected Journals

Work Points
Management Information Systems
MIS Quarterly (MISQ)
Journal of MIS (JMIS)
DATA BASE (DB)
Management Science
Management Science (MS)
Decision Sciences (DS)
Computer Science
Communications of the ACM (CACM)
Computing Surveys (COSU)
Organizational Science
Harvard Business Review (HBR)
Sloan Management Review (SMR)
Academy of Management Journal (AMJ)

Table 3. MIS Articles Published and Referenced

Work Points	MIS Articles Published 1980-1989	References MIS	MS	CS	OS
MIS Work Point					
MISQ	252	669	387	250	452
JMIS	146	350	190	164	177
DB	154	203	167	124	139
Total	552	1222	744	538	768
MS Work Point					
MS	61	73	252	33	90
DS	80	97	298	40	108
Total	141	170	550	73	198
CS Work Point					
CACM	115	131	69	193	71
COSU	16	35	21	121	31
Total	131	166	90	314	102
OS Work Point					
HBR	46	2	3	1	91
SMR	46	13	12	10	104
AMJ	13	12	22	0	42
Total	105	27	37	11	237
Overall Totals	929	1585	1421	936	1305

management information systems, decision support systems, or human information processing. Articles included in research sections such as management of computing and applications, and Operations and Management, or classified under the codes H or K (CACM). Articles in journals that are neither self-indexed with keywords nor classified with codes were reviewed for inclusion by reading their abstracts. In most cases, the selection of MIS articles from HBR, SMR, and AMJ was self-evident.

Findings

Table 3 shows a tabulation of the MIS articles selected in each journal, including the total number of corresponding references over the ten-year period 1980-1989. Figure 1 shows the proportions of MIS articles from each work point.

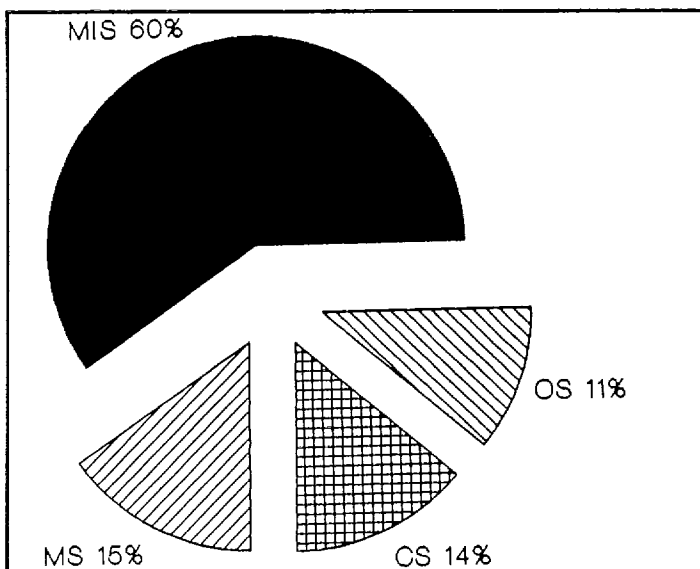Figure 2 shows the overall reference points of all articles

Figure 1. MIS Articles by Work Point

covered. A comparison with Figure 1 indicates that, in general, the number of references originating from a work point roughly parallels the number of articles from that work point. The possible exception is organizational science, where SMR and HBR typically have fewer references.
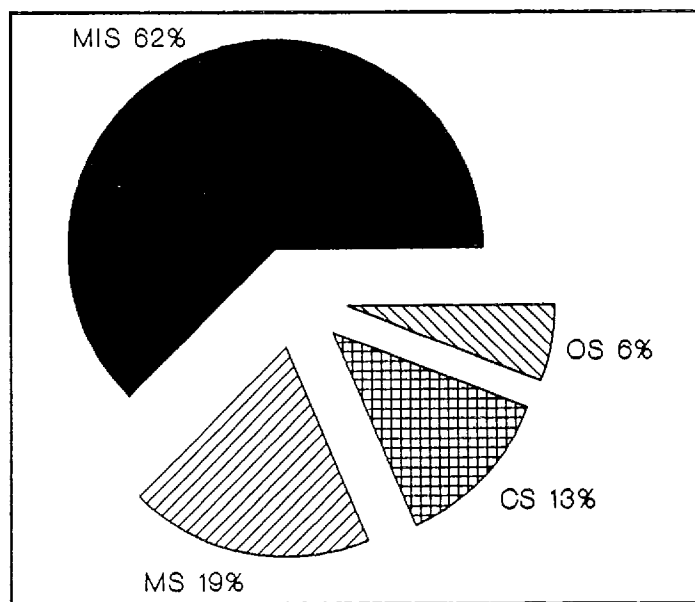

Figure 2. References by Work Point

Table 4 presents the distribution of mean reference points for the four work points. This data is used to test hypothesis 1, which posits that references to a work point are most likely to occur at that same work point. The higher diagonal numbers seem to support that hypothesis.

Univariate analysis of variance (ANOVA) was used to compare the means of each reference point among the work points (see small boxes in Table 4). In terms of assumptions required for

Table 4. MIS Work Points and Associated Reference Points

Work Points	Average Number of References				
	MIS	MS	CS	OS	ALL
MIS	2.21	1.35	0.97	1.39	5.93
MS	1.21	3.90	0.52	1.40	7.03
CS	1.29	0.70	2.36	0.79	5.14
OS	0.26	0.35	0.10	2.26	2.97
ANOVA F-ratio (df = 3, 925)	34.07	69.73	49.99	17.39	10.24
p-value	.0001 (a)	.0001 (b)	.0001 (c)	.0001 (d)	.0001

Note: Post-hoc tests for significant differences (at the p <.05) between groups (Tukey's method):
(a) MIS different from MS, CS, and OS, and OS different from MS and CS in terms of MIS references.
(b) MS different from MIS, CS, and OS, and MIS different from CS and OS in terms of MS references.
(c) CS different from MIS, MS, and OS, and MISS different from MS and OS in terms of CS references.
(d) OS different from MIS, MS, and CS, and CS different from MIS and MS in terms of OS references.

the ANOVA tests, both the assumption of normality and the assumption of homogeneity of variances are violated. Thus, ranked scores obtained from raw data are used for ANOVA procedures, which is often a better method than the chi-square approximation used by the Kruskal-Wallis nonparametric test. From the results of ANOVA in Table 4, each reference point differs significantly across work points. The average number of references to a work point is greatest at the same work point, without exception. Further, all post hoc tests of relevant differences prove to be statistically significant. Thus, hypothesis 1 is supported and evidence is provided consistent with the assumption that work points selected are empirically well represented.

Hypothesis 2 is tested based on the data presented in Table 5, which shows the relationships of the mean of "x references" in the "y work point." For example, 1.35 is the mean of MS references in the MIS work point. That is, 1.35 is the average number of MS references from MIS articles appearing in the MIS work point. The main focus of hypothesis 2 is to test whether the MIS work point is less established than its referent work points. In terms of testing this hypothesis, the means of the non-MIS references in MIS work point are compared with the means of MIS references (see the small boxes) by applying a two sample t-test. For example, from Table 5, the mean of MS references

Table 5. Cross-Disciplinary Patterns of Mean References

Work Points	Average Number of References				
	MIS	MS	CS	OS	ALL
MIS	2.21	1.35	0.97	1.39	5.93
MS	1.21	3.90	0.52	1.40	7.03
CS	1.27	0.69	2.40	0.75	5.13
OS	0.26	0.35	0.10	2.26	2.97

Non-MIS references in MIS work points vs. MIS references in non-MIS work points	t statistic	p-value
1.35 vs. 1.21	0.65	0.5192
0.97 vs. 1.27	-1.33	0.1847
1.39 vs. 0.26	7.67	0.0001
1.24 vs. 0.96 (overall	2.18	0.0293

(1.35) in the MIS work point is compared with that of MIS references in the MS work point (1.21). Using a two-sample t-test, two mean references (1.35 vs. 1.21) are compared. If the MIS work point is more established than its referent work point, the average number of the non-MIS references in the MIS work point should be less than the average number of the MIS references in the non-MIS work point.

From the results of the t-test in Table 5, there is no significant difference between the mean of MIS references in the MS work point and the mean of MS references in the MIS work point, and between the mean of MIS references in the CS work point and the mean of CS references in the MIS work point. The t-test comparing the mean of MIS references in the OS work point and the mean of OS references in the MIS work point denotes a significant difference; this indicates that OS references in the MIS work point are greater than those of MIS in the OS work point. However, the result of the overall t-test confirms that the MIS work point is still less established than its referent work points ($p < 0.05$).

Hypotheses 3 and 4 were advanced above to examine patterns of change in the MIS reference points over time. Table 6 provides the data to test hypothesis 3, i.e., the reference distance for the MIS work point is decreasing. In other words, we needed to test whether research at the MIS work point increasingly draws upon literature from its own work point (cumulative tradition) over the 1980-1989 period. Also, we needed to test how that trend compared to the changes in non-MIS references at the MIS work point over the same period.

On observing the column under MIS in Table 6, we can see a general increase in the average number of MIS references. Such a clear trend is not apparent in the non-MIS cases. Figure 3 plots these trends, where again we see the clear upward slope in the case of MIS references. To test for changes over time, the 1980-1989 period was divided into two periods, 1980-1984 and 1985-1989. A Chow test was used to test the trend change in the relationship between the mean of MIS references and that of non-MIS references at the MIS work point between the period of
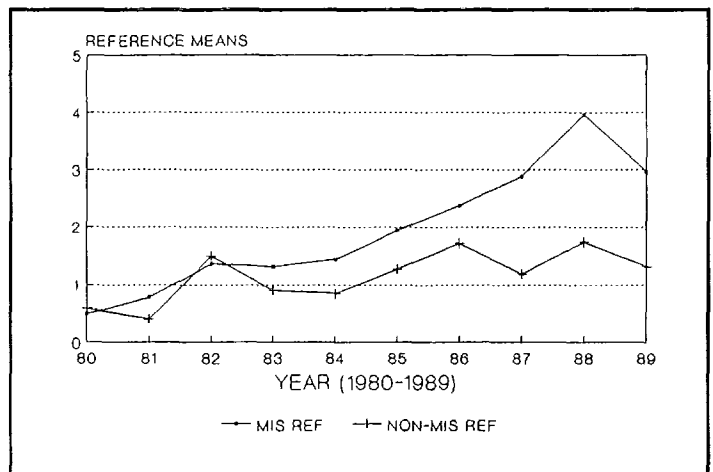

REFERENCE MEANS

YEAR (1980-1989)

— MIS REF —+— NON-MIS REF

Figure 3. Reference Trend in MIS Work Point

1980-84 and the period of 1985-89. The Chow test is a popular statistical method of testing for differences between two or more regressions.

The slope between the two periods is significantly different. This indicates the relative increase in MIS references with respect to non-MIS references at the MIS work point (refer to slopes 0.74 vs. 1.23 in Table 6). The test supports hypothesis 3 and indicates that the MIS work point is building on its own previous work and moving toward its own cumulative tradition.

Hypothesis 4 proposes that the reference point for the MIS and non-MIS work points are converging and moving in the direction of the MIS work point. While in hypothesis 3 we tested for the upward trend in MIS references at the MIS work point, here we test for the upward trend in MIS references (compared to non-MIS references) at the sum of all non-MIS work points. In order to test this hypothesis, the authors use data of ten years of references at non-MIS work points (see Table 7). Figure 4 shows the upward change of the mean of MIS references as well as the mean of non-MIS references at the non-MIS work point over the period. The Chow test is also applied to test the trend

Table 6. Mean References in MIS Work Points (1980-1989)

Year # of Articles	Average Number of References				
	MIS	MS	CS	OS	Non-MIS
1980 (N=46)	0.50	0.52	0.33	0.96	0.60
1981 (N=29)	0.79	0.52	0.17	0.55	0.41
1982 (N=39)	1.36	2.05	0.67	1.79	1.50
1983 (N=38)	1.32	0.95	0.50	1.29	0.91
1984 (N=52)	1.44	0.69	0.92	0.94	0.85
1985 (N=63)	1.95	1.24	1.19	1.41	1.28
1986 (N=64)	2.39	2.53	0.92	1.75	1.73
1987 (N=72)	2.89	1.11	0.90	1.57	1.19
1988 (N=72)	3.96	1.97	1.60	1.69	1.75
1989 (N=77)	2.97	1.18	1.44	1.35	1.32

Regression Models	R-Square (p-value)	Chow Test	
		F-ratio	p-value
Period I: MIS = 0.4 + 0.74 Non-MIS	0.2899 (0.0087)	7.00 (df = 2,22)	0.00445
Period II: MIS = 1.0 + 1.23 Non-MIS	0.5139 (0.0026)		

Table 7. Mean References in non-MIS Work Points (1980-1989)

Year # of Articles	Average Number of References				
	MIS	MS	CS	OS	Non-MIS
1980 (N=31)	0.45	2.03	0.61	1.97	1.54
1981 (N=28)	0.79	1.89	1.00	1.36	1.42
1982 (N=38)	0.13	1.11	0.34	1.39	0.95
1983 (N=52)	0.79	1.29	1.00	1.48	1.26
1984 (N=47)	0.72	2.00	0.81	1.15	1.32
1985 (N=27)	0.37	0.81	1.41	0.93	1.05
1986 (N=34)	1.21	1.65	0.68	2.00	1.44
1987 (N=38)	1.42	2.76	1.26	1.79	1.94
1988 (N=34)	1.76	2.35	1.74	0.94	1.68
1989 (N=48)	1.71	1.98	1.67	1.29	1.64

Regression Models	R-Square (p-value)	Chow Test	
		F-ratio	p-value
Period I: MIS = 0.1 + 0.35 Non-MIS	0.3606 (0.0003)	33.47	0.0000
Period II: MIS = -0.8 + 1.24 Non-MIS	0.8981 (0.0001)	(df = 2,60)	

REFERENCE MEANS

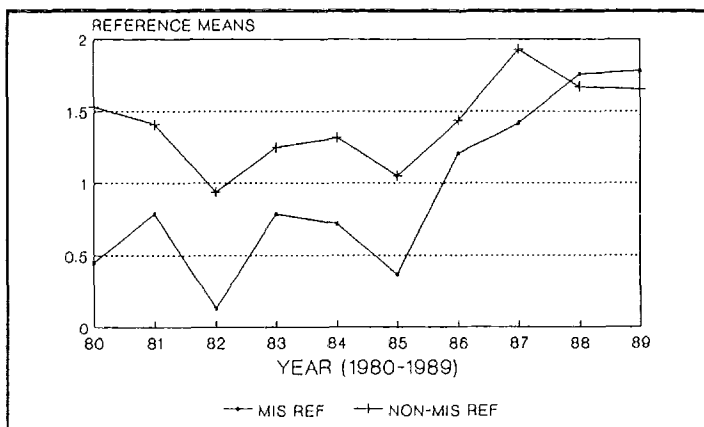YEAR (1980-1989)

—◆— MIS REF   —+— NON-MIS REF

Figure 4. Reference Trend in the non-MIS Work Points: Level of Diffusion

change in the relationship between the mean of MIS references and that of non-MIS references at the non-MIS work point between the period 1980-1984 and 1985-89. The trend change between the two periods is significantly different (refer to slopes 0.35 vs. 1.24 in Table 7).

This significance allows us to conclude that MIS references in non-MIS work points is increasing and is greater than the change in non-MIS references in non-MIS work points. This result supports hypothesis 4 and indicates that the MIS work point is increasingly being viewed as a distinct field at the non-MIS work points.

In order to further confirm the results of hypotheses 3 and 4, Table 8, which presents the average reference point for all MIS and non-MIS work points, is employed. The reference trend over the ten year period indicates a change over the decade for the mean of MIS references (decade increase from 0.48 in 1980 to 2.49 in 1989). On the other hand, the changes in the mean of non-MIS references is not as high (decade increase from 0.98 in 1980 to 1.45 in 1989). The result of the Chow test in Table 8 indicates that the trends between the period of 1980-84 and 1985-89 are significantly different in terms of the relationship

between the mean of MIS references and the mean of non-MIS references (refer to slopes 0.31 vs. 1.19 in Table 8). This indicates that for all work points MIS references are increasing at a rate higher than non-MIS references.

DISCUSSION

As Culnan and Swanson cautioned, the results of this study may also be conditioned by the pool of selected journals and proceedings. Although we extended the number of journals, we had to exclude several other journals which also represent outlets for MIS research. For example, *Information and Management*, *Interfaces*, and *Transactions on Database Systems* were excluded even though they can be considered as major MIS research outlets.

The consistency and significance of these results permit several conclusions concerning the current position of the MIS discipline and enable comparisons with results from Culnan and Swanson's study.

The Work Points Are Distinct

The unequivocal support for hypothesis 1 implies that the work points selected are distinct and the premise of the study is sound.

The MIS Work Point is Gaining Identity

Even though the results indicate that the MIS work point is less established than non-MIS work points (hypothesis 2), there is little doubt that it is gaining in stature over time. In fact, an interesting difference was found in the relationship with CS work point. Only the mean of CS references in the MIS work point is less than that of MIS references in the CS work point. Such a finding is different from that of the original study in which the mean of MIS references in the CS work point was greater.

Even though this exception may indicate that the MIS work point is mature enough to disassociate itself from the CS work point, it can be interpreted in two different ways. One possibility

Table 8. Mean References in MIS and non-MIS Work Points

Year # of Articles	Average Number of References				
	MIS	MS	CS	OS	Non-MIS
1980 (N=77)	0.48	1.13	0.44	1.36	0.98
1981 (N=57)	0.79	1.19	0.58	0.95	0.91
1982 (N=77)	0.75	1.58	0.51	1.60	1.23
1983 (N=90)	1.01	1.14	0.79	1.40	1.11
1984 (N=99)	1.10	1.31	0.87	1.04	1.07
1985 (N=90)	1.48	1.11	1.26	1.27	1.21
1986 (N=98)	1.98	2.22	0.84	1.84	1.63
1987 (N=110)	2.38	1.68	1.03	1.65	1.45
1988 (N=106)	3.25	2.09	1.64	1.45	1.73
1989 (N=125)	2.49	1.49	1.53	1.32	1.45

Regression Models	R-Square (p-value)	Chow Test F-ratio	p-value
Period I: MIS = 0.3 + 0.31 Non-MIS	0.2475 (0.0007)	29.18	0.0000
Period II: MIS = -0.1 + 1.19 Non-MIS	0.7642 (0.0001)	(df = 2,86)	

is that there has been a more efficient flow of knowledge between the two work points. The CS work point has been the primary reference discipline for MIS researchers from the early period of MIS research (Hamilton and Ives, 1982). The other is the trend that current MIS research has a strong organizational and managerial focus, which may result in less interest in technical CS articles. This interpretation was supported by Culnan's work concerning the intellectual structures in MIS (Culnan, 1987). Whatever the reason, this result bodes well for the establishment of an identity for MIS.

MIS is Building a Cumulative Research Tradition

The findings support the building of a cumulative research tradition in the MIS field (hypothesis 3). Culnan and Swanson consistently suggest that MIS researchers should be well anchored in prior research endeavors. The growth of this self-reference trend within the MIS field facilitates the recognition of MIS as an independent discipline within the MIS community itself. It also enables a more focused research-building tradition.

Other Work Points Are Recognizing the MIS Work Point

Hypothesis 4, which was unsupported in the original study, is strongly supported in this present study. It posited that the MIS work point is increasingly being viewed as one distinct field by other work points. Culnan and Swanson pointed out that both benefits and costs are associated with the establishment of a scholarly field of study. In evaluating whether the benefits of emergence and establishment ultimately exceed the costs, they suggest one guideline: "We need to see whether other fields, old or new, come to rely themselves upon MIS foundations" (p. 300).

There is a dramatic upward change, especially after 1984, in the number of MIS articles cited by other work points. As Culnan and Swanson pointed out, however, organizational science is still outside this general conclusion. While the mean of OS reference in the MIS work point is the most numerous among non-MIS references, the mean of MIS references in the OS work point is disproportionately small. A similar disparity

had been observed between CS and MIS to a lesser extent by Hamilton and Ives (1982) in a study conducted ten years earlier. Over the ten years, the gap between CS and MIS has narrowed, as one can see from Table 5. This finding may indicate that the maturation of a cross-disciplinary relation facilitates the efficient flow of knowledge. From this it might be reasonable to expect the same improvement between OS and MIS, since OS themes have been central in current MIS research.

CONCLUSIONS

This study replicates and extends Culnan and Swanson's attempt to assess the emergence of MIS as a distinct work point. It identifies progress toward building a cumulative research tradition, based upon statistical analyses of references patterns in the ten selected journals for the period 1980-89. We conclude that even though the MIS work point is still less established than its referent work points, it is increasingly being viewed as a distinct field with its own cumulative tradition. This is the evidence supporting the acceptance of MIS as a legitimate academic discipline.

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