INFORMATION SYSTEMS AND THE
ORGANIZATION: MEASURING ALIGNMENT

by

Jonathan Miller
Senior Lecturer, University of Cape Town
Visiting Scholar, New York University

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Abstract

Achieving alignment between the goals of the information systems (IS) function and the organization as a whole remains a top priority. A perceptual instrument is described that sets out to measure this alignment. It allows organizations to monitor the alignment and effectiveness of their IS function over time and to compare their situation with others. Largescale surveys of different industry sectors and more extensive studies of individual companies in the United States and South Africa have been undertaken using the instrument. The results are used to evaluate the reliability and validity of the instrument. Several hypotheses regarding alignment are tested. The results suggest that the degree of alignment between the importance and performance of specific aspects of IS influences overall perceptions of IS success. This applies to assessments by both IS staff and users. It is also found that IS staff and users are mostly in agreement about the importance of different aspects of IS and the success with which they are being performed, but the extent of this agreement is not a predictor of overall success. Conclusions are drawn regarding the link between alignment and effectiveness of the IS function and recommendations are made for researchers and practitioners.

Information Systems and the Organization:
Measuring Alignment

Introduction

Information Systems (IS) professionals and business managers continue to regard *alignment of information systems with the organization* as a key concern. This is clear from surveys in North America (Index Group 1990), Europe (Price-Waterhouse 1990), Australia (Watson 1989) and South Africa (Miller & Pitt 1990). Other issues that feature high on the list of priorities in these surveys are *strategic planning for IS* and *evaluating the effectiveness of IS*. Since strategic planning for IS sets out to effect proper alignment of IS with business goals (Earl 1990) and, at least in part, IS effectiveness relates to such alignment (Ein-Dor & Segev 1981, Miller 1989), the emphasis on alignment emerges even more strongly.

Many authors describe specific cases of successful and unsuccessful alignment, present frameworks for analysis and offer prescriptive advice on how to achieve success in this area. To date however, there is no common operational definition of alignment, nor an accepted method for measurement. If there were, organizations could objectively track alignment over time and researchers could compare the relative success of different organizations in achieving this goal.

A reason for our lack of success in this arealies in the complexity of the organizational arena and its impact on IS. Policy and strategy issues are what Mason & Mitroff (1981) call *wicked* as opposed to *tame* problems. Wicked problems have no definitive formulation and no single explanation for the same discrepancy. There are no "right" answers and every wicked problem can be considered as a symptom of another problem.

> *"Wicked problems are not necessarily wicked in the perverse sense of being evil. Rather, they are wicked like the head of a hydra. They are an ensnarled web of tentacles. The more you attempt to tame them, the more complicated they become."* (Mason & Mitroff, 1981, p.10).

Failure to recognize this organizational context for IS and apply appropriate analytical tools and measures has contributed to a too narrow emphasis on the financial benefits of information systems. Now that IS permeates all levels of organizational activity, success in aligning information systems and organizational goals must recognize a broader, more complex and fluid set of criteria.

Measurement of IS alignment and the ultimate goal of improving IS effectiveness thus needs to be considered in the context of organizational effectiveness. A study of the literature reveals that there are no agreed measures of organizational effectiveness (Cameron & Whetton 1983). Quinn & Rohrbaugh (1983) synthesize the variety of published criteria of organizational effectiveness in their so-called *competing values* model. They argue that organizations must grapple continually with trade-offs related to *internal vs. external focus, control vs. flexibility,* and *means vs. ends.*

Measures of success in achieving these trade-offs do relate to efficiency, productivity, and profitability - all quite easily expressed in financial terms. However they also relate to human resource development, adaptability to a changing environment, positioning for growth in the marketplace, internal stability and control. These areas are much less amenable to well-specified economic or financial analysis. Furthermore, studies show that the criteria of effectiveness applied by organizations vary with stage of growth, conditions in the environment and the perceptions of the individual stakeholder (Smith, Mitchell & Summer 1985, Mendelow 1987). Ultimately organizational effectiveness and by implication, IS effectiveness, involves the question of values (Cameron & Whetton 1983).

We can conclude that measures of alignment of information systems and the organization will not be common across all organizations. Criteria within a single organization will vary with changing value structures, stage of growth, and nature and level of the organizational stakeholder.

This article offers an approach to evaluating IS that recognizes the dynamic nature of the organizational context. First the article comments briefly on several approaches to measuring IS effectiveness and elaborates on the current trend toward perceptual measurement. Then the development and application of an instrument that measures alignment between information systems and the organization is described. The instrument can be used to measure changes in alignment over time and to compare different organizations. The author and colleagues have evaluated the reliability and validity of the instrument and conducted empirical tests of specific hypotheses regarding alignment of IS and the organization. The results of these tests are reported and conclusions are drawn regarding IS alignment, effectiveness and the connection between these two constructs.

Measuring IS Effectiveness - Perceptual Instruments.

There are a variety of approaches to the measurement of IS effectiveness. These include application of economic analysis (Chismar & Kriebel 1985, Williamson 1981), formal cost-benefit analysis (Zmud 1983) and systems usage (Lucas 1981, Trice & Treacy 1986). None of these approaches has been wholly satisfactory as a basis for measurement. Various authors have noted the limitations of economic analysis (Crowston & Treacy 1986), cost-benefit analysis (Ginzberg 1979) and usage measurement (Melone 1990, Srinivasan 1985).

There is a fourth measurement category that treats **user perceptions** as a surrogate for usage, quality, value and other systems attributes. While some criticize perceptual data for being "soft" and "subjective," general systems theory supports the validity of user perceptions as a measure of system effectiveness (Churchman 1971). Mason & Swanson (1979) argue cogently that measures for management decisions should be *influential*, not simply *accurate*. The emphasis should shift from the thing measured to the user's response to the measure. Academic arguments aside, a recent survey finds that over 40% of U.S. corporations use perceptual instruments to measure IS (Conference Board 1990). This approach to evaluating information systems dominates practice and merits careful attention.

Many researchers have developed instruments that tap user perceptions (eg. Schultz & Slevin 1975, Jenkins & Ricketts 1979, Bailey & Pearson 1983, Ives, Olson & Baroudi 1983, Miller & Doyle 1987, Doll & Torkzadeh 1988). .There are a variety of terms associated with perceptual instruments including *system acceptance, perceived usefulness, MIS appreciation, feelings, perceptions* and *beliefs* (Swanson 1982) and it is not always clear what a given instrument is measuring. Furthermore, in practice, measurement of IS perceptions has become virtually synonymous with a particular operationalization, **user information satisfaction (UIS):**

> *"The extent to which users believe the information system available to them meets their information requirements."* (Ives, Olson & Baroudi 1983, p.785).

Miller (1989) has reviewed twelve perceptual instruments and shows that they vary widely in number and range of items included and are largely atheoretic in their derivation. At least two mental constructs - *cognitive beliefs* about IS and *affective attitudes* toward IS - appear in the instruments and are not clearly distinguished. The mixed results obtained in empirical studies (Swanson 1982), lack of clarity in IS theory formation (Goodhue 1986) and a shaky foundation for the measurement of attitudes (Melone 1990) have all been attributed to confusion in this area.

A particular 39-item UIS instrument (Bailey & Pearson 1983), a psychometrically sounder 22-item version of it (Ives, Olson & Baroudi 1983) and a 13-item Short Form (Baroudi & Orlikowski 1988) have attracted much attention. There have been several reported field studies using one or other of them (Mahmood & Becker 1986, Raymond 1987, Baronas & Louis 1988, Tait & Vessey 1988, Montazemi 1988). However there have also been criticisms that the Bailey-Pearson instrument lacks construct validity (Treacy 1985) and is out of date in the 1980s IS environment (Doll & Torkzadeh 1988). Careful experimentation has led Galletta and Lederer (1986) to question the test-retest reliability of the Short Form.

The Current Instrument.

Building on the work of Bailey and Pearson and Alloway and Quillard (1981), the author and colleagues in South Africa have developed and applied a new perceptual instrument to evaluate the overall IS function (Miller & Doyle 1987, Miller 1988, 1989). The following aspects of the instrument and its administration suggest where and how the present work differs from other examples of UIS research.

1   The objective of this research is to assess the overall IS function in the 1980s. Therefore a particular paradigm for IS was selected (Ein-Dor & Segev 1981, 1990) and items chosen to map onto it. This paradigm proposes three subsystems for IS: the *structural* (reflecting the operational characteristics of facilities and systems), *procedural* (planning and control issues) and *behavioral* (roles and characteristics of executives, users and implementors). Appendices One and Two compare the Bailey-Pearson instrument and its derivatives with the present instrument. Appendix One shows that twenty-one items have been retained, eighteen discarded and sixteen new ones added. These changes lead to a broadening of scope and shift in emphasis from detailed mainframe operational concerns to managerial, behavioral and end-user computing issues.

2   The Bailey-Pearson instrument uses several performance-related scales and an importance weighting for each item. However, Pearson (1977) found that importance weighting did little to change his conclusions based on performance alone. Perhaps because of this observation and subsequent commentary (Ives, Olson & Baroudi 1983), current researchers have all but discarded the importance rating from their UIS instruments. This is evident from inspection of the studies mentioned in the previous section and others (Doll & Torkzadeh 1988, Guimaraes & Gupta 1988). In contrast the current instrument explicitly incorporates importance with performance scales. However the importance scale is not appended as a weighting factor for performance. It is treated as a specific measure of the *business importance* of a particular aspect of IS as compared to *IS performance* of that aspect. The current instrument presents the full list of items twice, first for assessment of "business importance" and secondly for "IS performance" (Miller & Doyle 1987). Appendix 2 compares the scales in the different instruments mentioned above.

3   The current questionnaire uses wording to tap *cognitive perceptions* of company priorities and IS performance and not to encourage *affective reactions* to personal IS experiences. Thus instructions are to "assess the importance to the organization of . . . " as opposed no "how do you feel about what you are getting?" Respondents are encouraged to act as "expert witnesses."

4   In the UIS literature, few studies have treated IS people as more than providers of technical information. The emphasis has been on the "user" in UIS. Some authors, however, have found large differences in IS and user perceptions (Dickson & Powers 1973, Mendelow 1987) and others complete agreement (eg. Montazemi 1988). Given these contradictory findings, and on the basis that perceptions of the providers of the IS service should be just as relevant to IS effectiveness as those of users, the present study specifically seeks responses from both IS professionals and users.

Validity and Reliability Testing.

The content of the current instrument derives from a study of previous well-researched instruments and a comprehensive paradigm for IS. Several IS professionals and academics reviewed the items and twenty-two managers attending an executive course on IS Management pilot-tested the instrument. The *content validity* of the resulting instrument is thus likely to be high.

Factor analysis was used to examine *construct validity*. Researchers conducted three nationwide surveys using the instrument. They obtained results from 794 IS and user managers in forty-two manufacturing, twenty-one financial services and twenty retailing firms (Miller & Doyle 1987, Miller 1988). Exploratory factor analysis using varimax rotation was applied to each industrial sector and to the combined sample. In each case the analysis grouped IS and user responses, but treated importance and performance separately.

Factor analyses of the importance ratings explained 55% or less of the variance in responses and did not produce stable or "sensible" factors[1]. On the other hand equivalent analyses of the

performance ratings explained over 60% of the variance and yielded stable and meaningful factors. Each industry and the combined cross-sectoral sample produced very similar factors (Miller 1988). They are named:

1 Traditional Systems, 2 End-User Computing, 3 Strategic Issues, 4 Responsiveness to Change, 5 User Participation, 6 IS Staff Characteristics[2].

The numbers Appendix Two show the association between items and factors. In terms of the original aim of mapping the Ein-Dor & Segev paradigm for IS, these results are very satisfactory. Factors 1 and 2 map the *operational* subsystem, factors 3 and 4 the *procedural* and factors 5 and 6 the *behavioral.* The instrument thus demonstrates a high degree of construct validity and is adequate for assessing the overall IS function.

The *predictive validity* of the instrument was examined in two ways. First each industry study correlated the average IS performance rating by firm across all items in the questionnaire with a separate single item performance rating (see Methodology section ahead). Pearson's r for the Financial Services sector (for instance) is 0.91, which is highly significant (Miller & Doyle 1987). In a further test, an independent researcher administered the questionnaire to new respondents in seven firms that had participated in the previous surveys. That researcher was not aware of the earlier results. He also evaluated IS performance through a series of extensive interviews with IS and user managers. One firm was going through a highly volatile period in IS, but with that exception, all other firms ranked similarly on overall performance ratings via the instrument and interview scores. This supports the predictive validity of the instrument. The study also supports its *test-retest reliability* in that the ranking of firms by average performance in the first and second surveys proved to be very similar. Table One shows the relevant data.

Table One: Comparison of Independent Surveys			
Firm	Average IS Performance Rating		Interview Score
	First Survey	Second Survey	
1	5.5	5.4	72
2	5.2	4.9	66
3	5.1	5.1	71
4	5.1	4.7	54
5	4.5	4.2	60
6	4.3	4.4	57
7	4.0	4.0	50

Finally *statistical reliability* of the performance ratings in the face of measurement error was measured via analyses of variance. Highly significant reliability coefficients of 0.94 for between and within-respondent variability and 0.88 for between and within-firm variability were found for the financial services sector (Miller & Doyle 1987) and similar results were found for the manufacturing and retailing sectors[3].

In summary, the validity and reliability test results for the proposed instrument give confidence that it may be used for assessment of the overall IS function. Based on the performance ratings, the items associate with stable constructs which are intuitively meaningful and map well onto an accepted paradigm for MIS.

Alignment - Initial Findings.

Several further analyses were applied to the data gathered in the three national surveys mentioned above. Cluster analysis led to a four way split of the firms for more detailed analysis and two attributes were found to vary with this grouping. First the average performance ratings varied quite markedly between groups. Second the correlation between the average performance and importance ratings for the 37 items in the questionnaire, across all respondents within each group of firms, also varied by group. Table Two shows the results for the three sectors. All Pearson's r coefficients except that for group 4 in the financial services sector are statistically significant at the 3% level or better. This finding is in sharp contrast to previous work by Alloway & Quillard (1981), who found no associations at all.

Table Two: Importance-Performance Correlations						
Success Group	Manufacturing Sector		Retailing Sector		Financial Services	
	Average Performance	Imp-Perf Correlation	Average Performance	Imp-Perf Correlation	Average Performance	Imp-Perf Correlation
1	5.2	.65	5.0	.67	4.9	.75
2	4.8	.65	4.6	.49	4.6	.54
3	4.5	.55	4.4	.44	4.3	.63
4	4.4	.50	4.1	.30	3.8	.17

(Source: Miller 1988, p99)

This finding suggests strongly that overall perceptions of IS performance do vary with the correlation between perceived importance and performance of individual aspects of IS. The correlation is interpreted as a measure of alignment between business importance and IS performance across the broad terrain of IS.

Alignment - The Current Study

The above studies relied on only 10-20 responses in each firm polled. The numbers of respondents and data collection did not allow comparisons of IS and user perceptions. Accordingly further study aimed at larger samples of respondents in fewer firms. The following hypotheses are formulated:

H1: User ratings of IS performance will increase with the extent of *alignment between importance and performance*

> **H1a:** as seen by the user community.
> **H1b:** as seen by the IS staff.

This hypothesis follows directly from the results of the initial study. However, given the varied findings of other authors regarding IS staff and user perceptions, the subhypotheses treat these categories separately.

H2: User ratings of IS performance will increase with alignment between user and IS staff perceptions of the *importance* of different aspects of IS.

This hypothesis explores the territory noted previously (Dickson & Powers 1973, Mendelow 1987, Montazemi 1988). It examines whether agreement between IS and users on issues important to the business leads to more successful IS as perceived by the users. (Many attempts to improve IS in corporations have the objective of improving communications on business issues between IS and users.)

H3: User ratings of IS performance will increase with alignment between user and IS perceptions of the *performance* of different aspects of IS.

This is similar to H2. Agreement between IS staff and users on how well *or* poorly different aspects of IS are performed should lead to more focussed action and result in improved user perceptions of IS.

The dependent variable is *user rating of IS performance*. This is different from UIS. In its design the survey instrument intends to measure perceptions of IS contribution to organizational performance as opposed to the extent that IS satisfies personal information needs

Methodology

Several firms that had been part of the large industry samples were selected specifically to reflect a cross-section of industries and levels of IS performance. They were approached and all agreed to take part in a follow up study. To broaden the base, two public sector organizations were also invited to participate. Finally one manufacturing firm requested participation because they wished to assess their own IS effectiveness. In the latter case two surveys separated by twelve months took place and management action to improve performance took place between the surveys. Table Three briefly describes the eleven participating firms.

CODE	SECTOR	DESCRIPTION
FIN 1	Financial	Major bank and Savings & Loan (S & L) institution.
FIN 2	Financial	Life assurance; market leader in annual premium income
FIN 3	Financial	Life assurance; market leader in gross assets
FIN 4	Financial	Major S & L; market leader in number of S & L clients
FIN 5	Financial	Large short term insurance company
MNF 1	Manufacturing	Largest producer of aluminum
MNF 2	Manufacturing	Auto manufacturer; one of big five
MNF 3	Manufacturing	Major manufacturer of vehicle engines
RET 1	Retailing	Largest retailer of clothing, footwear and household products
PUB 1	Public sector	Regional hospital authority overseeing 130 hospitals and health care facilities
PUB 2	Public sector	1700-bed teaching hospital

Table Three: Participating Organizations

The study used the instrument described in this article (Miller & Doyle 1987) with slight modifications and streamlining that was introduced during the national surveys. Appendix Two lists the items in abbreviated form.

Besides the 37 performance and importance ratings, the instrument includes a single global measure of IS performance to enable partial measurement of the predictive validity of the aggregate performance measures. This item precedes the full questionnaire to create some psychological "distance" from the detailed performance scales:

Please rate your firm's overall information systems effort on the following scale:

very poor		poor		good		excellent
1	2	3	4	5	6	7

The study polled all managers down to a chosen level and all senior IS staff (except in one case that used a stratified random sample). A senior IS manager acted as liaison person in each organization, distributing questionnaires to potential respondents under cover of a letter from a high ranking organizational officer. The text assured confidentiality.

Results

Usable responses were obtained from 188 IS staff and 837 users. This represented response rates of 32-100% from individual organizations[4]. There was no evidence of respondent bias in terms of available respondent characteristics. Table Four shows summary results for the eleven surveys conducted in 1988 and the prior survey conducted in 1987. The table shows the twelve sets of data in descending order of the dependent variable, mean user rating of IS performance. Averages and standard deviations for importance and performance ratings are shown for the IS and user groups respectively. The "global perf." ratings are the averages for the single performance scale presented at the start of the questionnaire (sometimes this data was not gathered and in one case no IS responses were solicited. These are noted as n/a).

Simple linear regression analyses linking the 37 pairs of importance and performance ratings in each organization yielded four sets of coefficients of determination (r^2). These are the "measures of alignment" shown in Table Five. In statistical terms these correlations express the four hypotheses presented earlier. Figures 1 and 2 provide visual impressions of high and low correlations between importance and performance ratings shown in the table. (The 37 points in each scatter plot represent the 37 items in the questionnaire).

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		ORGANIZATIONS										
		FIN 1	FIN 2	MNF 2	MNF1 '88	RET 1	MNF 3	MNF1 '87	FIN 3	FIN 4	FIN 5	PUB 1	PUB2
I/S STAFF	no.	16	20	21	9	10	36	13	29	14	0	9	11
Global Perf.	mean	6.00	5.47	5.62	n/a	5.90	4.86	n/a	4.27	4.71	n/a	n/a	n/a
Importance	mean	5.57	5.74	5.78	6.01	5.59	5.55	6.09	5.18	5.70	n/a	5.48	5.67
	s.d.	.41	.45	.46	.53.	.58	.42	.48	.55	.62	n/a	.43	.49
Performance	mean	5.20	5.02	5.24	5.58	4.71	4.71	5.41	4.16	4.18	n/a	4.48	3.83
	s.d.	.61	.45	.47	.50	.63	.49	.49	.36	.68	n/a	.67	.87
USERS	no.	73	111	63	40	47	53	40	82	171	77	64	14
Global Perf.	mean	5.47	5.41	5.20	n/a	5.09	5.00	n/a	4.51	3.95	n/a	n/a	n/a
Importance	mean	5.32	5.59	5.76	5.45	5.59	5.53	5.26	5.38	5.63	5.63	5.43	5.30
	s.d.	.74	.35	.34	.46	.39	.40	.45	.47	.55	.43	.63	.48
Performance	mean	5.13	5.00	4.87	4.82	4.63	4.39	4.27	4.16	3.84	3.82	3.77	3.68
	s.d.	.50	.38	.36	.65	.50	.53	.33	.38	.43	.72	1.03	.60

Table Four. Summary Results

		ORGANIZATIONS										
		FIN 1	FIN 2	MNF 2	MNF1 '88	RET 1	MNF 3	MNF1 '87	FIN 3	FIN 4	FIN 5	PUB 1	PUB 2
User Perf. Rating		5.13	5.00	4.87	4.82	4.63	4.39	4.27	4.16	3.84	3.82	3.77	3.68
IS Imp-Perf r^2		.62*	.58	.49	.61	.47	.39	.30	.17	.15	n/a	.20	.15
User Imp-Perf r^2		.45	.48	.46	.59	.36	.40	.25	.06	.05	.11	.36	.06
IS-User Imp r^2		.30	.64	.60	.71	.44	.61	.59	.76	.62	n/a	.45	.28
IS-User Perf r^2		.50	.49	.62	.53	.54	.48	.39	.57	.56	n/a	.52	.27

Significance for d.f.=35: $r^2 > .21$ p<.01, $r^2 > .12$ p<.05, $r^2 > .08$ p<.10

Table Five. Measures of Alignment

Associations between some measures of alignment and the mean user ratings of IS performance are evident. Spearman's rank-order correlation formula is thus used to compare the rank order of the firms in terms of user performance rating and each measure of alignment (Welkowitz, Ewen & Cohen 1982). The results in Table Six show that the only statistically significant correlations are between the first two measures of alignment and the user rating of IS performance.

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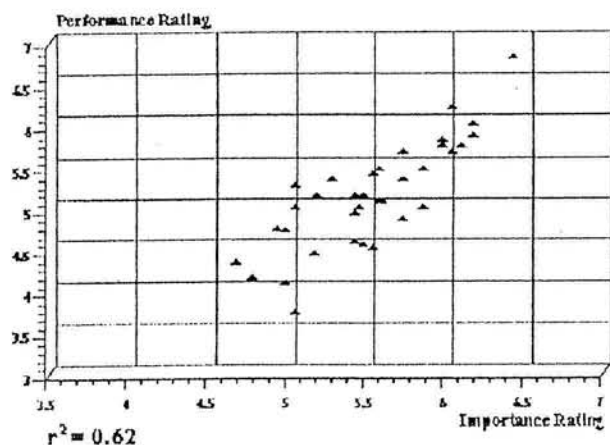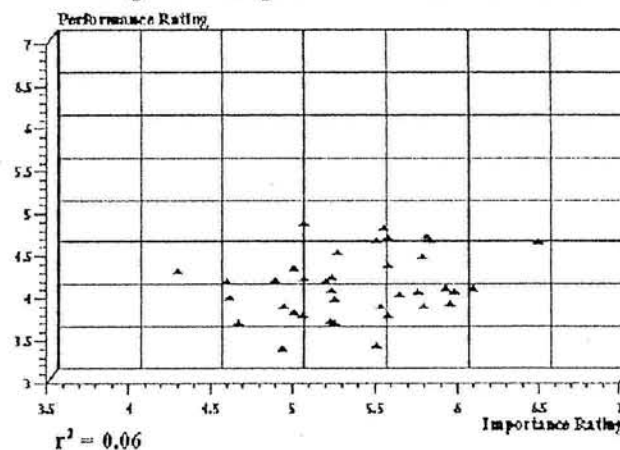Stern School of Business
Working Paper IS-92-08

Figure 1. Importance vs. Performance

$r^2 = 0.62$

Figure 2. Importance vs. Performance

$r^2 = 0.06$

User Rating of IS Performance	Rank Order of Organizations by:			
	IS Imp-Perf r^2	User Imp-Perf r^2	IS-User Imp r^2	IS-User Perf r^2
1	1	4	10	7
2	3	2	3	8
3	4	3	6	1
4	2	1	2	5
5	5	6.5	9	4
6	6	5	5	9
7	7	8	7	10
8	8	9.5	1	2
9	10.5	11	4	3
10	9	6.5	8	6
11	10.5	9.5	11	11
r_s	.95	.80	.14	.16

Significance for 11 pairs: $r_s > .78$ $p < .01$, $r_s > .48$ $p < .10$

Table Six: Rank Order Correlations between
Performance Ratings and Measures of Alignment

Discussion

Traditionally there has been an emphasis on similarities and differences between the perceptions of IS staff and users. The argument is that IS personnel are technically oriented and unconcerned about business factors, whereas users do not know or care about the technicalities. They simply want results. Commentators attribute failures in IS to this mismatch. Hypotheses 2 and 3 address this assertion and Table Five presents the relevant results. With few exceptions the r^2coefficients linking IS staff and user perceptions are statistically significant and most of them are in excess of 0.4. This suggests that, at least in this sample, there is a high degree of concordance between IS staff and users on both dimensions. Furthermore, there is no apparent association between the extent of agreement between IS and users and user perceptions of IS performance on either dimension. Figures 3 and 4 depict the associations between IS staff and user perceptions of importance and performance respectively. Alignment of IS and user views on these issues is not a predictor of IS performance and accordingly hypotheses H2 and H3 are not supported.

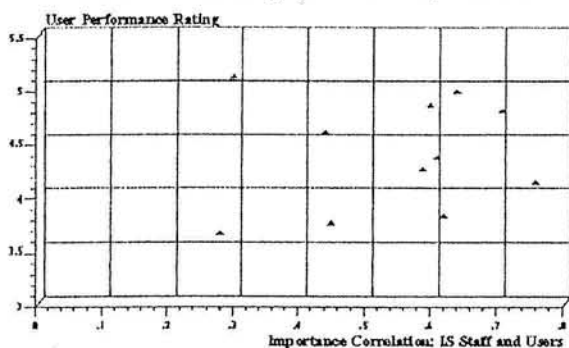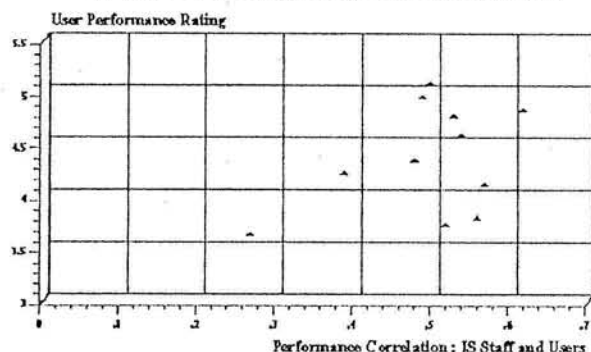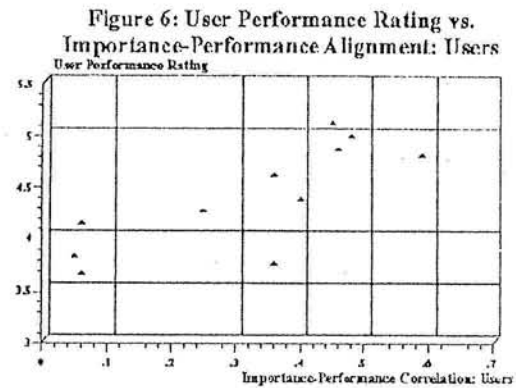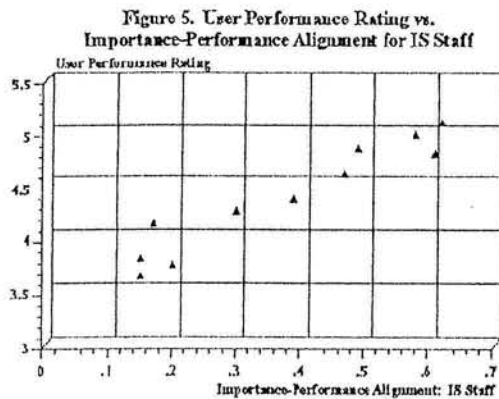Figure 3. User Performance Rating vs. IS Staff - User Alignment on Importance

Figure 4. User Performance Rating vs. IS Staff-User Alignment on Performance

By contrast, as Table Five shows, there is a larger range of r^2 values linking importance and performance. Figures 5 and 6 show these values plotted against user ratings of IS performance. A pattern is evident in the cases of both IS staff and user perceptions. The better the alignment between importance and performance, the more positive is the assessment of users regarding the IS function.

The pattern is particularly clear when comparing alignment as perceived by *IS people* with *user* performance ratings. Given that IS staff and users generally agree on importance ratings (Figure 3), it may be interpreted that the more focussed IS staff are in meeting the most important needs of the business, the more positive users will be about IS. In terms of causality it is more likely that user ratings of IS performance are a result of focussed action by IS, than that userperceptions of IS performance influence the extent of alignment between importance and performance. The results of this study support both hypotheses H1a and H1b.

Figure 5. User Performance Rating vs. Importance-Performance Alignment for IS Staff

Figure 6: User Performance Rating vs. Importance-Performance Alignment: Users

An independent study of several U.S. organizations, using the same instrument, obtained similar results. 224 IS staff and users in six organizations covering the entertainment industry, manufacturing, financial services and computer software completed the survey (Innes 1991). Figure 7 shows the relationship between IS performance ratings and the alignment between importance and performance. It should be noted that both variates shown reflect the combined results of IS staff and user perceptions. This is because small sample sizes and imbalances between categories of response prevented a meaningful split between IS and user responses. Despite the greater heterogeneity in samples, the same tendency as in the present study is evident. This provides further support for the notion that importance/performance alignment associates with the overall level of IS performance.

Figure 7. Alignment Relationships in 1991 US Study
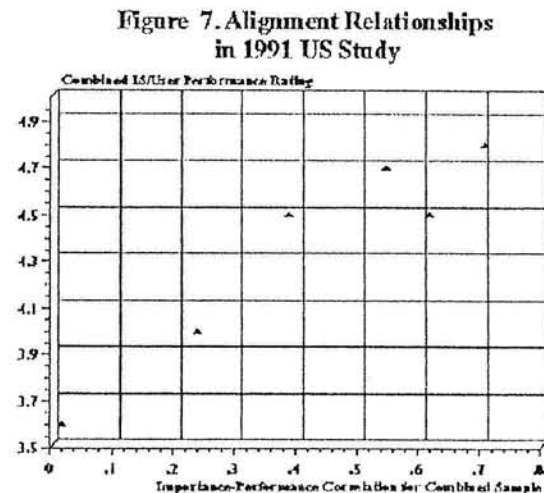
Conclusions

It is generally accepted that alignment of the goals and priorities of the information systems function with that of the organization is important in improving the contribution of IS. Defining and measuring the extent of this alignment has, however, been elusive. The results reported here suggest a way to operationalize the idea of alignment. An instrument is described that enables longitudinal studies within organizations and inter-organizational comparisons.

It has been shown elsewhere that *user information satisfaction* is not sufficient to capture the full meaning of the IS effectiveness construct (Melone 1990). This article argues that the more measured cognitive assessment of the contribution of IS to the organization required by the current instrument overcomes some criticisms of the UIS construct. However we suggest that alignment itself is a more powerful surrogate for effectiveness than UIS or another average perception of IS performance. The alignment between perceived importance and performance of a range of detailed aspects of IS should be treated as the independent variable. Programs to enhance effectiveness should be directed at improving this correlation. Average performance ratings represent a variable dependent on this alignment, but there may be others as well that are more closely related to the overall contribution of IS to the organization.

In light of this discussion, a simple definition of IS effectiveness might be:

An effective information system achieves the purposes of its users.

This definition specifically addresses the dictates of organizational effectiveness research and systems theory. These disciplines call for a definition of information systems effectiveness that emphasizes the individual and focuses on purpose. The ultimate purpose of the organization is then expressed in terms of the collection of individual purposes of its members. In comparison with UIS the definition is grounded in the *cognitive* and not the affective domain and requires the *explicit measurement of alignment*. Respondents might include users, IS staff, top management or other stakeholders who act as *expert witnesses*, assessing business needs and aspects of the IS capability. The respondents and items chosen should match the purposes of the investigation. These might be a general assessment of the total IS function, an evaluation of a specific system, a comparison between functional groups etc. Measurement scales should specifically be designed to tap cognitive belief structures and measure issues such as the degree of importance of different aspects of IS and their perceived usefulness. It can be expected that degrees of alignment will differ from one group to another in the organization.

From the researcher's point of view, measuring and diagnosing IS alignment or effectiveness thus requires a knowledge of user and IS cognitive perceptions. Instrument design and administration must take this into account, in particular ensuring that scales associated with items tap the appropriate mental constructs. The items selected for inclusion must be chosen explicitly to reflect the domain of interest. Items might differ for assessments of mainframe systems, end-user computing, IS departments, or the total IS function.

An important outcome of this research is the role of the IS professional. Elsewhere researchers have shown that the penetration of information technology in large companies correlates with the strength of informal communications networks between IS managers and user managers (Zmud, Boynton & Jacobs 1987). The present study supports this finding. It emphasizes the need for IS people to understand business requirements to focus their efforts and offer appropriate support to their users.

From the practitioner's point of view, the study underlines the need to work with both users and IS to achieve IS alignment and effectiveness. Managers must *engineer* a fit between organizational needs and IS capabilities, in the minds of both the IS and user communities. "Throwing money" at the problem or imposing solutions will not work. Training and education should be specifically targeted at bringing the elements of IS into closer alignment with organizational needs. This is in contrast to general awareness courses or required attendance at routine training courses. Focussed business training for IS staff and active user participation in IS projects may well enhance alignment.

There is no doubt that the nature and contribution of IS in organizations continues to undergo radical change. In the process IS has become a wicked problem, requiring new ways of analysis and fresh approaches to solution. It is believed that the approach to measurement of alignment between IS and the organization offered here is a useful step in that direction.

Appendix One

ITEMS INCLUDED IN UIS INSTRUMENTS

	B-P[1]	IOB[2]	SF[3]	M-D[4]
Schedule of products and services	*			
Language for interaction with system	*			
Format of output	*			
Documentation of systems and procedures	*			
Error recovery for corrections and reruns	*			
Integration of systems across functional areas	*			
Means of interface with EDP center	*			
Organizational position of the EDP function	*			
Organizational competition with the EDP unit	*			
Expectations regarding IS products/services	*			
Job effects - changes due to computer systems	*			
Charge-back method of payment for services	*			
Vendor support	*	*		
Priorities determination (fairness)	*	*		
Volume of output	*	*		
Reliability of output information	*	*	*	
Precision of output information	*	*	*	
Relationship with the EDP staff	*	*	*	
Users' feeling of participation	*	*	*	*5
Users' understanding of systems	*	*	*	*5
Processing of change requests	*	*	*	*4
Time required for new development	*	*	*	*4
Attitude of EDP staff	*	*	*	*6
Communication with EDP staff	*	*	*	*6
Degree of training in user proficiency	*	*	*	*3,5
Completeness of output contents	*	*	*	*1
Accuracy of output information	*	*	*	*1
Relevancy of products/services provided	*	*	*	*1
Timeliness of output information	*	*		*1
Currency of output information	*	*		*1
Users' confidence in systems	*	*		*1
Convenience of access to computer system	*	*		*2,5
Flexibility of systems	*	*		*4
Users' feeling of control/influence	*	*		*5
Technical competence of EDP staff	*			*6
Top management involvement	*			*3
Perceived utility/cost-effectiveness	*			*1
Security of data	*			*1
Hardware and systems downtime				*1
Efficient running of current systems				*1
Direct user access to data and models				*2
Models to analyze business alternatives				*2
Data analysis to support decisionmaking				*2
Technical sophistication of new systems				*3
Increased IS effort on creating new systems				*3
IS strategic planning and resource allocation				*3
Use of IS steering committee				*3
Priorities reflecting organizational objectives				*3
IS providing competitive advantage				*3
Integration of office communications and IS				*3
Responsiveness to changing user needs				*4
Improving of new systems development				*4
Quick and flexible access to computer data				*5
Quality of systems analysts				*6
User-oriented systems analysts				*6
IS support for users in preparing IS proposals				*6

*5 (numbers refer to factor loadings discussed in text)

[1]Bailey-Pearson [2]Ives et al [3]Baroudi-Orlikowski [4]Miller-Doyle

Appendix Two   EXAMPLES OF ITEMS AND SCALES

BAILEY-PEARSON
Item: **Degree of EDP training provided to users:** The amount of specialized instruction and practice that is afforded to the user to increase the user's proficiency in utilizing the computer capacity that is available.

complete :	:	:	:	:	:	:	: incomplete
sufficient :	:	:	:	:	:	:	: insufficient
high :	:	:	:	:	:	:	: low
superior :	:	:	:	:	:	:	: inferior
satisfactory :	:	:	:	:	:	:	: unsatisfactory
To me this factor : is important	:	:	:	:	:	:	: unimportant

The seven intervals are denoted by adverbial qualifiers; extremely, quite, slightly, neither/equally, slightly, quite, extremely.

BAILEY-PEARSON SHORT FORM
Item: **Users' feelings of participation**

positive :	:	:	:	:	:	:	: negative
sufficient :	:	:	:	:	:	:	: insufficient

The seven intervals are denoted as above, except that the middle interval also caters for "does not apply".

MILLER-DOYLE
Item: **A low percentage of hardware and systems downtime**

Importance Scale ("assess the importance to your organization's activities")

Irrelevant		Possibly Useful		Very Important		Critical
1	2	3	4	5	6	7

Performance Scale ("assess your organization's performance on this item")

Very Poor		Poor		Good		Excellent
1	2	3	4	5	6	7

(Sources: Bailey & Pearson 1983, Baroudi & Orlikowski 1986, Miller & Doyle 1987)

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End Notes

1. This poor outcome may be because the range of perceptions amongst IS people and users, and within the management levels and functional areas represented within the user community, varies more widely for business importance than for IS performance (see also Cooper & Wolodzco 1988).

2. The data was also subjected to a hierarchical cluster analysis using the complete linkage method (Churchill 1979). Stable *performance* clusters similar to those found via factor analysis resulted, but indistinct and variable *importance* clusters emerged.

3. Recently an independent assessment of the reliability and validity of the instrument was obtained from a sample of 31 US firms covering a variety of industries. A series of highly significant split-half correlations between odd-numbered and even-numbered items in the instrument were obtained. Despite the fact that some items were omitted from the US version of the questionnaire, factor analysis of about 330 responses produced very similar factors to those reported in this paper (Lodahl 1991).

4. It is not clear why such a wide range of response rates occurred. It is however unrelated to perceived IS performance or importance. The 100% response rate was enjoyed by a firm that arranged a series of group sessions at which the questionnaires were administered.