

**ALIGNING INFORMATION SYSTEMS
WITH THE ORGANIZATION: A
MEASUREMENT TOOL AND ITS APPLICATION**

by

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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 measures this alignment. It allows organizations to monitor their IS function over time and to compare their situation with others. Large-scale surveys of different industry sectors and more extensive studies of individual companies enable conclusions to be drawn about the extent and relevance of alignment in the views of users and IS staff. Of particular significance is the perceived alignment between the rated importance and performance of different aspects of IS.

A large manufacturing company has used the instrument to evaluate the effectiveness of its IS function. Interpretation of the results revealed certain shortcomings and plans were made to rectify them. IS management took tangible action and a subsequent survey of both the user community and IS staff showed measurable changes in perceptions.

ALIGNING INFORMATION SYSTEMS WITH THE ORGANIZATION: A MEASUREMENT TOOL AND ITS APPLICATION

1 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). The emphasis on alignment emerges even more strongly given two other issues that feature high on these lists of priorities: *strategic planning for IS* and *evaluating the effectiveness of IS*. Strategic planning for IS sets out to effect proper alignment of IS with business goals (Earl 1990). At least in part, IS effectiveness is about achieving the goals of the organization, in other words *alignment* (Ein-Dor & Segev 1981, Miller 1989).

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 is there an accepted method for measurement. If there were, organizations would be objectively tracking this phenomenon over time and researchers would be comparing the relative success of different organizations in achieving this goal. This article presents an approach that uses a particular perceptual instrument to measure alignment in an objective and repeatable way. Using it, organizations can assess the status of IS, diagnose problem areas, take action and measure the results. One company that adopted this approach is described.

2 ALIGNMENT AND IS EFFECTIVENESS

The reason for striving for alignment between IS and organizational goals is to maximize the contribution of IS investments to the organization. Thus a measure of successful alignment may be the financial return on IS investment. There are different approaches to measuring such returns. *Economic analysis* assesses the impact on financial outputs of the firm relative to inputs (Chismar & Kriebel 1985), or attempts to assess the costs of the transactions of the firm (Williamson 1981). *Cost-benefit analysis* assembles the total costs of a given information system and compares them with the total benefits expressed in financial terms (Zmud 1983). As IS has matured and pervaded the entire organization, these approaches have become increasingly inadequate. Costs of IS such as the full impact of a new system on future work processes, and benefits such as improved planning processes, organizational learning etc., are difficult or impossible to quantify. Different authors have noted the limitations of both economic analysis (Crowston & Treacy 1986) and cost-benefit analysis (Ginzberg 1979). *Systems usage* is another metric that relates to both alignment and effectiveness. Different authors have reported positive connections between the level of usage of an information system and IS success (Lucas 1981, Trice & Treacy 1986). Others have noted its limitations as a measure of success (Melone 1990, Srinivasan 1985).

Probably because of difficulties in applying traditional methods, a very popular method for assessing IS effectiveness now adopts *user perceptions* as the surrogate for quality, value, usage and other systems attributes. Furthermore, 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).

The notion of alignment is implicit in this definition, since it calls for a match between needs and availability. 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 for such an approach, stressing the need for measures to be influential and also accurate. Academic arguments aside, however, a recent survey finds that over 40 percent of U.S. corporations use perceptual instruments to measure IS (Conference Board 1990). This approach to evaluating information systems thus dominates practice and merits careful attention.

3 THE CURRENT INSTRUMENT

Building on the work of Bailey and Pearson (1983) 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, 1989a,b). The instrument, here termed the Miller-Doyle instrument, taps the perceptions of respondents regarding organizational importance and IS performance on a range of items. Appendix One lists the items in abbreviated form. Respondents, who may include both users and IS staff, assess the items twice on different scales and Appendix Two lists these scales.

Certain features of the instrument and its administration need elaboration here.

(i) The objective is to assess the overall IS function in the 1980s. Therefore a particular paradigm for IS (Ein-Dor & Segev 1981) was used as a basis for developing the set of items comprising the instrument. This paradigm contains 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). The 37 items in Appendix One were chosen accordingly.

(ii) Early instruments (eg. Bailey & Pearson 1983) used performance-related scales and an importance weighting for each item. However, current researchers have all but discarded the importance rating from their UIS instruments (eg. Ives, Olson & Baroudi 1983, Doll & Torkzadeh 1988, Guimaraes & Gupta 1988). By contrast the Miller-Doyle instrument explicitly incorporates importance and performance scales. It does not append the importance scale as a weighting factor for performance. The importance construct is treated as a specific measure of the *organizational importance* of the particular aspect of IS compared to *the*

performance of that aspect. In other words, alignment between organizational needs and priorities and IS capabilities is explicit.

(iii) The instrument uses wording to tap *cognitive perceptions* of organizational 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 to "how do you feel about what you are getting?" Respondents are encouraged to act as "expert witnesses."

(iv) 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 IS should be just as relevant to IS effectiveness as those of users, the author has specifically sought responses from both IS professionals and users. This provides a further opportunity to measure alignment.

4 EMPIRICAL FINDINGS

Three national surveys of firms in the manufacturing, retailing and financial services sectors respectively have been conducted in South Africa. Usable responses from 794 user managers and senior IS staff were obtained and provided the data for evaluating the reliability and validity of the instrument (Miller & Doyle 1987, Miller 1988). Factor analysis with varimax rotation revealed six stable and intuitively meaningful constructs underlying the 37 items in the instrument. These have been named:

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

The numbers Appendix One 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*.

Satisfactory levels of *predictive validity*, *test-retest reliability* and *reliability in the face of measurement error* have also been found and are reported elsewhere (Miller & Doyle 1987, Miller 1988).

An important finding from the national surveys was that high IS performance ratings associated with high levels of alignment between business importance and IS performance. This suggested a causal relationship. If IS efforts focus on just those areas perceived to be most important to the business, overall perceptions of IS will improve. A subsequent study confirmed and deepened this finding (Miller 1989a, b). Over one thousand IS and user managers in eleven organizations covering manufacturing, retailing, finance and the public

sector participated in an extensive survey. Overall IS performance ratings and correlations between importance and performance varied widely across the organizations, but the association between the two dimensions emerged clearly. In particular, high alignment as perceived by the IS staff associated with high performance ratings perceived by the user community. The results also showed that IS staff and users were generally in agreement on the business importance of the various elements of IS and their performance. However, counter-intuitively, the alignment in the views of IS staff and users on these scales did not relate to overall user ratings of IS performance. Figures One and Two show these findings. Apparently alignment in IS staff and user views is generally good and does not predict IS performance. It is the alignment between importance and performance that is key.

Figure 1. IS Performance Ratings and Importance - Performance Alignment

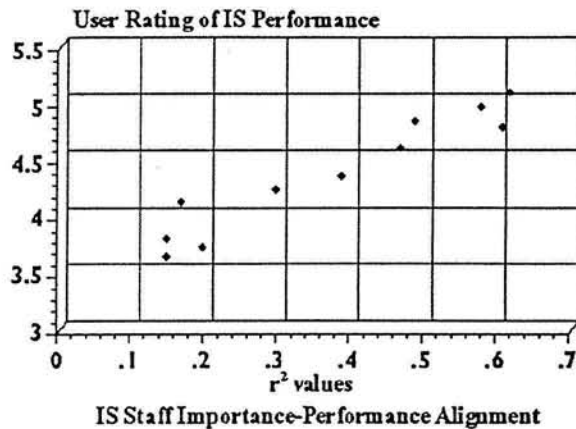
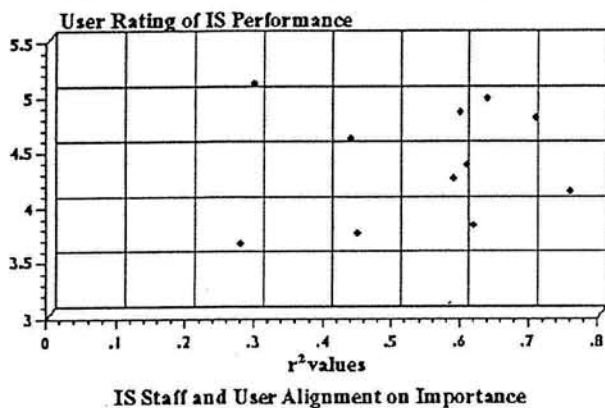


Figure 2. User Rating of IS Performance and User - IS Staff Alignment on Importance



A recent nationwide survey of firms in the United States incorporated the Miller-Doyle instrument with a series of scales that measured the contribution of IS to specific managerial goals (Lodahl 1991). Analysis of 281 responses from 31 firms produced very similar factor loadings to those found in the previous studies. The US study classified participating firms as "high," "medium" and "low" in terms of the performance ratings from the Miller-Doyle instrument and separately by the extent to which IS contributed to high ranking managerial goals. There is a close concordance between the groupings derived from the two separate measures. This supports the predictive

validity of the current instrument as a general measure of alignment between organizational priorities and IS performance.

In addition to many firms that participated in the research studies discussed here, several have applied the Miller-Doyle instrument specifically to analyze their IS operations and diagnose problem areas. Some have conducted two or more studies to track changes in time. The remainder of this article describes one such experience.

5 A CASE STUDY

5.1 Background

ALUSAF (Pty) Ltd. is the major producer of primary aluminum in South Africa and ranks among the top twenty corporations in South Africa. Using imported bauxite, the company produces 170000 tonnes of Aluminum annually and exports 50 percent. Aluisse (Switzerland) and South African conglomerates own Alusaf, which has a turnover of \$400 million and employs 2800 people. A new chief executive took office in 1982. The focus he brought to bear strongly emphasized formal strategic planning initiatives and over the period 1985-1987 a series of conferences and workshops took place. Management set mission statements, goals, objectives and action plans for the company as a whole and at the operational level. These documents reflected the primary strategic thrusts of the company — cost reduction through production efficiencies and quality control. A cohesive top management team and a healthy climate of participative management evolved, reenforced by the relaxed, informal business and social environment characteristic of the surrounding community.

Alusaf's Information Systems department consisted of fourteen senior staff members, organized into Systems, Technical Support and Operations. DP operations were highly centralized. Two Hewlett Packard 3000/70s handled all data processing and connected to the plant, laboratories, finance and administration and the other organizational areas through 150 terminals. Operational data was held in a central data base and accessed via a series of purchased packages that handled payroll, stores, maintenance, quality control, production control, sales and finance. A fourth generation language and business report writer were available and used to a small extent. Microcomputers had yet to appear.

The IS Manager reported to the Senior Manager Management Services, Peter Cowie, who in turn reported to the Director, Finance. Computer activity was overseen by a steering committee with the Technical Director as chairman and Finance, Management Services, IS and Technical Process managers as members. However this committee met only annually and was not regarded as effective in providing business direction. At the start of this case (1987), the Information Systems department had yet formally to examine its own direction and strategy as already undertaken by other functional units. Therefore, the Management Services Manager decided to conduct a survey and lay the foundation for future IS planning and evaluation.

5.2 The First Survey

The idea of a perception survey was tested with the IS staff. Initial reactions were negative: *"We don't need criticisms from the users . . . users don't understand IS . . . perceptions are vague."* Nonetheless Cowie proceeded with the survey, distributing the Miller-Doyle instrument to sixty four senior IS staff and company managers down to a chosen level. Thirteen IS staff and forty managers responded, representing 83 percent of those surveyed. The importance and performance scales in Appendix Two have a range of one (low) to seven (high). Table One shows the average results across all items in the questionnaire.

	Users	IS Staff
Importance	5.26	6.09
Performance	4.27	5.41

Table One. Overall Results: First Survey

Users rate Information Systems as "very important," and IS staff rate it as approaching "critical." Users rate IS performance as slightly above average, whereas IS staff rate it as well above "good." The differences between IS Staff and user ratings were the largest encountered in an extensive survey of eleven organizations (Miller 1989b).

The responses to individual items were grouped into the six factors underlying the questionnaire. Table Two shows the Importance and Performance ratings by factor for the two groups of respondents, in decreasing order of user performance rating.

FACTOR	IMPORTANCE		PERFORMANCE	
	Users	IS Staff	Users	IS Staff
1 TRAD SYSTEMS	5.55	6.51	4.47	5.57
6 IS STAFF CHAR.	5.35	6.14	4.34	5.31
3 STRATEGIC ISSUES	4.96	5.85	4.28	5.38
2 END USER COMP.	5.34	5.92	4.22	5.50
4 RESPONSIVENESS	5.02	5.77	4.02	5.36
5 USER PARTICIPAT.	4.96	5.67	3.93	5.18

Table Two: Ratings by Factor: First Survey

The table reveals that the overall gap between user and IS perceptions applies to each area of IS activity as well. However users and IS agree that the traditional systems area, IS staff characteristics and end-user computing are most important and place them in the same order.

In line with Section 4 and Figures One and Two, IS Staff and User ratings of the importance and performance of *all* the individual items in the questionnaire were compared. The r^2 correlation between IS and users is 0.59. This is statistically significant and quite a strong association. There is also a significant, but not as strong association between IS and users ratings of performance. The r^2 is 0.39. The correlation coefficients linking importance and performance are 0.25 and 0.30 for Users and IS Staff respectively. These statistics will be

referred to in subsequent sections.

5.3 Management Action

Cowie concluded that IS staff were too involved with the technical challenges of implementing particular packages. They had lost touch with their users and had unwittingly become too *product focused*. They needed to adopt a *marketing focus*. As Cowie wrote in a letter to the author:

"I am now busy analyzing the results in detail and hope to build the results of this analysis into a strategic information systems plan . . . I am extremely excited about the results so far and firmly believe that the next year will see us focusing our energy in the right areas." (Cowie 1988)

The plan put into effect indeed had a strong marketing orientation (Cowie 1989). It included a Mission Statement for IS (Appendix Three), in line with the company Mission Statement, and a framework that showed the integration of information systems with business processes.

A customer analysis was undertaken and

"a program of customer visits was set in motion. The MIS people went into the world of the user to see what they were doing and to learn something of the business environment." (Cowie 1989, p.7)

User groups were created for major systems and a systems support analyst assumed the role of mentor for each group. A variety of promotional activities took place. These included Board presentations, being host to users at conferences and computer exhibitions, and social events to celebrate achievement of implementation milestones. IS people were encouraged to meet informally with users.

These management actions greatly increased the exposure of IS Staff to business needs and users to the capabilities of computing technology. In particular they served to address two aspects of IS, Responsiveness to Change and User Participation. After diagnosing the results in the important but poorly performed area of End-User Computing, the IS Department took more specific action. They purchased a hundred or so microcomputers and associated software and deployed them throughout the organization. Furthermore, they launched a financial scheme by which staff could obtain interest free loans to acquire their own PCs. Employees acquired 120 PCs in this way.

5.4 The Second Survey

A year later the same population responded to a second survey. Sixty three questionnaires were issued and forty nine returned (forty users and nine IS staff). Table Three compares the overall ratings for importance and performance in the two surveys.

		First Survey	Second Survey
Importance	Users	5.26	5.42
	IS Staff	6.09	5.98
Performance	Users	4.27	4.99
	IS Staff	5.41	5.50

Table Three. Overall Ratings: Comparison of Survey Results

Shifts in all statistics are evident, with shifts in user perceptions being more prominent than those for IS staff. The largest change is for user rating of IS performance, which essentially shifts from "average" to "good." The shift in user perceptions of importance is not very great. In relation to the larger survey mentioned earlier, however, it serves to shift the user perception of IS importance from being the lowest in the set to about the middle (Miller 1989).

Figures Three and Four examine the responses of the users in more detail. Figure Three shows that user importance ratings increased across the board with the largest increases being for User Participation and IS Staff Characteristics. These are the two "behavioral" factors in terms of the Ein-Dor & Segev paradigm that underlies the instrument. Figure Four, drawn to the same scale as Figure Three shows similar, but much greater across the board increases in user ratings of IS performance. The aspects specifically targeted for

Figure 3. Importance Ratings

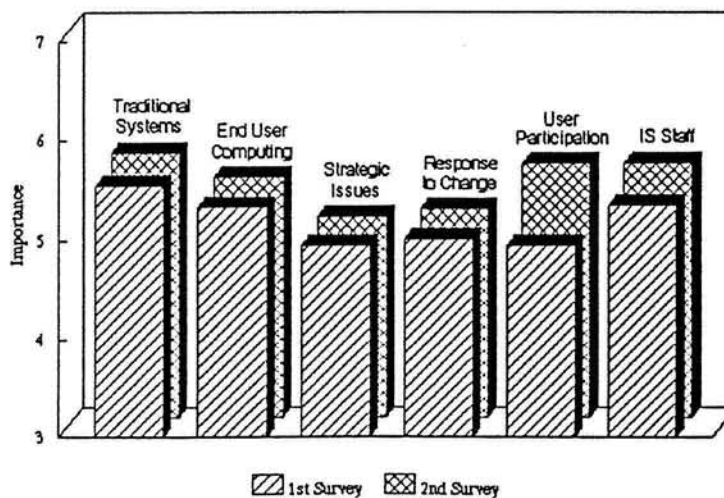
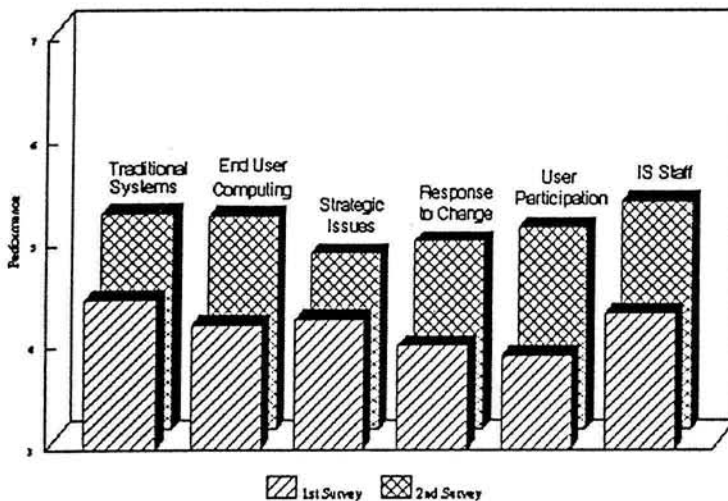


Figure 4. Performance Ratings



attention, User Participation, Responsiveness to Change and End-User Computing all enjoyed large increases, as did IS Staff Quality.

The shifts in importance may be interpreted as the measurable effect of efforts to raise the profile of IS. The much greater level of contact between IS and users resulted in the importance of these behavioral aspects increasing more than other aspects. The intense focus on IS and some aspects in particular resulted in a general improvement in perceptions of IS performance.

Evidently respondents considered the specific actions undertaken to be well targeted and beneficial. It appears that the improvements enjoyed in those areas led to carryover effects as well¹.

5.5 Achieving Alignment

Section 4 reported a positive association between IS performance ratings and measures of alignment between business priorities and IS capabilities. There was no such association for alignment between IS staff and user perceptions of importance or performance separately. Those studies were cross-sectional in nature — snapshots in time — but suggest that improvements in IS performance ratings over time should be accompanied by changes in the relevant alignment coefficients. Table 4 shows the user ratings of IS performance and the various alignment coefficients (r^2) for the two surveys. The perceived alignment between business importance and IS performance increased significantly for both users and IS staff. There was also an increase in alignment between the views of users and IS staff on both the importance and performance of the various aspects of IS, but the improvement in those r^2 coefficients was not nearly as large as for the increases in importance-performance alignments.

¹As opposed to being the inevitable result of a "Hawthorne" effect. For instance in two other longitudinal studies by the author, IS made considerable efforts and spent a lot of money to improve IS effectiveness, but user ratings remained constant at 3.8 and 4.0 respectively.

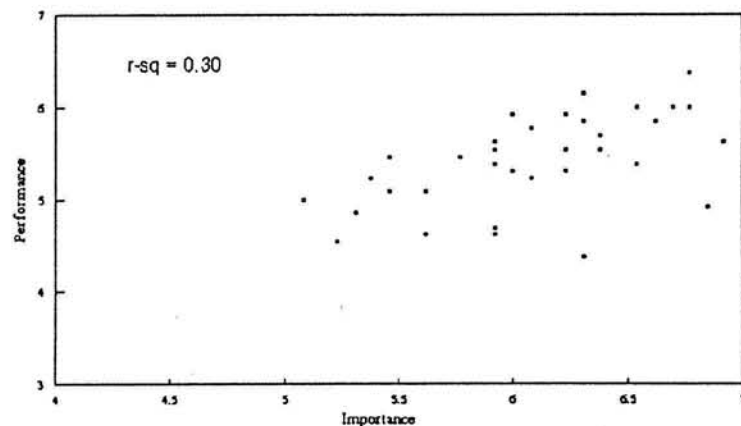
The mechanism presumed to be in operation regards the user assessment of IS performance as a function of the ability of IS staff to focus successfully on those aspects of IS *they* (IS) regard as most important. To the extent that IS staff correctly interpret user priorities, they also will succeed in focusing on user priorities.

		1st Survey	2nd Survey
User Rating of IS Performance		4.27	4.99
Importance-Performance Correlations	Users	0.25	0.53
	IS Staff	0.30	0.65
User-IS Staff Correlations	Importance	0.59	0.74
	Performance	0.39	0.52

Table Four. Comparison of Survey Results

Figures Five and Six are scatter plots of the IS Staff importance-performance responses to all the items in the questionnaire in the first and second surveys respectively. The "tightening" of the band of responses from the first to second surveys (reflected in the increased r^2 values) is evident. This, with an improvement in the already significant alignment between IS staff and user views on the relative importance of the different aspects of IS, suggests that management action indeed focused IS better on user-related priorities and that this focus translated into effective action.

Figure 5. Importance-Performance Alignment IS Staff: First Survey



5.6 Summary

The Alusaf project is an example of one organization's attempt to measure IS effectiveness and make improvements. Alusaf had not explicitly attempted to increase alignment measures. They had intended to identify areas of poor performance and concentrate on improving them. It came as a surprise when the large discrepancy between user and IS staff ratings emerged from the

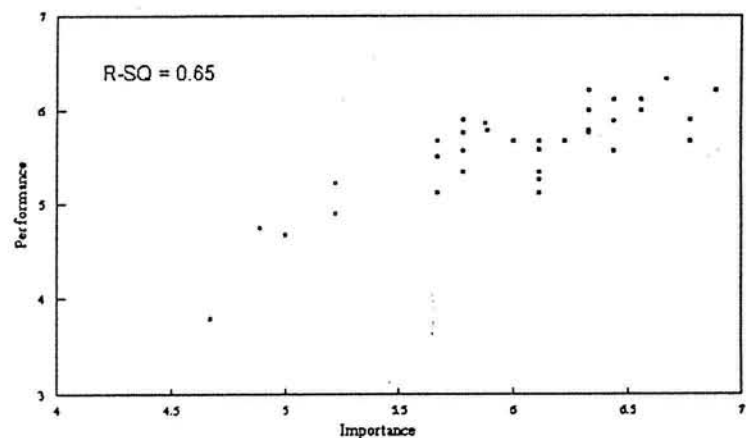
first survey. Interpretation led to a shift from a product- to marketing-orientation and the specific managerial actions described. In retrospect those actions clearly should have had a measurable effect on alignment between IS staff and users. Furthermore, the exposure of IS staff to the business through heightened contact with users and users to IS through attendance at conferences etc., should have resulted in measurable improvements in the relevant alignment coefficients. It is a tribute to the managers involved that they succeeded and were able to demonstrate measurable improvements in perceptions.

6 CONCLUSIONS

This article has argued that, in an era of all-pervasive application of information systems and technology, traditional methods of measuring the effectiveness of the information systems function are inadequate. Effectiveness criteria must recognize the "wicked" nature of organizational problems (Mason & Mitroff 1981), adapt to continually changing *organizational* effectiveness criteria and be influential in shaping management action. The results of the development of the perceptual instrument described here and analysis of the outcomes of large scale studies suggests that the popular approach of tapping user attitudes as a surrogate for IS effectiveness is also not fully satisfactory. More fundamental is achievement of alignment between organizational priorities and IS performance in those areas. It is the measured alignment between those two dimensions that relates more closely to the actions of the purposeful organization and enables focused plans.

The instrument described here makes the connection between user and organizational purposes explicit. It stresses the roles of both users and IS staff as "expert witnesses" in assessing the alignment between IS and the organization. The case study demonstrates the value of a measurement. However the ability to measure is clearly only the first step. The case also demonstrates that effective management and a willingness to make technological and behavioral changes are essential to effect improvements.

Figure 6. Importance - Performance Alignment: IS Staff: Second Survey



Appendix One. Items in Miller-Doyle Instrument.

(Abbreviated descriptions; numbers refer to factors described in text. Two items load equally onto two factors)

Accuracy/ completeness of output	1	Processing of change requests	4
Relevance of products/services provided	1	Time required for new development	4
Timeliness of output information	1	Flexibility of systems	4
Currency of output information	1	Responsiveness to changing user needs	4
Users' confidence in systems	1	Improving of new systems development	4
Overall cost-effectiveness	1	Users' feeling of participation	5
Security of data	1	Users' understanding of systems	5
Hardware and systems downtime	1	Users' feeling of influence over services	5
Efficient running of current systems	1	Quick and flexible access to computer data	5
Direct user access to data and models	2	Attitude of EDP staff	6
Models to analyze business alternatives	2	Communication with EDP staff	6
Data analysis to support decisionmaking	2	Technical competence of EDP staff	6
Ease of access to computer system	2,5	Quality of systems analysts	6
Top management involvement	3	User-oriented systems analysts	6
Application of modern technology	3	IS support for users with IS proposals	6
Increased IS effort on new systems	3		
IS strategic planning & resource allocation	3		
Use of IS steering committee	3		
Priorities reflecting org. objectives	3		
IS providing competitive advantage	3		
Office communications and IS	3		
Degree of training in user proficiency	3,5		

Appendix Two. Scales

(Descriptions abbreviated)

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

Appendix Three. Alusaf Mission Statement for Information Systems.

PURPOSE

We are a service organization and provide the Shareholders and Management with a quality Management Information Service.

We are committed to relating information systems to business needs in order to provide a competitive advantage to the Company.

We are committed to promoting the need for effective information and planning and control systems and a general awareness of the business systems to all decision makers within the Company.

We are an integral part of this dynamic organization and make a significant contribution to the effective management of the business.

VALUES

Marketing Orientation

We believe that the success of our customers is a measure of our own success.

We seek to satisfy their needs and dedicate our efforts to provide them with distinctive professional service and technical support.

Quality

We believe the quality of our products and services is paramount. We expect a dedication to quality from all our people as well as our suppliers of goods and services. We will concentrate on doing the job right first time and will not tolerate wastage.

Human Relations

We believe in the development of our people and will encourage training to enable each employee to progress within the Company.

We believe that communication is the cornerstone of good people relations and we encourage sincere face-to-face communication at all levels.

We believe that our own results should be achieved by a team effort from all of our people

Management Style

We believe in participating in the team building style of management based on clear objectives and strong leadership. We associate ourselves with the sound business and generally accepted practices of this organization, and will maintain ethical and cordial relations with outside institutions.

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