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INFORMATION SYSTEMS EFFECTIVENESS: THE FIT BETWEEN BUSINESS NEEDS AND SYSTEM CAPABILITIES

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ABSTRACT

The concept and measurement of information systems (IS) effectiveness is discussed and results of a field study are presented. The literature on organizational effectiveness suggests that defining and measuring IS effectiveness via user perceptions is both appropriate and practical. A popular construct, user information satisfaction (UIS), is examined and several instruments purporting to measure UIS are discussed. The theoretical bases for a number of studies of IS using this measure are reviewed and it is concluded that theories and models from the behavioral sciences offer a sound basis for understanding and measuring IS effectiveness. A particular model of IS behaviors grounded in well-known behavioral theories is offered. The results of an industry survey of 848 IS professionals and user-managers in eight firms are presented and shown to lend support to the model. Deficiencies in the UIS construct are highlighted and an alternative definition of IS effectiveness is proposed and motivated.

1. INTRODUCTION

Measuring the effectiveness of computer-based information systems (IS) remains unresolved and the topic regularly appears among the "top ten" in major surveys of issues requiring attention from the IS community (Brancheau and Wetherbe 1987). The objective of this article is to examine the concept and measurement of information systems effectiveness and report on a field study conducted in eight organizations. First the relationship between IS effectiveness and organizational effectiveness is discussed. In the light of approaches to the measurement of organizational effectiveness, it is concluded that measurement of user perceptions of IS is both an appropriate and practical method of measuring IS effectiveness. One popular perceptual measure (user information satisfaction) is then examined and several instruments purporting to measure this construct are discussed. This leads to a brief review of a number of related IS field studies and their theoretical underpinning. It is noted that this class of IS study is increasingly being grounded in the behavioral sciences, which offer a strong basis for understanding and measuring IS effectiveness. Drawing on well-established behavioral theories, a particular model of IS behaviors is offered. It is suggested that through this model the link between user beliefs, attitudes and IS effectiveness can be traced. The results of an industry survey of IS personnel and user managers in several organizations are presented and shown to lend support to the model. Finally a definition of IS effectiveness is proposed that meets important dictates of organizational theory and is supported by the empirical results of this study.

2. EXISTING DEFINITIONS AND MEASURES OF I/S EFFECTIVENESS

The design and implementation of computer-based information systems is pointless unless the new systems benefit the organization. Thus "information systems effectiveness" only has meaning to the extent that IS contributes to organizational effectiveness (OE). However, there are no simple prescriptions regarding the latter construct. Theorists argue that organizations must grapple continually with trade-offs between internal and external focus, control and flexibility and means versus ends. Ultimately OE is seen to be a question of values (Cameron and Whetten 1983; Quinn and Rohrbaugh 1983; Lewin and Minton 1986). To date there is no strong theory of the organization upon which to build a single model of OE nor is there unanimity on how to measure the effectiveness of organizations (Goodman, Atkin and Schoorman 1983).

The organizational literature suggests several basic conclusions applicable to IS effectiveness studies. It appears futile to search for a precise measure or set of measures of IS effectiveness that will be common across all organizations. Criteria for effectiveness in a single organization can be expected to vary with changing value structures, levels in the organization and phases in organizational growth. The values and attitudes of management can and should be expected to play a key role in evaluating IS effectiveness. These observations explain in part "the IS profession's inability to establish and quantify the value of information" (Brancheau and Wetherbe 1987) and the fact that "the most common way to evaluate the MIS function

is to listen to 'screams in the hallways'" (Dickson and Wetherbe 1985).

In the face of OE measurement problems, there have been many attempts to define and measure information systems effectiveness. These can be placed into four general categories: economic benefits, process outcomes, IS usage and user perceptions, briefly summarized as follows:

1. Various forms of input-output analysis have been proposed to relate IS inputs to ultimate *economic benefits* such as financial returns, profits, and growth (Chismar and Kriebel 1985). Crowston and Treacy (1986) review several such studies, but find no definitive results. Transaction cost economics (Williamson 1981) has also been proposed for evaluation of information systems effectiveness, but measurement and computational problems stand in the way of empirical tests of economic theory (Ciborra 1987).

2. Economic benefits are achieved through *organizational processes*. The classic techniques of cost-benefit analysis (Zmud 1983) relate the costs of IS to the financial benefits expected or enjoyed through improved process. Ginzberg (1979) offers a taxonomy of organizational processes and argues that benefits of IS in each category *must* be expressed in financial terms for proper IS assessment. That taxonomy of benefits spans information processing costs, planning, organizational flexibility and organizational learning and simply confirms the impracticality of strict cost-benefit analysis related to process outcomes.

3. Even if economic or process outcomes cannot be successfully measured, *IS usage* offers a potential precise basis for evaluating information systems effectiveness. Several studies show positive associations between systems usage and value-related criteria (Lucas 1981; Trice and Treacy 1986). However the connection between usage and value is by no means simple. Issues such as mandatory versus discretionary use, the influence of viable information alternatives, appropriate reductions in usage with experience, and the extent to which obtained information is actually used complicate this construct and make its use problematic (Ginzberg 1978; Melone 1988; Srinivasan 1985).

4. Added to the larger conceptual issues concerning organizational effectiveness, there are other definitional and computational problems as well. In this context, the fourth measurement category, *user perceptions*, assume special relevance, and in particular the large and growing number of studies of information systems effectiveness that treat user attitudes as surrogates for usage, quality, value and other systems attributes. Those studies suggest that users' evaluations of their information systems influence subsequent usage and realized value to the organization. Systems theory (Churchman 1971) provides a strong justification for user evaluation as a measure of information systems effectiveness. Using this approach, Mason and Swanson (1979) contrast "scientific" and "management" measurement. They assert that measurement for management decision must be influential rather than accurate, must shift emphasis from the thing measured to the user and his response to the measure, and must aid the manager in pursuing the social system's purpose. Organizational measures should be pragmatic and teleological.

Perceptual measures appear to fulfill these requirements, suggesting that the "user attitude" construct may indeed be equivalent to the information systems effectiveness construct. In practice, however, the user attitude construct in IS is poorly developed, as evidenced by the variety of terms associated with it: system acceptance, perceived usefulness, MIS appreciation, feelings, perceptions and beliefs (Swanson 1982). Also the attitude construct has become virtually synonymous with a particular operationalization of it, *user information satisfaction* (UIS) (Ives, Olson and Baroudi 1983).

It is concluded that constructs and measures related to user perceptions of their information systems offer a conceptually sound and pragmatic basis for defining and measuring information systems effectiveness. In comparison with more "scientific" measures, perceptions may also be more pertinent in striving for the achievement of organizational effectiveness.

3. MEASURING USER INFORMATION SATISFACTION

User perceptions of different facets of IS have been employed as a surrogate for systems success at least since the early 1970s (Dickson and Powers 1973). The umbrella term "user information satisfaction" (UIS) has been widely adopted, a popular definition and description being:

> the extent to which users believe the information system available to them meets their information requirements....a meaningful surrogate for the critical but unmeasurable result of an information system, namely, changes in organizational effectiveness (Ives, Olson and Baroudi 1983).

A number of instruments intended to measure UIS have been devised and twelve of these are listed in Table 1. These instruments vary widely in the number and range of items included and are largely theoretic in their derivation. Current social psychology theory distinguishes "beliefs" about an object from "attitudes" towards it, each construct being associated with quite different measurement scales. These mental constructs are not clearly distinguished in the instruments listed.[1]

Table 1. UIS Measurement Instruments

INSTRUMENT	DEVIATION	COVERAGE	ITEMS	SCALES
Gallagher (1974)	Empirical	IS Product	18	Beliefs
Schultz and Slevin (1975)	Literature and empirical	OR Implementation variables	67	Beliefs and Attitudes
Jenkins and Ricketts (1979)	Literature and interviews	IS Product	5	Beliefs
Larcker and Lessig (1980)	Interviews	IS Product	2	Beliefs
Alloway and Quillard (1981)	Empirical	Product and function	26	Beliefs
Bailey and Pearson (1983)	Literature, interviews, empirical	Product and support	39	Beliefs and Attitudes
Ives, Olson and Baroudi (1983)	Bailey and Pearson	Product and support	22	Beliefs and Attitudes
Sanders (1984)	Literature, interviews, empirical	Product	13	Beliefs and Attitudes
Baroudi and Orlikowski (1986)	Bailey and Pearson	Product and support	13	Beliefs and Attitudes
Miller and Doyle (1987)	Literature and empirical	Product and function	37	Beliefs
Guimaraes and Gupta (1988)	Interviews and empirical	MIS department	19	Beliefs and Attitudes
Doll and Torkzadeh (1988)	Literature, interviews, empirical	End-user computing	12	Beliefs

In the search for an accepted base for measurement of UIS, publication of the Bailey-Pearson instrument in 1983 represented a turning point. The appearance just a few months later of a detailed analysis and endorsement of the instrument together with a shortened, psychometrically sounder 22-item version and a 13-item "Short Form" generated a good deal of interest (Ives, Olson and Baroudi 1983; Baroudi and Orlikowski 1986).

As shown in Table 2, a number of researchers have published empirical results using the Bailey-Pearson instrument or its derivatives. However the Bailey-Pearson instrument has been criticized for lack of construct validity (Treacy 1985), questionable test-retest reliability of the Short Form (Galletta and Lederer 1986), and for being out of date in a 1980s end-user computing environment (Doll and Torkzadeh 1988).

Since 1983, the author and colleagues have been developing and applying an instrument to evaluate the *overall* IS function (Miller and Doyle 1987; Miller 1988). Items are drawn from earlier instruments and supplemented with new items addressing topics such as end-user computing and IS strategy issues. Importance and performance scales similar to those employed by Alloway and Quillard (1981) are associated with the items. Results from large scale surveys provide evidence for the construct validity and reliability of the Miller-Doyle instrument. Factor analysis reveals six robust subconstructs that have been named Traditional Systems, End-user Computing, Strategic Issues, Responsiveness to Change, User Participation, and IS Staff Characteristics, indicating the broad coverage of the items. Appendix 1 lists the items contained in the Bailey-Pearson instrument and its derivatives and the Miller-Doyle instrument, showing how the content of the various instruments varies in emphasis. Appendix 2 indicates the nature of the scales employed.

4. FIELD STUDIES INCLUDING MEASURES OF UIS

Table 2 lists features of 20 field studies in which UIS is employed to tap user perceptions. The table is in chronological order to reveal possible developments over time.[2] Inspection of the table shows that the studies are characterized by great diversity: the unit of analysis varies from a single system to the total IS function, the nature of the responding user covers a wide spectrum, and many generalized and tailormade instruments are used. There is a mixture of factor studies and process studies and objectives and outcomes also vary greatly. Only a few UIS studies tap the perceptions of IS professionals, input from this group being reserved for technical assessments.[3] Some authors find large differences between IS and user manager perceptions of items important for IS success (Dickson and Powers 1973; Mendelow 1987) and others find IS and users in complete agreement on importance and UIS ratings (Montazemi 1988). This suggests that important insights may be gained by comparing these two viewpoints.

IS research in general and UIS studies in particular have been criticized for lack of theoretical grounding. Without strong grounding, knowledge does not accumulate, progress is hampered and measures may be chosen out of expediency (Culnan 1986; Culnan and Swanson 1986). In their review of 30 studies, Ives and Olson (1984) conclude that most work relating user involvement to MIS success is theoretic, methodologically flawed and relying on inadequate measures. In Table 2, however, there appears to be a tendency towards stronger theoretical grounding in more

Table 2. Studies Involving UIS Measurement

AUTHORS	INDEPENDENT VARIABLES	MEASURES	FOCUS OF STUDY	RESPONDENTS	COMMENTS
Dickson and Powers (1973)	Project and organizational characteristics	Attitudes: scales not specified	MIS projects	Managers	Several I/S related organizational factors are related to UIS; UIS is independent of project time and cost variables. Large difference between I/S and user rankings.
Schewe (1976)	System and organizational characteristics	10 attitude scales	Batch and on-line systems	79 user managers	Some associations between use, attitudes and independent variables.
Robey and Zeller (1978)	System adoption	Schultz and Slevin	A quality information system	11 managers and users	Adoption of system influenced by attitudes regarding individual performance and importance/ urgency of system. Organizational factors also influence adoption.
Robey (1979)	Use, perceived worth	Schultz and Slevin	Customer database	66 sales personnel	User attitudes more strongly correlated with use than with perceived worth.
Ginzberg (1981)	Users' preimplementation expectations	5 attitude scales	A portfolio management system	35 portfolio managers	Realistic expectations correlate with UIS and usage.
Baker and Miller (1984)	I/S importance rating; Nolan stages	15 attitude scales	I/S function	180 CEOs	UIS correlates with overall importance rating and presence of database, inquiry and DSS facilities.
Srinivasan (1985)	Use	Jenkins/Ricketts instrument	Modelling systems	29 corporate planners	UIS and use of modelling systems not always positively correlated. Fit between needs and features promotes use.
Raymond (1985, (1987)	7 organizational factors	20 items from Bailey/Pearson	I/S support	464 controllers in small business firms	Stronger associations with UIS than with use. UIS correlated with in-house development effort and other factors.
Mahmood and Becker (1985)	Organizational maturity in I/S	22 items from Bailey/Pearson	I/S organization	59 user-managers	UIS associates with different levels of I/S maturity.
Franz and Robey (1986)	User involvement; organizational context	12 perceived usefulness scales	Particular systems	118 user-managers; non-profit	UIS correlates with involvement in design and implementation. UIS also influenced by various features of MIS department.
Snitkin and King (1986)	Use, user system characteristics	Single effectiveness scale	Personal DSSs	31 users	High correlation between use and UIS. Other associations also found.
Emanuel (1986)	13 managerial factors	Miller/Doyle instrument	The I/S function	98 managers and I/S professionals	UIS correlates well with presence of important managerial factors.
Baroudi, Olson and Ives (1986)	Use, user involvement	Bailey/Pearson instrument	I/S activity	200 production managers	User involvement leads to UIS and usage. UIS promotes systems use.
Mendelow (1987)	Managers versus I/S professionals	42 effectiveness criteria	IS department	106 user-managers and I/S professionals	Users and I/S professionals differ on relative importance of effectiveness criteria.
Hill, Smith, and Mann (1987)	Sense of computer efficacy	Belief and intention scales	Computer purchase decision	437 undergraduate students	Beliefs about personal computer efficacy influence eventual purchase decision.
Miller (1988)	Industry sectors	Miller/Doyle instrument	I/S activity	794 users and I/S managers	Performance rating associates with importance-performance correlations.
Baronas and Louis (1988)	Control during implementation	Bailey/Pearson short form	Payroll system	92 payroll/personnel employees	Perceived control correlates with UIS.
Tait and Vessey (1988)	User involvement	Bailey/Pearson 22 items	Specific systems	42 pairs of users and designers	UIS negatively influenced by system complexity and resource constraints.
Montazemi (1988)	7 organizational factors	Bailey/Pearson 35 items	I/S activity	164 users and I/S personnel in 42 small businesses	Several organizational factors correlate with UIS. Strong correlations between I/S and users.
Collins and Mann (1988)	Human needs, group influence, management style	Belief and attitude scales	Real estate database	362 realtors	Human needs, group norms and management style influence intention to use database.

recent times. Robey draws on *expectancy theory* in his study and in expectancy theory and *social change theory*. *Nolan's stage theory* is used by Mahmood and Becker and Franz and Robey.[4] Social change theory is also a basis for the work of Franz and Robey, Baroudi, Olson and Ives, and Tait and Vessey. *Participative decision making theory* is used by Baroudi, Olson and Ives, and by Tait and Vessey. Baronas and Louis test theories of *perceived control* drawn from the social psychology discipline. Hill, Smith and Mann, and Collins and Mann test hypotheses

emanating from the *theory of reasoned action* (Ajzen and Fishbein 1980).

From this brief review of empirical research relying on the measurement of user information satisfaction, it appears that there is as yet no single accepted measure of UIS and indeed it remains a question whether available instruments tap underlying user attitudes or other psychological processes. There is more evidence of theoretical underpinning in recent studies with a distinct emphasis on behavioral models as a basis for IS theorizing.

5. A MODEL OF INFORMATION SYSTEMS BEHAVIORS

A model of IS behaviors is proposed that draws on three theories from the behavioral sciences: expectancy theory, discrepancy theory and the theory of reasoned action. It suggests that user perceptions about the fit between business needs and IS capabilities shape attitudes towards IS and that those attitudes influence usage and ultimately value to the organization.

Expectancy theories of human motivation hold that

> the strength of a tendency to act in a certain way depends on the strength of an expectancy that the act will be followed by a given consequence and on the value or attractiveness of that consequence to the actor. (Lawler 1973, p. 45)

This approach is successfully used in the IS context to relate prior expectations about a sales system's impact to job performance (Robey 1979) and to show that prior user expectations about a new portfolio management system correlate with subsequent measures of systems success (Ginzberg 1981). In a laboratory setting, DeSanctis (1983) finds some support for an expectancy theory explanation of the use of a decision support system.

Discrepancy theory is regarded as one of the strongest theories to explain job satisfaction (Lawler 1973). Locke (1969) suggests that satisfaction is the simple difference between what a person wants and what he perceives he gets. Here it is argued that IS satisfaction is analogous to job satisfaction and that the discrepancy (or fit) between perceived job needs and IS capabilities influences attitudes towards IS. Similar propositions have been made by Goodhue (1986), who defines IS "satisfactoriness" as the correspondence between job requirements and IS functionality, and Iivari (1987), who examines notions of fit in relation to UIS. Empirical support is provided by Srinivasan (1985), who finds that satisfaction with output quality correlates with the fit between the features of modelling systems and the perceived needs of corporate planners. Miller (1988) obtains importance and performance ratings from IS and user managers in a large number of firms representing different economic sectors. A consistent finding is that, in the firms rating themselves high on IS performance, there is also a fit between importance and performance ratings. There is no or very little correlation in the firms rated poor on IS.

The theory of reasoned action (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980) relates human beliefs, attitudes, intentions and behavior. Beliefs are defined as *cognitive* expectations about particular behaviors or specific attributes of those behaviors. The set of beliefs then defines an overall attitude, regarded as an *affect* (feeling). Attitude influences the intention to behave and, contingent on exogenous variables, the behavior itself. A second set of beliefs relates to whether important others think the behavior should or should not be performed, leading to a subjective norm that also influences intentions.

The utility of this theory in the psychology and marketing domains has been well documented (Ajzen and Fishbein 1980), but only recently has its value in the IS arena been investigated. Baroudi, Olson and Ives (1986) show that user involvement (arguably shaping expectations) influences both usage (a behavior) and UIS (an attitude) and that UIS has a direct influence on usage. Hill, Smith and Mann (1987) study the sense of personal efficacy regarding computers and intentions to purchase computers. They confirm the predicted path between beliefs, attitudes, intentions and behaviors. Collins and Mann (1988) find that attitudes towards usage of a database are influenced both by individual beliefs and group norms.

Based on the above theories and empirical evidence, a proposed model of IS behavior is presented in Figure 1. It is an elaboration of the theory of reasoned action, taking into account notions of fit and linking organizational outcomes to individual behaviors. The model centers on the user and suggests that process and economic outcomes of IS result from specific IS-related behaviors, especially usage of IS facilities. These behaviors are the outcomes of intentions to act, but there may be intervening variables that on occasion prevent certain actions from taking place (poor timing, changes in task requirements, revised priorities). The intention to behave is shaped by favorable or unfavorable personal feelings towards the behavior and social pressures for or against that behavior. Personal attitudes are the result of cognitive beliefs (expectations) regarding the behaviors in question and subjective norms formed as a result of beliefs or expectations about the views of important others (managers, supervisors, work groups, the IS department).

It is argued that a major influence on the individual's beliefs about outcomes is his or her evaluation of the relationship between task needs and IS capabilities. If a large discrepancy is perceived, there will be low expectations of eventual success/value, negative attitudes, and a disinclination to perform the behavior. Conversely a perception of close fit between needs and capabilities will

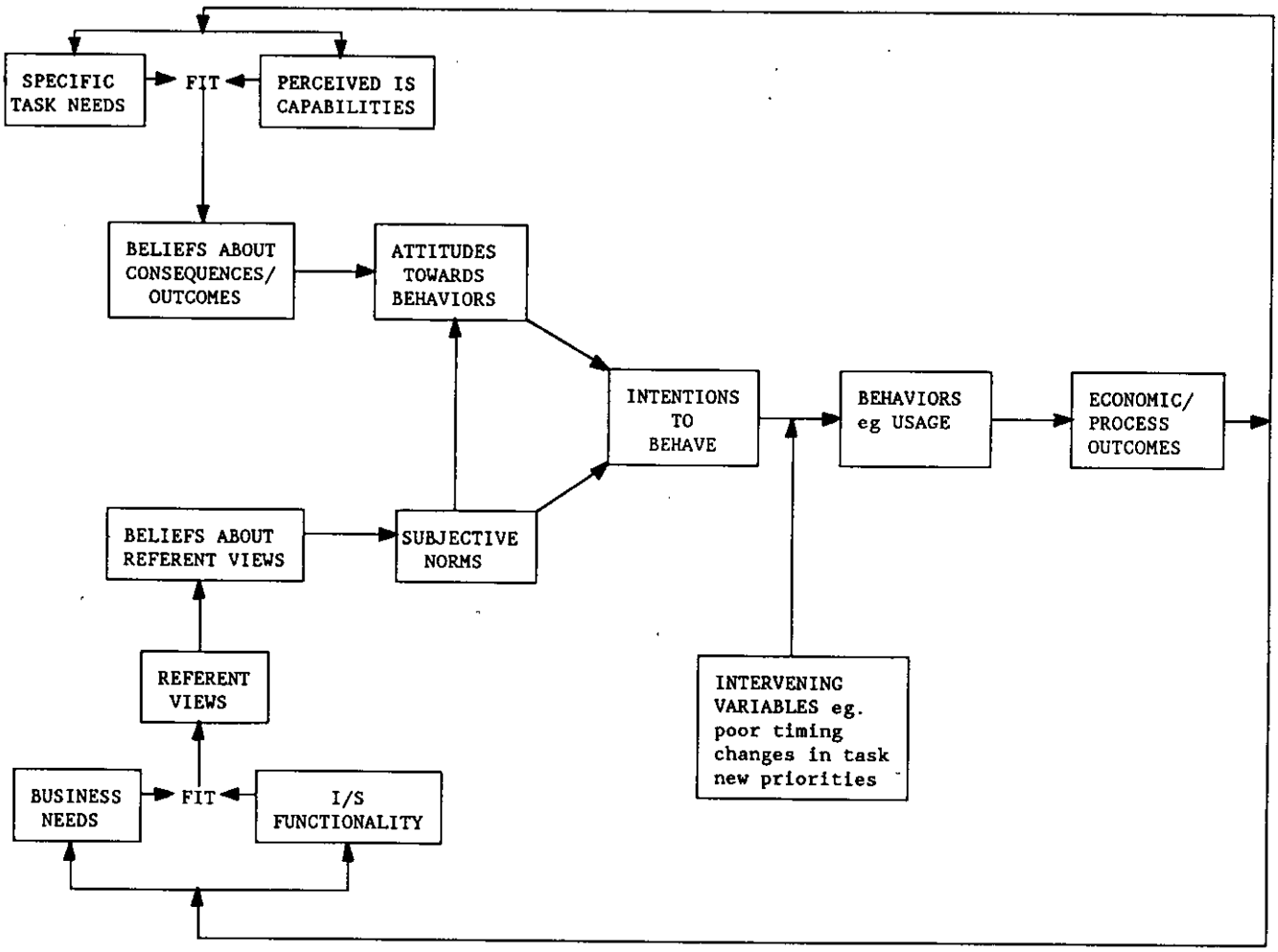

Figure 1. A Model of Information Systems Behaviors

initiate a positive sequence and encourage the behavior. The (known or imagined) views of important referents lead to subjective norms. It is postulated that notions of fit in particular are also important within the referent group. The figure shows the case where the referent might be a senior manager, viewing the overall requirement of the business and general IS functionality.

6. RESEARCH HYPOTHESES

The area investigated in this study is the overall IS function and user-managers' evaluations of IS effectiveness.[5] Specific attention is paid to the possible influence of the IS group (as referent group) on user perceptions. In line with the theory of reasoned action, the attitude of a user-manager towards IS is regarded as the summation of his or her cognitive beliefs about IS, specifically regarding IS performance. This attitude is treated as the dependent variable. It is postulated that attitudes are positively influenced by beliefs about fit held both by the individual and the IS group. Given the undoubted presence of feedback loops as outcomes change preconceived ideas and complex interactions between individuals and groups, only general hypotheses are put forward.

H1 A user-manager's attitude towards the overall IS function is influenced by his or her belief about the fit between the perceived business needs for IS and the IS capabilities available.

H2 A user-manager's attitude towards IS is influenced by beliefs about fit held by the providers of the IS service.

Other related mechanisms may also apply. First, positive user attitudes may result from the simple agreement between users and IS as to priority needs for IS. As mentioned above, some researchers claim that users and IS staff differ widely on this topic and stress the importance of achieving alignment. Second, a common view of how well the IS function is performing may be sufficient to achieve overall user satisfaction. Disagreement here may indicate that IS and users apply different criteria for evaluation, a situation that could well lead to frustration and dissatisfaction both among the user community and IS staff. These ideas can be expressed in the form of the following hypotheses.

H3 A user-manager's attitude towards the overall IS function is influenced by the extent to which his or her

perceptions of business needs for IS are matched by similar perceptions in the IS group.

H4 A user-manager's attitude towards IS is influenced by the extent to which users and IS agree on how well IS is performing.

7. METHODOLOGY

7.1 Selection of Firms and Respondents

The author approached seven of the firms that had participated in previous studies and that reflected a cross-section of industries and different levels of IS performance. All of the firms agreed to participate in the present study (see Table 3). One new firm requested involvement because of a desire to assess their own information systems effectiveness. Two surveys separated by twelve months were conducted in this case and specific interventions to enhance the IS capability and to change perceptions occurred in-between. A senior IS manager acted as liaison person in each firm and distributed questionnaires to potential respondents in confidence and under cover of a letter from a high level company official. All managers down to a chosen level together with all senior IS staff were included in the sample (except in one case where a stratified random sample was drawn).

Table 3. Participating Firms

CODE	SECTOR	COMMENTS
FIN1	Financial	Major bank and building society
FIN2	Financial	Life assurance society; market leader in annual premium income
FIN3	Financial	Life assurance society; market leader in gross assets
FIN4	Financial	Major building society; market leader in numbers of savings and loan clients
MNF1	Manufacturing	Largest producer of aluminum
MNF2	Manufacturing	Motor vehicle manufacturer and marketer; one of big five
MNF3	Manufacturing	Major manufacturer of motor vehicle engines
RET1	Retailing	Largest retailer of clothing, footwear and household products

7.2 Choice of Instrument

The Miller-Doyle instrument was used. The items are appropriate for managerial surveys of the overall IS function and the scales are of specific interest in the testing of the current hypotheses. Validity and reliability of the instrument is considered adequate for the present study. In addition to the 37 individual performance and importance ratings listed in Appendix 1, the instrument includes a single global measure of IS performance to enable partial measurement of the predictive validity of the aggregate performance measures:

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

This item preceded the full questionnaire to create some psychological "distance" from the detailed performance scales.

7.3 Follow-up Interviews and Document Analysis

Subsequent to the surveys, two to three hour structured interviews were held with senior IS officials in each firm. The objectives of the interviews were to obtain insight into IS structures and procedures, both formal and informal, relationships with the user community, and to rationalize the results of the survey. Annual reports and other company documents were also studied and case reports written. These reports became the vehicle for an on-going dialogue to identify issues related to IS effectiveness.

8. RESULTS

Usable responses were obtained from 168 IS staff and 680 user managers, representing response rates of 44 to 84 percent from individual firms. There was no evidence of respondent bias in terms of available respondent characteristics. Table 4 shows summary results for the eight surveys conducted in 1988 and the prior survey conducted in 1987. The nine sets of data are presented 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 and the combined group respectively. The "global" performance ratings shown are the averages for the single performance scale presented at the start of the questionnaire.

Simple linear regression analyses linking the 37 pairs of importance and performance ratings in each firm yielded four sets of coefficients of determination (r^2), or "measures of fit," shown in Table 5. In statistical terms these correlations express the four hypotheses presented earlier. Figures 2 and 3 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.) Absolute differences between importance (I) and performance (P) ratings for the 37 items were also calculated and summed. Table 5 shows the sum of I-P gaps for IS and User groups in each organization.

Table 4. Summary of Importance and Performance Ratings

		FIRMS								
		FIN 1	FIN 2	MNF 2	MNF 1 1988	RET 1	MNF 3	MNF 1 1987	FIN 3	FIN 4
NUMBER OF RESPONSES	I/S	16	20	21	9	10	36	13	29	14
	USER	73	111	63	40	47	53	40	82	171
	COMBINED	89	131	84	49	57	89	53	111	185
IMPORTANCE RATINGS	I/S MEAN	5.57	5.74	5.78	6.01	5.59	5.55	6.09	5.18	5.70
	SD	.41	.45	.46	.53	.58	.42	.48	.55	.62
	USER MEAN	5.32	5.59	5.76	5.45	5.59	5.53	5.26	5.38	5.63
	SD	.74	.35	.34	.46	.39	.40	.45	.47	.55
	COMBINED MEAN	5.36	5.61	5.77	5.58	5.59	5.54	5.46	5.33	5.64
	SD	.65	.35	.35	.46	.40	.39	.43	.48	.53
PERFORMANCE RATINGS	GLOBAL	6.00	5.47	5.62	n/a	5.90	4.86	n/a	4.27	4.71
	I/S MEAN	5.20	5.02	5.24	5.58	4.71	4.71	5.41	4.16	4.18
	SD	.61	.45	.47	.50	.63	.49	.49	.36	.68
	GLOBAL	5.47	5.41	5.20	n/a	5.09	5.00	n/a	4.51	3.95
	USER MEAN	5.13	5.00	4.87	4.82	4.63	4.39	4.27	4.16	3.84
	SD	.50	.38	.36	.65	.50	.53	.33	.38	.43
	GLOBAL	5.57	5.42	5.31	n/a	5.23	4.92	n/a	4.45	4.01
	COMBINED MEAN	5.14	5.00	4.96	4.96	4.64	4.52	4.55	4.16	3.89
	SD	.49	.38	.37	.67	.50	.47	.34	.35	.44

Table 5. User Performance Ratings and Measures of Fit

		FIRMS								
		FIN 1	FIN 2	MNF 2	MNF 1 1988	RET 1	MNF 3	MNF 1 1987	FIN 3	FIN 4
		Mean User Performance Ratings								
		5.13	5.00	4.87	4.82	4.63	4.39	4.27	4.16	3.38
	MEASURES OF FIT									
	I/S GROUP USERS	r^2 values*								
	Imp Perf Imp Perf									
1	X X	.62	.58	.49	.51	.47	.39	.30	.17	.15
2	X X	.30	.64	.60	.71	.44	.61	.59	.76	.62
3	X X	.50	.49	.62	.53	.54	.48	.39	.57	.56
4	X X	.45	.48	.46	.59	.36	.40	.25	.06	.05
	SUM OF I/S	15.4	25.8	19.5	18.2	32.7	30.8	24.9	39.1	59.9
	I-P GAPS USERS	18.2	22.6	33.3	17.4	34.6	41.5	36.7	45.1	60.1

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

Associations between some of the measures of fit and the mean user ratings of IS performance are evident. To further explore these, the rank order of the firms in terms of user performance rating and the four measures of fit are compared using Spearman's rank-order correlation formula (Welkowitz, Ewen and Cohen 1982). The results in Table 6 indicate that the only statistically significant correlations are between measures of fit 1 and 4 and the user rating of IS performance.

9. DISCUSSION

9.1 Survey Results

The four hypotheses put forward in this study postulate that user-managers' attitudes towards the overall IS function will be influenced by prior beliefs about organizational needs for IS and actual IS capabilities. It is also postulated that the IS group will influence user-managers'

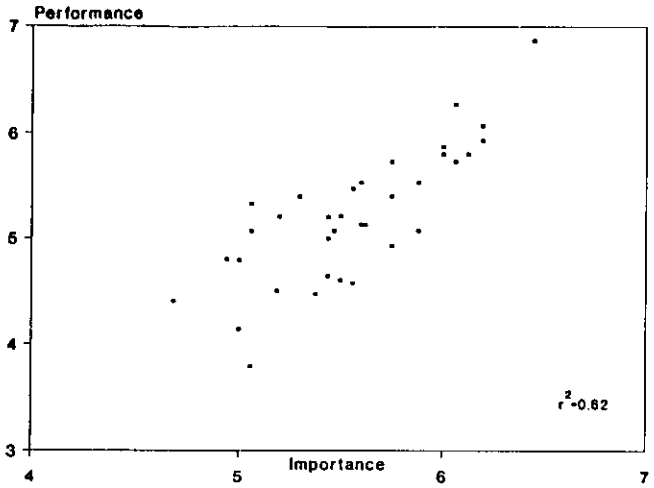

Figure 2. IS Staff: FIN 1

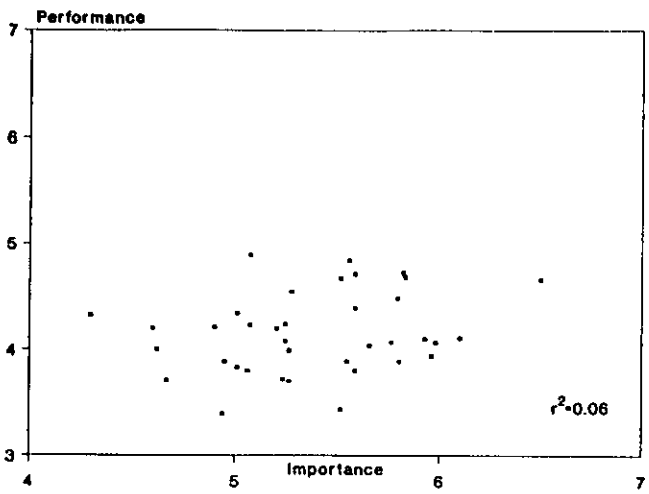

Figure 3. User-Managers: FIN 3

attitudes. Beliefs about organizational needs are operationalized by *Importance* ratings for each item, actual IS capabilities by the equivalent *Performance* ratings, and user managers' attitudes by the *mean ratings of IS performance*. Table 6 shows that the only significant correlations with mean user ratings of IS performance are for measures of fit 1 and 4. These are the IS group importance-performance correlation and the user group importance-performance correlation respectively. The relationships are shown in Figures 4 and 5 and suggest that users' attitudes towards IS are influenced by their own sense of fit between business needs and IS capabilities and also by the perceptions of their IS staff. This expresses the concepts contained in the model presented in Figure 1 and supports hypotheses H1 and H2.

Table 6. Rank-Order Correlations
User Ratings of I/S Performance and Measures of Fit

RANKING OF FIRMS BY				
I/S PERF RATING	MEASURES OF FIT 1	2	3	4
1	1	9	6	4
2	3	3	7	2
3	4	6	1	3
4	2	2	5	1
5	5	8	4	6
6	6	5	8	5
7	7	7	9	7
8	8	1	2	8
9	9	4	3	9
r_s	.95	-.35	-.13	.83

Sign. for 9 pairs: $r_s > .83 p < .01$, $> .60$ $p < .10$

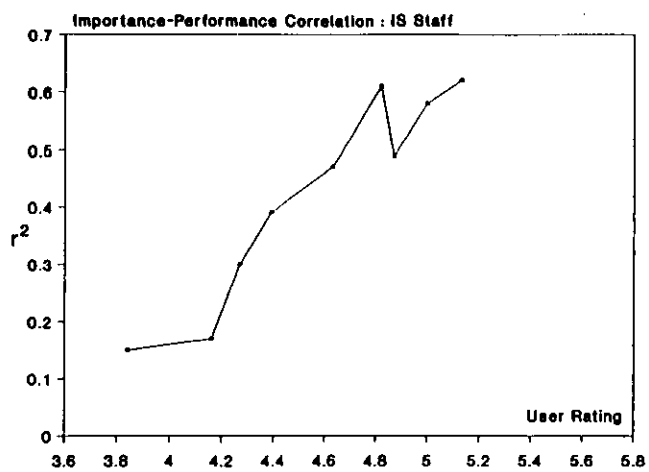

Figure 4. Measure of Fit 1 versus User Rating of IS Performance

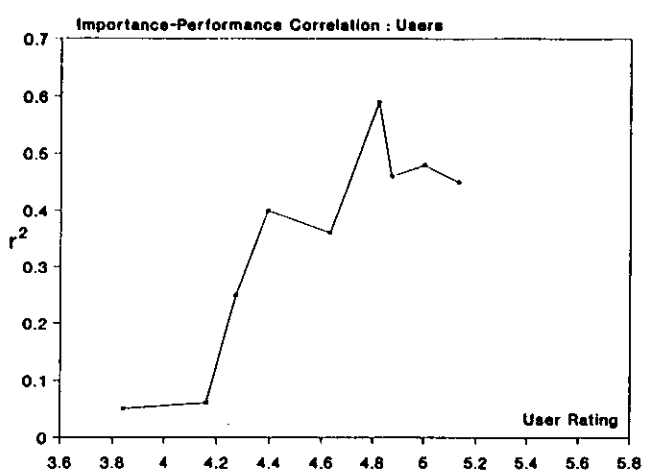

Figure 5. Measure of Fit 4 versus User Rating of IS Performance

The table shows no correlation between the mean performance ratings and measures of fit 2 or 3. Measure of fit 2 links IS and user perceptions of importance. Measure of fit 5 links IS and user perceptions of performance. From Table 5, however, the r^2 values for these two measures are all statistically significant and reasonably high. In other words, *irrespective of the level of user satisfaction with IS*, user-managers and IS staff tend to agree on what is important for the business and how IS is performing. The extent of agreement on these two separate entities is not a predictor of user satisfaction with IS and the results therefore do not support hypotheses 3 and 4.[6]

Regarding the evaluation of gaps between importance and performance ratings, Table 5 shows that the sum of individual gaps rises sharply with declining perceptions of overall IS performance. This is not as useful a finding as might appear. There is a common perception of the importance of IS irrespective of firm. Thus, inevitably, as perceptions of performance decline, so will the gaps increase. Gap analysis does not account for the extent of fit among individual items making up the overall IS function. Correlation analysis does and therefore offers measures of alignment between needs and capabilities.[7]

9.2 Contextual Data

The in-company interviews and document analysis are in line with the survey results and provide insight into the contextual mechanisms whereby fit is or is not achieved. Brief comments on some of the firms are offered here in descending order of IS performance.

FIN 1 and FIN 2 corporate cultures strongly emphasize communications. Extensive formal planning procedures are in place and there is also continual informal discussion between IS and users at all levels. Senior IS staff are long-serving and promotion from within is IS policy. Business training for IS staff is encouraged. The IS mission statement in FIN 2 stresses service to policy holders and marketing staff.

The MNF 2 culture is clearly focused on service and communications. A successful "customer care" program has been extended to internal operations and has led to formal interdepartmental appraisals. Informal communications between IS and users and within the IS group are rated very highly. Nonetheless, ratings of IS performance have declined from levels of about 5.5 three to four years ago, this being attributed to the restructuring and perceived downgrading of the IS function, followed by resignations among senior IS staff.

The first survey in MNF 1 revealed unrealistic perceptions among IS, fragmentation and an overly technical focus. User demand for end-user facilities had not been met. Conscious moves to unite the IS group and bring it "closer to the user" were effected and microcomputers were provided throughout the firm. Improved communications caused users to shift from "your DP system" to "our system." Comparison of survey statistics shows greater fit between needs and capabilities and a large shift in user performance rating (Cowie 1989a, 1989b).

At the time of the survey in FIN 3, IS underestimated user capabilities and were trying to "go it alone." They were spread too thinly and lacked focus. Users were resistant to undergoing IS-related training. There was a lack of emphasis on long-range planning and business pressures had led to a "firefighting" mode in IS. FIN 3 is currently going through a planned change in culture from one of complacency to one that demands only the best (from "good enough" to "not good enough").

FIN 4 has experienced extremely rapid growth in its client base and IS has consistently failed to keep up. Poor service from on-line systems has caused major dissatisfaction and disillusionment among users. The operations and development groups in IS report through different senior managers to the CEO and there is inappropriate competition and fragmentation in the groups.

10. CONCLUSIONS

Theorizing and empirical research into IS effectiveness have led to a focus on user attitudes. Both the attitude construct and its measurement via UIS have been shown to be imprecise and to mix cognitive and affective mental processes. The model of IS behaviors offered here is grounded in well-established behavioral theories, specifically separating these mental processes and suggesting a causal link between them. The relationships between beliefs and feelings proposed in the model receive some empirical support from this and previous studies and the present study suggests that cognitive beliefs about the fit between business needs and IS capabilities are of special relevance. At most, however, these results support "fit" as a *necessary* condition for positive attitudes and consequent behaviors and outcomes. This limited conclusion reflects the realism of the "emergent perspective" of causal agency in IS theory, which holds that

> the uses and consequences of information technology emerge unpredictably from complex social interactions...[and the] dynamic interplay between actors, context and technology. (Markus and Robey 1988, p. 588)

Regarding IS effectiveness, the complexity of the attitude construct has been discussed at some length by Melone (forthcoming), who concludes that user satisfaction alone is not sufficient to capture the full meaning of IS effectiveness. In support of this view and based on the results of this study, the following simple definition of IS effectiveness is proposed:

An effective information system is one that achieves the purposes of its users.

This definition specifically addresses the dictates of organizational effectiveness research and systems theory which call for a definition of information systems effectiveness that emphasizes the individual and focuses on purpose. In comparison with UIS, the definition is grounded in the *cognitive* rather than affective domain and requires the *explicit measurement of fit*. Respondents could include users, IS staff, top management or other stakeholders and are treated as *expert witnesses*, assessing business needs and facets of the IS capability. The respondents and items chosen should match the purposes of the investigation, which might be a general assessment of the total IS function, an evaluation of a specific system, or a comparison between functional groups. Measurement scales should specifically be designed to tap cognitive belief structures and measure issues such as the degree of importance of different facets of IS and the probability that a particular facility will be used.

From the researcher's point of view, measuring and diagnosing IS effectiveness 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 and can be expected to differ for assessments of mainframe systems, end-user computing, IS departments, the total IS function or other domains.

An important outcome of this research is the role of the IS professional in shaping user beliefs and attitudes. Elsewhere it has been 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 and Jacobs 1987). The present study supports this finding and emphasizes the need for IS people to understand business requirements so that they might focus their efforts and offer appropriate support to their users.[8]

From the practitioner's point of view, the model underlines the need to work with both users and IS in order to achieve IS effectiveness. The model is an adaptive one. If both IS and users perceive a fit, success can be expected. Otherwise, unless there are interventions, a progressive decline in expectations and attitudes is likely. The model suggests that managers must *engineer* a fit between perceived business needs and IS capabilities. "Throwing money" at the problem or imposing solutions will not work. Training and education specifically targeted at understanding the nature of fit and narrowing perceived gaps is clearly indicated (in contrast to general awareness courses or required attendance at routine training courses). Active user participation in IS projects may well enhance fit for both IS and users.

The model presented here does not pretend to capture the full richness of IS behaviors in organizations. The results do, however, suggest that further and more specific research projects will throw valuable light on this crucial aspect of organizational activity.

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12. ENDNOTES

1. Confusion here has been blamed for mixed results in empirical studies of IS relationships (Swanson 1982), lack of clarity in IS theory formation (Goodhue 1986) and a shaky foundation for measures of attitude (Melone forthcoming).

2. Only a few studies from the 1970s are listed. Extensive reviews applicable to this period are available (Zmud 1979; Swanson 1982; Ives and Olson 1984).

3. Mahmood and Becker (1985) rely on IS managers to define the stage of growth of IS in the firms they study, but gather information satisfaction data from users.

4. This theory has been strongly criticized (Benbasat et al. 1984; King and Kraemer 1984).

5. The terms user, user-manager and manager tend to be used interchangeably here. They are intended to refer to what Beath (1987, p. 415) defines as the "virtual user," i.e., "high enough in the organization to influence the flow of resources and also a knowledgeable participant in the business function to be supported."

6. There is a noticeable tendency for IS measures of fit to be higher than the equivalent user measures. In only one firm is the order reversed (MNF 3). It is also seen from Table 4 that user standard deviations of I and P ratings are smaller than the equivalent IS ratings in 15 out of 18 cases, despite the fact that user groups are much more heterogeneous in terms of organizational level and functional responsibility. A possible explanation is that users are less discriminatory in their assessments of both I and P.

7. In the present context, the analysis of gaps is not as fruitful as correlation analysis. However, the author has found that, in practical terms, identification of large gaps between importance and performance ratings for particular items has proved to be very instructive for managers and has enabled them to make specific diagnoses of problem areas.

8. The influence of other referents is explored by Robertson (1988), who examines the social determinants of IS use among professionals in a management consulting firm. He finds that the use of an information system is influenced directly through the individual's attention to the social influences around him and indirectly through the social system's influence on how the individual interprets the IS available. Leonard-Barton and Deschamps (1988) examine managerial influence on the implementation of an expert system and find that the influence of management input varies according to employee characteristics.

APPENDIX 1:

ITEMS INCLUDED IN UIS INSTRUMENTS

ASPECT OF INFORMATION SYSTEMS ACTIVITY	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	*			
Response/turnaround time (online/batch)	*			
Integration of systems across functional areas	*			
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	*	*	*	*
Users' understanding of systems	*	*	*	*
Processing of change requests	*	*	*	*
Completeness of output contents	*	*	*	*
Accuracy of output information	*	*	*	*
Relevancy of products/services provided	*	*	*	*
Time required for new development	*	*	*	*
Attitude of EDP staff	*	*	*	*
Communication with EDP staff	*	*	*	*
Degree of training in user proficiency	*	*	*	*
Currency of output information	*	*		*
Convenience of access to computer system	*	*		*
Flexibility of systems	*	*		*
Timeliness of output information	*	*		*
Users' feeling of control/influence	*	*		*
Users' confidence in systems	*	*		*
Means of interface with EDP center	*			*
Perceived utility/cost-effectiveness	*			*
Technical competence of EDP staff	*			*
Security of data	*			*
Top management involvement	*			*
Hardware and systems downtime				*
Technical sophistication of new systems				*
Quality of systems analysts				*
User-oriented systems analysts				*
IS support for users in preparing IS proposals				*
Increased IS effort on creating new systems				*
Responsiveness to changing user needs				*
IS strategic planning and resource allocation				*
Use of IS steering committee				*
Priorities reflecting organizational objectives				*
IS providing competitive advantage				*
Integration of office communications and IS				*

	B-P[1]	IOB[2]	SF[3]	M-D[4]
Direct user access to data and models				*
Quick and flexible access to computer data				*
Models to analyze business alternatives				*
Data analysis to support decision making				*

[1]Bailey-Pearson [2]Ives, Olson and Baroudi [3]Baroudi-Orlikowski [4]Miller-Doyle

APENDIX B

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 profiency 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 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 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")

		Possibly				Very
Irrelevant		Useful		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 and Pearson 1983; Baroudi and Orlikowski 1986; Miller and Doyle 1987)