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# Rethinking Office Automation Evaluation: Teaching Old Tricks to a New Dog

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Teaching Old Tricks to a New Dog

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# ABSTRACT

In the literature exploring IS (information systems) evaluation, practitioners rarely practice what researchers preach, and researchers rarely preach what practitioners practice. However, the unique characteristics of OA (office automation) systems force a rethinking of the existing schism between IS evaluative practice and research. This paper presents a model of OA evaluation that integrates the perspectives of research and practice. The model suggests that in certain circumstances, purely quantitative OA evaluation may be irrelevant or destructive. Strategies for avoiding the undesirable behavioral side-effects of OA evaluations include integrating multiple perspectives, considering unintended effects, using orthogonal measures and methods, scrutinizing social and decision processes, and discovering goals.

## INTRODUCTION

This paper is built around a paradox. Evaluation strategies from the information systems (IS) literature are generally based upon quantitative methodologies (e.g. Schwuchow, 1977; King and Schrems, 1978; King and Epstein, 1983; Bozcany, 1983; Piepta and Anderson, 1987; Sharda, Barr, and McDonnell, 1988). However, studies of IS professionals indicate that they frequently omit formal, quantitative evaluations of IS and rely instead on more intuitive assessments of system impact (Greiner, Leitch, and Barnes, 1979; Keen, 1981; Sprague and Carlson, 1982; Couger and Colter, 1983; Hogue and Watson, 1984). If formal, quantitative models for IS evaluation are of value, why are they infrequently used by their intended beneficiaries?

One explanation is that most formal models of IS evaluation are vestiges of an era when the goal of assessing IS was to evaluate the realized cost savings. With the advent of office automation (OA)[1] however, IS increasingly impact qualitative processes in organizations such as social relationships, leadership emergence, communication patterns, and managerial feedback processes (Williams, 1978; Zuboff, 1982; Weick, 1985; Kiesler, 1986; Rogers, 1986). As a result, the relevance of evaluative strategies developed primarily to assess direct cost savings are increasingly suspect. Further, given that approximately 20% of U.S. businesses have adopted some form of office automation (Uttal, 1982; Rogers 1986) assessing the impact of OA is far from an "academic" issue.

The perspective I wish to consider in this article is that both the practice and theory of OA evaluation can be improved by a dialectic approach,

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[1] OA is herein defined as the application of electronic and electro-mechanical devices to facilitate communications between organizational actors.

wherein descriptive and normative views of the evaluative process inform one another (Adler, 1927; Benson, 1977; Dirsmith and Covaleski, 1987). To date, approaches to IS evaluation have frequently been theoretical constructs borrowed from reference disciplines (e.g. experimental psychology, engineering) that ignored the context of IS, or, descriptions of existing IS practice uninformed by relevant theory. This article seeks to inform normative theory with descriptions of practice, and descriptions of practice with normative theory. March argues for a similar approach in discussing the relationship between normative and descriptive theories of choice:

> "I think there is good sense in asking how the practical implementation of theories of choice combine with the ways people behave when they make decisions, and whether our ideas about the engineering of choice might be improved by greater attention to our descriptions of choice behavior." (March, 1978, p. 588).

It is worth noting that much of the theory presented herein is not new. Its origins date to the 1950s (e.g. Blau, 1955; Merton, 1957). However, the perspective offered by this theory is relatively unexplored in IS. As a result, the purpose of this article is to teach some old tricks (from social intervention and organizational behavior research) to a new dog (OA evaluation).

## UNDERLYING PRINCIPLES

Three principles from organizational behavior provide a conceptual foundation for linking social intervention theories with OA evaluation practice. These are the principle of incompatibility, the distinction between high and low evaluative methodology, and the distinction between uncertainty and ambiguity.

### *The Principle of Incompatibility*

The principle of incompatibility states, in essence, that as a system becomes more complex, it is increasingly difficult to generate statements about

the system that are both precise and significant (Zadeh, 1973; Daft and Wiginton, 1979). Ultimately, a threshold is reached beyond which precision and significance become mutually exclusive. Since human systems are among the most complex of known systems (Boulding, 1956; Pondy and Mitroff, 1978; Daft and Weick, 1984), significant statements about organizations must necessarily contain ambiguity and inexactness to retain relevance (Daft and Wiginton, 1979). Similarly, assessing the impact of a complex OA system necessitates the use of some imprecise, ambiguous statements if evaluation is to be nontrivial.

*High and Low Variety Evaluation Methodologies*

A related distinction is the difference between low and high variety evaluation methodologies (Pondy, 1977; Patton, 1987). Low variety evaluation methodologies seek to generate precise statements about organizational processes, while sacrificing accuracy. Tools used in low variety evaluation include traditional experimental controls, formal statistical techniques, and analytical mathematics. Due to the principle of incompatibility, low variety evaluation will likely detect, process, and exhibit relatively less variety in the system under study, since they have a limited capacity to detect qualitative phenomena (Daft and Wiginton, 1979). For example, the use of low variety methodologies might lead to the conclusion that an implemented OA system had "no effect" since there were no measurable cost savings from the system.

In contrast, higher variety evaluation methodologies seek to generate more accurate descriptions, but contain ambiguity and imprecision. Tools used in higher variety evaluation are primarily qualitative and are designed to detect, process, and exhibit qualitative organizational phenomena, such as intangible benefits and ultimate outcomes (Argyris, 1972; Child, 1972). As a result

of the use of thicker, richer measures, complex organizational processes are more likely to be captured, understood, and explained using high variety methodologies (Weick, 1974).

Table 1 (adapted from Douglas (1976) and Weick (1984)) provides a continuum of evaluation methodologies. The first three categories in Table 1 represent high variety evaluation methodologies. These include instrospection (e.g. a manager writing a memo) and many forms of field research (e.g. a manager asking subordinates about system effects). The last category in Table 1 consists of low variety evaluation methodologies, such as questionnaires, mathematical models, and statistical models. To date, evaluative methodologies proposed for evaluating IS are primarily of low variety (e.g. King and Schrems, 1978; Sprague and Carlson, 1982; Sharda, Barr and McDonnell, 1988), while methodologies used by IS practitioners are generally of high variety (e.g. Greiner, Leitch, and Barnes, 1979; Keen, 1981; Sprague and Carlson, 1982; Couger and Colter, 1983; Hogue and Watson, 1984).

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Insert Table 1 about here

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*Uncertainty and Equivocality*

A final principle useful in considering OA evaluative practices is the distinction between uncertainty and equivocality. Uncertainty is the absence of information (Miller and Frick, 1949; Daft and Lengel, 1986). As information increases, uncertainty decreases. The game of 20 questions illustrates uncertainty and uncertainty reduction. A questioner receives yes-no answers to questions intended to identify an unknown object as either animal, vegetable, or mineral (Taylor and Faust, 1952; Bendig, 1953; Daft and Lengel, 1986). Uncertainty is eliminated when the object is correctly identified. In management

tasks characterized by uncertainty, managers are able to ask questions, and get answers that permit problem solving. Organizational processes can be structured to reduce uncertainty through the use of rules and regulations and through the creation of formal, structured IS (Daft and Lengel, 1986).

In contrast, equivocality involves interpreting data that is unclear, conflicting, or paradoxical (Weick, 1979; Daft and Macintosh, 1981). The sentence, "I saw the man on the hill with the telescope," is equivocal: multiple interpretations are possible (Simon, 1982, p. 93). Do I have the telescope, or does the man on the hill? Is it merely on the hill and not in his hands? Managers deal with 'men on hills with telescopes' regularly, and must make sense of such equivocality. Daft et al. observe that in equivocal environments:

> "Managers are not certain what questions to ask, and if questions are posed there is no store of objective data to provide an answer. (Daft, Lengel, and Trevino, 1987, p. 357)."

Fundamental to the process of managing equivocality are exchanges between managers intended to reduce equivocality and create a shared interpretation that can direct future events. When facing equivocality, organizations must enact solutions rather than discover them through data gathering activities (Weick, 1979; Daft and Weick, 1984). The process of enactment involves exchanging subjective opinions, managing multiple perspectives, and proactively shaping environments (Smircich and Stubbart, 1985). Equivocality is reduced by managing and generating both events and interpretations of events.

Since communication between managers is essential in reducing equivocality (Weick, 1979), implementing an OA system may directly impact the organizational processes for managing equivocality and enacting solutions to ambiguous problems (Daft, Lengel, and Trevino, 1987). OA systems are frequently designed to alter communications patterns in tasks containing equivo-

cality. Neith decision support systems (DSSs) designed for individual managers nor transaction processing systems are designed to change organizational communication patterns. Individualized DSSs and transaction processing systems are therefore more likely to impact organizational processes for managing uncertainty, but not equivocality. For reasons to be discussed, the use of evaluative methodologies appropriate for uncertainty-managing systems may lead to irrelevant or destructive evaluations of equivocality-managing systems.

## OA AS SOCIAL EXPERIMENT

OA systems are social experiments[2], similar to the implementation of a program designed to ameliorate social problems (Rogers, 1986). Both OA systems and social programs are generally implemented in field studies without benefit of formal experimental controls or control groups. Both are implemented by purposive action that is tied to specific, frequently qualitative, objectives. The effects of both OA systems (Kling, 1980) and social programs (Salasin, 1973; Suchman, 1977) have been demonstrated to be far-reaching and often unanticipated.

A significant body of research, called "evaluation research" has evolved to assess the effects of social experiments (e.g. Caro, 1971; Weiss, 1972a, 1972b; Suchman, 1974, 1977; Patton, 1987). Rogers (1986, p. 218) notes the similarities between OA systems and social programs and suggests that evaluation research is a useful paradigm for considering the impact of OA systems. This section discusses the implications of viewing OA systems as social experiments, and explores findings from evaluation research relevant to OA evaluation.

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[2] The term "social experiment" is from Suchman (1974).

*A Model of OA Implementation Evaluation*

Evaluations are an important component of the authority structure of an organization (Scott, Dornbusch, Busching, and Laing, 1967; Pfeffer, 1978). Figure 1 is a model (adapted from Suchman (1977, 1974)) that is useful in formulating the problem of evaluating an implemented OA system. The introduction of OA into an organization creates multiple, measurable effects ($Y_1$, $Y_2$, ... $Y_m$) (Hedberg, Edstrom, Muller, and Wilpert, 1975; Kling, 1980). Each of these effects may be explained by an antecedent condition ($a_1$, $a_2$, ... $a_m$), by the introduction of the OA system (X), or by an interaction between the OA system and an antecedent condition ($X * a_n$). No single antecedent condition is a necessary and sufficient explanation for any effect. Further, measurable effects (Y) are presumed to link to qualitative consequences ($b_1$, $b_2$, ... $b_p$), that represent the ultimate objectives or outcomes of the system. Evaluation under such conditions requires multicausal models, that include consideration of the interdependence of antecedent conditions, observed effects, and consequences (Suchman, 1977).

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Insert Figure 1 about here

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To illustrate the model, consider the evaluation of a teleconferencing system (X) designed to facilitate meetings between geographically-disbursed engineers or executives. Such systems are currently in place at Digital Equipment, AT&T (Kiesler, 1986), and NASA (Trevino, Lengel, and Daft, 1987). Potentially important antecedent conditions ($a_m$s) include existing communication modes, power relationships between engineers and executives, managerial roles, familiarity with communications technology, and the stated goals of the teleconferencing system. Measurable effects ($Y_n$s) might include measures

of productivity (e.g. time required to make a decision), process (e.g. frequency of communications between users), and OA product (e.g. development costs, on-going maintenance costs) (Sprague and Carlson, 1982). Consequences of the system ($b_p$s) might include a better understanding of the business, new insights, and improved communication.

Inferences of causality under such conditions must be conditional and probabilistic, focused upon identifying contributing or precipitating factors, rather than determining conditions. Because of the complexity and equivocality of the organizational environment (Pondy and Mitroff, 1978), effects resulting from OA implementation must be considered dependent upon existing preconditions present in the environment, and upon the linkage of preconditions with system objectives and implemented technology. As Kling (1980) notes, computers have no intrinsic impact. Rather, the impact of computing on organizations results from the joint effects of computing technology and managerial intent:

> The "consequences" of computer use are simply the consequences of purposive action married to computing. As these actions change, the "consequences" may well change. ... "Impact" [from computing] happens because of some underlying patterned social process, and speaking about the "impacts of technology" often distracts attention from the social processes by which they are developed, adopted, and used. (Kling, 1980, p. 100).

OA systems can be considered only one factor introduced into an ongoing social process existing prior to implementation. Suchman argues for a similar perspective is assessing the effects of social programs:

> "Thus, any explanation of the success or failure of program [X] to achieve effect [Y] must take into account the preconditions under which the [system] is initiated, the events which intervene between the time the program begins and the time the effects are produced, and the consequences that follow upon the effects. Thus no program is an entity unto itself, but must be viewed as part of an ongoing social system (Suchman, 1977, p. 51).

*Measurable and Qualitative Failure*

Two sources of potential OA system failure can be identified using Figure 1. *Measurable failure* is herein defined as failure of the system (X) to impact the measurable dependent variables ($Y_n$s). *Qualitative failure* is herein defined as the failure of the measurable dependent variables ($Y_n$s) to impact system objectives ($b_p$).

Measurable failure in OA systems can be detected using low variety evaluation methodologies. Once identified however, measurable failure is not easily explained, due to the quasi-experimental design used in OA implementation. Possible explanations include: 1) poor system engineering (i.e. inadequate X), 2) preexisting conditions that nullified the impact of the system (a * X interaction), or, 3) inadequate measurement of dependent variables (i.e., Ys). Techniques intended to improve low variety evaluation have been presented in the systems literature in discussions of experimental design (e.g. Jarvenpaa, Dickson, and DeSanctis, 1985), systems engineering (e.g. Sprague and Carlson, 1982), and measurement methodologies (e.g. Miller and Doyle, 1987). Qualitative failure has received considerably less attention in the IS literature (a notable exception is Mason and Swanson, 1981). Consequently, the remainder of this article will focus on evaluative techniques for detecting and describing qualitative failure.

Qualitative failures are summarized metaphorically by Suchman as medical operations in which "the operation was a success, but the patient died (Suchman, 1977, p. 51)." Qualitative failures are attributable to a misspecified or nonexistent relationship between measurable dependent variables and system objectives. In such cases, the system may impact the dependent variables

as predicted (i.e. X --> $Y_n$s). However, changes in the dependent variables ($Y_n$s) do not lead to the expected consequences ((i.e. $Y_n$s -/-> $b_p$s)).

For example, an OA system might reduce the time required to make decisions, increase the frequency of communications between executives, be praised by end-users, and still be perceived as decreasing the quality of organizational communication. Reduced time to make decisions may decrease decision quality by reducing time needed for deliberation and cogitation (Zuboff, 1982; Weick, 1985). Increased quantity of communication between users may be due to decreased quality of interactions (e.g. "I was just calling to clarify what I thought you said during our last conference call ...") (Kiesler, 1986; Daft, Trevino, and Lengel, 1987). End-users might accept the system to placate superiors with a vested interest in making the system appear successful (Eveland, 1983). The above scenario provides an OA equivalent of Suchman's medical metaphor: "No one likes the system, but everyone uses it."

Low variety evaluation methodologies are well-suited to capturing measurable failure, but not qualitative failure. Low variety measures of time to make a decision, frequency of electronic communications, and user perception would likely indicate in the above example that the system was a success. However, high variety methodologies would be required to determine if the qualitative consequences of the system were desirable (Rice and Rogers 1984; Rogers, 1986).

**RATIONAL DECISIONS TO NOT EVALUATE**

The potential for qualitative failure provides a justification for omitting low variety evaluative approaches of OA in certain circumstances. Since low variety methodologies are hypothesized to provide data relevant only to assessing measurable failure, then researchers interested in determining quali-

tative success or failure are well advised to forego low variety evaluations. Further, evidence from existing OA systems suggests they have provided no direct cost savings (National Archives and Records Service, 1981; Uttal, 1982; Bowen, 1986; Business Week, 1988), yet have had a significant impact on qualitative processes in organizations (Zuboff, 1982; Kiesler, 1986; Sproull and Kiesler, 1986; Jarvenpaa, 1988). This suggests that OA systems may be prone to weak or nonexistent causal links between measured dependent variables and systems objectives (Rice and Rogers, 1984; Rogers, 1986). As a result, thoughtful consideration of the strength of linkages between measurable dependent variables and systems objectives is relevant to designing effective OA evaluation.

*The Measurement of Intangible Benefits*

The extent to which intangible benefits can be captured in measurable variables is an issue in the IS literature. Some authors argue that all IS benefits can be assigned quantitative values (Emery, 1982; Wallace, 1984). Others contend that attempting to quantify intangible benefits leads to a misplaced focus on the assumptions used for quantification, and thereby distracts from meaningful evaluation (Knutsen and Nolan, 1974; Keen, 1975; Keen, 1981). In a discussion of quantifying the benefits resulting from building controls into accounting IS, an Arthur Young and Co. training manual argues that quantifying intangible benefits is frequently impossible:

> Determining the benefits ... to be derived from correcting a weakness in controls is even more subjective than determining the costs. In many (if not most) cases, the benefits to be derived from a given control cannot be measured quantitatively (Arthur Young and Co., 1980, p. 61).

The principle of incompatibility provides an explanation for the inability to capture qualitative phenomena using quantitative analysis (Daft and Wigin-

ton, 1979). By definition, intangible goals contain ambiguity and interdependence between decision factors. The principle of incompatibility suggests that nontrivial descriptions of intangible goals requires the use of language that captures these ambiguities and interdependencies. Attempting to measurable intangible, qualitative factors using low variety evaluative methodology may result in a caricature, rather than a veracious description, of such factors. Only high variety evaluation methodologies contain sufficient complexity to provide meaningful evaluations of intangible benefits.

If system objectives cannot be adequately captured by measurable dependent variables, then undertaking low variety evaluations of OA system incurs costs with no corresponding instrumental benefits. Existing evidence suggests that IS practitioners often do not employ low variety evaluation strategies when systems are developed in response to intangible goals (Keen, 1981; Sprague and Carlson, 1982; Hogue and Watson, 1984). In such cases, undertaking formal, quantitative evaluation may be undertaken for primarily symbolic rather than instrumental value (March, 1978; Feldman and March, 1981; Meyer, 1984). For example, a formal cost-benefit analysis of an OA system may be undertaken primarily as a ritual necessary to projecting an appearance of rational decision making (Robey and Markus, 1984).

*The Goal Trap*

The preceding discussion suggests that under certain circumstances, low variety evaluation may result in incurring costs with only symbolic benefits. However, social intervention research indicates that improperly-applied low variety evaluation may also result in a redefinition of program objectives. Deutscher (1977) defines the transformation of program goals resulting from low variety measurement as the "goal trap."

The goal trap refers to the potential for the measurement process to lead to trivialized programs, directed not towards original goals, but rather towards achieving the measurable "equivalents" of those goals. In terms of Suchman's model, the dependent variables (Y) may replace and usurp system objectives ($b_p$s). Original, qualitative goals are replaced with the measurable "equivalents". However, the measurable "equivalents" may be poor surrogates for the original qualitative objectives of the system.

The goal trap has been recognized in IS. Moore and Chang (1983) describe cases of premature closure on systems requirements leading to creating systems designed to address structured, easily solved problems, rather than more important, but less structured problems. Similarly, Kleijnen observes that emphasizing quantitative measures of benefits can result in clerical applications being given priority over less easily justified projects. As a result:

> "in more sophisticated applications there is the danger of concentrating on the easily quantified factors (say, inventory cost) at the expense of possibly more important, but more difficult to quantify factors (say, goodwill) (Kleijnen, 1980, p. 9)."

Colton (1978) provides an example of a system that was successful according to pre-established measurable criteria, but that could be described as a qualitative failure. The Kansas City Police Department provided officers with decision support in locating stolen cars, unpaid parking tickets, and unregistered vehicles. Police Department statistics showed a marked increase in efficiency as a result. The (ex)Chief ultimately regretted the DSS however, since officers spent more time on these relatively minor offenses, to the exclusion of messier, less easily quantified cases. Similar dysfunctional consequences from the use of low variety measures in equivocal, complex environments have been observed in research on welfare offices and public employment agencies (Blau, 1955), undergraduate education (Becker, Geer, and Hughes, 1968), military

strategy (Campbell, 1977), and both Soviet (Granick, 1954) and U.S. (Argyris, 1952) factory production management.

## STRATEGIES FOR DESIGNING OA EVALUATION

The exclusive use of low variety evaluation methodologies in environments characterized by high equivocality creates the potential to ensnare both evaluator and evaluatee in the goal trap. Such arguments help explain why IS practitioners frequently omit low variety evaluations of IS. However, these observations are not helpful in designing techniques more appropriate to OA evaluation. Accordingly, this section offers suggestions for increasing the relevance of OA evaluation, and decreasing its potentially destructive by-products.

### *1. Use Multiple Perspectives For Evaluation*

One approach to increasing the relevance of OA evaluation is to use multiple perspectives in evaluation (Akoka, 1981; Robey and Marcus 1984; Cooper 1988). Kling (1980) argues that there are two basic theories used to examine the effects of computing. Weick summarizes these theories as follows:[3]

> "Systems rationalist perspectives assume consensus on goals relevant to computer use, view efficiency as a predominant value, focus attention on the user more than on the context in which the user operates, assume a top-down view of change and implementation, and treat the formal authority structure as an accurate map of the way activities are carried out.
>
> Segmented institutionalist perspectives assume that conflict is more common than consensus, that definitions of the situation are multiple, that goals are diverse, that implementation is affected by vested interest groups and power, that relevant social forms consist of much more than task groups, and that technology can take on a variety of meanings (Weick, 1984, p. 118)."

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[3] Other authors have presented similar dichotomies using different labels. For example, Boland (1978) discusses the "traditional" and "alternative" perspectives of rationality in IS design. These roughly correspond to Kling's systems rationalist and segmented institutionalist perspectives, respectively.

Kling's perspectives provide alternative frames for conducting OA evaluation. In terms of Suchman's model, multiple evaluative perspectives can be used to increase both the number of orthogonal dependent variables (Ys), and the number of observed outcomes (bps). Increasing the pool of unique variables and observed outcomes makes it less likely that: (1) only predicted consequences will be observed, (2) data will be an artifact of the theoretical perspective embraced by the evaluator (Weick, 1979), and (3) evaluation will use only low variety measures. Consequently, a pragmatic strategy for improving OA evaluation is to integrate the systems rationalist and segmented institutionalist perspectives in evaluation. Suggestions for accomplishing this integration follow.

*2. Attend to the Unintended*

Suchman's model of evaluation (Figure 1) illustrates the complex, interdependent environment in which OA systems are placed. This environment insures that multiple effects will result from OA implementation. Some of these effects will be intended; however, many more will be unintended, and unanticipated by system designers (Rogers, 1983, 1984, 1986). Recent research confirms that unintended effects result from OA systems. Demonstrated unintended effects include changes in leadership patterns (Strickland, Guild, Barefoot, and Paterson, 1978; Zigurs, Poole, and DeSanctis, 1987), altered propensities toward risk (McGuire, Kiesler and Siegel, 1987), interruptions of traditional feedback processes (Zuboff, 1982), changed communication patterns (Williams, 1978; Rogers, 1986), altered social relationships (Zuboff, 1982; Kiesler, 1986; Siegel, Dubrovsky, Kiesler, and McGuire, 1986), changes in social status (Rogers, 1986), increases in the quantity of available information (Zuboff, 1982), and decreases in the number and richness of information sources (Zuboff, 1982; Weick, 1985; Daft, Lengel, and Trevino, 1987).

Kiesler (1986) and Rogers (1983, 1986) observe a bias in the evaluation of new technology towards overestimating the expected improvements in efficiency, and underestimating the unintended social effects. To illustrate, the elevator was introduced to increase the efficiency of movement in multi-floor buildings (Kiesler, 1986). However, the elevator enabled skyscrapers and extremely high population densities. Consequently, an unintended social effect of elevators is increased superficiality in social contacts, as people work in one area and live in another. A byproduct of this superficiality is greater alienation and increased social distance. Such effects from elevators were unpredicted and unexpected. Given the significant capacity of OA to alter work relationships (Zuboff, 1982; Weick, 1985), long-term social effects are likely to result from OA systems.

Actively seeking out the unintended effects of OA avoids framing the evaluation question as a nonsensical null hypothesis that ignores unintended effects. When evaluating OA systems implemented in complex social systems, asking, "did anything happen from the OA implementation?" is inane. The interdependencies present in any meaningful OA implementation insure that the null hypothesis of "nothing" happening is logically impossible. The more sensible questions to be answered in evaluating OA systems are, "what is happening that was intended?" and "what is happening that was not intended?" (Merton, 1957; Deutscher, 1977).

Reframing the evaluation question as stated above serves two objectives. Changing the temporal form of the question (i.e. from "what happened" to, "what is happening?") reframes the evaluation of OA systems from a static evaluation of a past event, into recognition of the on-going, interdependent nature of the social process in which even the evaluator is a party (Pondy, 1977). Such a perspective aids the evaluator in recognizing that the evaluation pro-

cess (as well as the evaluation product) is likely to impact perceptions of the OA system, and may therefore change perceptions of the success or failure of the system. Dividing the evaluation question into consideration of both the intended and unintended effects of the system further insures that OA evaluation does not exclusively focus on predefined variables that the system was predicted to impact. The complexity of the social environment of an OA implementation makes prediction of all effects impossible. However, the unpredictability of OA system effects does not mean that such effects cannot be recognized and evaluated *ex post*.

It is a logical contradiction to suggest that the *unanticipated* effects of OA can be predicted. However, explicating and evaluating *unintended* effects should be an essential component of OA evaluation. Possible unintended effects of OA can be obtained from a variety of sources. Existing research in OA explicates many of the short term unintended consequences of OA (Williams, 1978; Zuboff, 1982; Kiesler, 1986; Er, 1987). Extrapolating from the long-term effects of prior technological advances, such as the printing press, elevator, and telephone offer a second source (Kiesler, 1986; Rogers, 1986). Finally, opponents of OA implementation, both within and outside the implementing organization can identify many potential undesirable consequences of OA (Salasin, 1973; Rogers, 1984).

*3. Triangulate Data Sources*

One strategy for increasing the likelihood of capturing unintended effects is the use of multiple, independent data sources. Many authors have suggested the use of multiple measures as a means for avoiding the goal trap (e.g. Ridgway, 1981). However, the use of multiple measures is a necessary but insufficient condition for triangulation in measurement (Webb, Campbell,

Schwartz, and Sechrest, 1966; Isaac and Michael, 1984). The use of multiple, low variety measures (e.g. a series of survey questions), or multiple measures within a single perspective (e.g. multiple measures of user satisfaction) does little to increase evaluative variety. For example, existing data suggests that low variety measures of user satisfaction are largely redundant (Rushinek and Rushinek, 1983).

Table 1 provides a reference source for generating triangulated data. By choosing one evaluative approach from the upper half of the list, and one from the lower half, evaluators can avoid the false security of having multiple, confirming low variety measures. For example, one evaluative strategy for OA might be to "go native" and conduct covert field research, but combine this approach with a user questionnaire. Such an approach would likely provide insights into social relationships and unintended consequences from OA that would be overlooked by exclusive use of a questionnaire.

*4. Evaluate Processes And Input/Output*

A second method for triangulating data is to combine input/output analysis with evaluations of social (Rogers, 1986) and decision processes (Todd and Benbasat, 1987). OA systems are increasingly designed to impact managerial decision making processes (McLeod and Jones, 1987). Consequently, an evaluative perspective that focuses solely on input and outputs (e.g. quantifiable costs and benefits) is likely to fail to capture much of the impact of OA. Integrating input-output measures with evaluations of processes offers a richer, more complete evaluative perspective than can be provided by input-output analyses alone (Hedberg, Nystrom, and Starbuck, 1976; Payne, Braunstein, and Carroll, 1978; Einhorn, Kleinmuntz, and Kleinmuntz, 1979; Rogers, 1984; Patton, 1987)).

*5. Discover Goals, Don't Evaluate Them*

Recent research suggests that, "organizations are rarely what they pretend to be (Deutscher, 1977, p. 221)." Significant differences often exist in the formal and informal structures, processes, and goals of organizations (March and Olsen, 1976; Weick, 1976; Sproull, Weiner, and Wolf, 1978). Managers may only understand and make sense of events after the events have transpired (Hirschman, 1967; Weick, 1979). Goals may be left intentionally vague, or even stated as opposites of desired ends in order to strategically manage preferences for outcomes (March, 1978; Pascale, 1979). Within IS, rituals may be used to "... symbolize rationality and signify that the actions taken are not arbitrary, but rather acceptable within the organization's ideology" (Robey and Markus, 1984, p. 12). Such examples suggest that OA systems may be constructed for reasons other than those stated in a formal information requirements analysis. Consequently, the formally stated goals of an OA system may have little to do with the actual goals of managers, designers, and users.

The loose coupling of formal and actual goals in organizations suggests that evaluation directed only at measuring the extent to which stated goals have been met by an OA system will likely miss most of what goes on in organizations (Deutscher, 1977; Deutscher and Gold, 1979). Actual goals and unintended consequences are intimately wound into the on-going social mosaic within which OA is placed. As a result, a major objective of OA evaluation should be to explicate the goals of organization actors responsible for an OA system.

Evaluating OA systems from this perspective replaces the task of evaluating the extent to which the system has met its original goals, with the task of discovering the system's actual goals. Such an approach assumes that users,

designers, and managers often cannot or will not articulate the actual goals of OA. In such cases, evaluation becomes similar to investigative journalism (when actors will not state goals) (Guba, 1981) or participant-observer research (when actors cannot state goals) (Deutscher and Gold, 1979). Either role requires an evaluative perspective relatively unexplored in IS.

## CONCLUSION

The frustration of IS professionals with existing methodologies for OA evaluation is expressed by a Westinghouse Electric executive responsible for monitoring the company's use of teleconferencing:

> "I can measure how much this video teleconferencing equipment costs and guess about how much we save in travel expenses when we apply it, but I haven't the slightest idea how good the decision are that our people reach when they use it. (Kiesler, 1986, p. 54)"

The principle of incompatibility suggests that accurate and consequential statements about complex organizational communication systems are not possible with low variety, single perspective evaluations. Such methodologies do not contain sufficient complexity to permit description and evaluation of equivocality management and organizational sense-making processes (Pondy, 1977; Daft & Wiginton, 1979). Rather, effective evaluation in equivocal environments requires integrating multiple perspectives, observing the unexpected, collecting orthogonal measures, measuring processes, discovering goals, and employing both high and low variety methodology.

This paper began with the observation that, in evaluating the effects of IS, practitioners rarely practice what researchers preach, and researchers rarely preach what practitioners practice. Ultimately, the point of this paper is that both IS evaluation research and practice can be improved by integrating the seemingly disparate perspectives of practitioners and researchers. IS re-

search can be improved by greater attention to and observation of existing practice, unencumbered by existing normative models of evaluation. IS practice can be improved by experimentation with formal models and theories of evaluation, leading to improvements in current practice.

The implications of this argument for IS research are more subtle and profound than may be initially evident. The choice of a methodology for evaluation of OA is tightly bound to issues of theoretical substance. That is, what evaluators "see" when assessing the effects of technology is largely a function of what they expect to see (i.e. "believing is seeing," Weick, 1979, p. 135). Researchers using low variety, single perspective evaluative methodology expect to "see" rational, measurable phenomena that are largely predictable and orderly. However, unintended effects, social processes, and goal displacement and evolution generally lie outside of the rational models and measurements often prescribed for OA evaluation. As Weick suggests:

> "The crux of my concern is that the comfort MIS researchers feel with rational models, measurement, and order will tempt them into the following illogic:
>
> 1. Every real phenomenon can be measured.
> 2. If it can't be measured, it's not real.
> 3. If it can be measured, it's real.
>
> Blunt measures, narrow measures, and nonmeasures poke holes in this reasoning. Nevertheless, the imagery is seductive. Application of this illogic, especially when the issues in technology and organization are at a formative stage, could make it impossible for us to learn about this important area (Weick, 1984, p. 129)."

The insights of social intervention research offer an alternative to the current schism between IS evaluation research and IS evaluation practice. Further, such methodologies are not new and untested, but rather are the cumulative result of 30 years of research into social interventions and organizational processes. An old cliche goes, "you can't teach an old dog new tricks." The important question for OA researchers and evaluators in their decision to

apply and adapt the insights of social intervention research is however, "Can you teach old tricks to a new dog?".

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Table 1
Continuum of Evaluative Methodologies
(Adapted from Douglas (1976) and Weick (1984))

| | |
|---|---|
| Everyday Life/<br>Social Experience and Thought | 1. Conscious Experience<br>2. Practical Thought and Action<br>3. Diaries and Memories<br>4. Travelogues<br>5. On-Site Field Studies and Reports<br>6. Systematic Reflection<br>7. Philosophical Reflection |
| Field Research/<br>Participant Field Research | 8. Depth-Probe Field Research<br>9. Investigative Reporting, Detective Work<br>10. Covert Field Research<br>11. Overt Journalism and Police Work<br>12. Overt Field Work |
| Nonparticipant Field Research | 13. Discussion Research (free-flowing), In-Depth Interviews<br>14. In-Depth Interviews with Flexible Checklists of Questions |
| Controlled Experimental Methods | 15. Natural Experiments<br>16. Preprogrammed Interviews (with statistical analysis)<br>17. Official Data and Business Analysis Reports<br>18. Judicial Investigations (operating under rules of evidence)<br>19. Panel (test and retest) Studies<br>20. Laboratory Experiments<br>21. Questionnaires and Polls<br>22. Computer Simulation Studies<br>23. Mathematical and Statistical Models |

Figure 1
A Model of OA Implementation Evaluation
(Adapted from Suchman (1977) and Suchman (1974))

| Preconditions | Independent Variable | Dependent Variable(s) | Consequences |
|---|---|---|---|
| $(a_1, a_2, \ldots a_m)$ | (X) | $(Y_1, Y_2, \ldots Y_n)$ | $(b_1, b_2, \ldots b_p)$ |
| Existing Social Environment | System Implementation | Measurable Effects | Outcomes and Objectives |