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A Planning Theory Perspective on Information System Implementation

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ABSTRACT

The paper is based on the assumed affinity between planning and Information System (IS) design, which makes it warranted to transfer results arrived at in planning theory to our field of IS design and implementation, at least as first tentative hypotheses. The basic notion is that alternative procedural features of planning or IS design have a definite impact upon the implementability of plans or information/data systems. The paper puts forward and discusses ten conjectures aboout the influence of ten procedural features of IS design upon IS implementability.

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Introduction

It is customary to divide Information System (IS) implementation research into two major categories, the implementation factor and implementation process approaches (e.g. Ginzberg, 1980, Lucas, 1981). Lucas emphasizes, however, (ibid. p. 97) that "These two paradigmas are not opposed to each other; each has something to contribute to understanding and planning implementation" and in order to concretize this statement he suggests a framework which aims at synthesizing both these approaches. One of the key points in his synthetic framework is the observation that the "implementor's" influence over various implementation factors—'technical characteristics', 'client actions', 'attitudes toward system', 'decision style' and 'personal and situational factors'—varies and can be ordered on a continuum (ibid., pp. 103-107).[1] Closely related to this, Ginzberg (1981) remarks that much of the implementation research carried out to date has been concerned with measurement instead of focusing on the management of the implementation process.

With reference to these distinctions and orientations, our paper is in the nature of a synthetic IS implementation management oriented process factor approach. It is implementation management oriented in the sense that the process factors to be discussed below are highly controllable during IS design and implementation, at least to the same extent as is user participation.[2] The process factors to be analyzed in this paper focus on the procedural features of the IS design process, i.e. on general principles, approaches and potential forms of the process. To our knowledge, existing IS of MS/OR implementation research has been quite limited in this respect, concentrating on top management support, user participation and some project organization and management issues (e.g. Powerll, 1976, Hildebrandt, 1980, Lee and Steinberg, 1980, Lucas, 1981).

Due to this state of the art, we have used planning theory as the major reference discipline and perspective. Implementation in planning is also a crucial problem, the "tragedy and comedy of planning" in Churchman's terms (1979, p. 94), and our intention is to transfer the results arrived at in planning theory to our field of IS design, at least as first tentative hypotheses. The paper is based on the assumed affinity of planning and IS design at the procedural level, and the basic conjecture is that alternative procedural features of planning and IS design have a definite impact upon the implementability of plans and information systems, respectively.

The paper consists of three major parts. The concept of implementation success/failure is discussed and defined in Part Two and the planning theory framework to be applied is introduced in Part Three. In Part Four the conjectures are put forward and discussed, and finally Part Five summarizes the results.

IS Implementation Success

INTRODUCTION

In many IS design methodologies the implementation phase is the last one in the development of an operational data system for use. Implementation is treated as largely a technical problem of hardware and software procurement and installation, building of files, etc., even though the various conversion or cut-over options bring a flavor of a more organizational and human-oriented interpretation related to the institutionalization of information systems.

In contrast to this tradition, there is a tendency in IS implementation research to interpret the term 'implementation' quite broadly as "an on-going process which includes the entire development of the system from the original suggestion through the feasibility study, systems analysis and design, programming, training, conversion, and installation of the system" (Lucas, 1981, p. 14). Even though we recognize the importance of the process approach in implementation research, we prefer to interpret the term in a more traditional sense as the last phase, mainly for two reasons. Firstly, there is lot of evidence that implementation in this traditional sense is a real problem in practice and therefore requires a term of its own. Since we have this customary interpretation of 'implementation', why should we not use it? Differing from the traditional interpretation of 'implementation', our interest in this paper is nevertheless in the institutionalization aspect of information systems, and we use the term 'implementation' in this non-technical meaning. Referring to the quotation above, we also use the terms IS design more broadly than Lucas to cover the entire IS development process as far as implementation (potential coding, conversion, installation and above all institutionalization) (see footnote 2).

Our principal reason for doing this lies in the fact that it is extremely important to be aware of the dilemma between IS implementation success and IS development success (cf. Markus and Robey, 1983). The latter describes the desirability of the consequences of the whole IS development process (= IS design + implementation) from the viewpoint of the host organization, the users of the system and the other interest groups. IS implementation success, on the other hand, describes the success of the institutionalization of the information system in its host system. It is quite obvious that IS implementation success, in the sense that the IS is institutionalized, is necessary but not sufficient for IS development success. On the other hand, there is evidence that maximization of the probability of IS implementation success may detract from IS development success in the longer-run (cf. Miller and Friesen's [1982] finding that quantum changes, which are often quite hard to implement, tend to be more associated with high performance than are piecemeal, incremental changes).

THE DEFINITION

More formally, we define IS implementation success as a decreasing function of the costs of producing a state in which a model component for the information/data system is transformed into a compatible real system which is institutionalized in the host system. This definition entails three major problems. Firstly, when is the real component compatible with the model component? Without delving deeply into philosophical questions concerning information systems, we assume that the model is a prescriptive statement and that the compatability problem is quite similar to legality problems encountered daily e.g. in administration and jurisdiction.

The second problem concerns the criteria for the institutionalization of an information/data system. Referring e.g. to Yin (1981) the institutionalization could obviously be interpreted as a continuum rather than as a dichotomy. In the following we restrict our discussion to completely institutionalized information systems interpreting institutionalization as having taken place when the system is present and functioning without any extra assistance which is not planned as a permanent part of the information/data system.

Thirdly, the reference to costs recognizes that implementation should not take place at any cost whatsoever. Also it may cause, in addition to its economic costs, various relatively direct human and social costs which should be taken into account in the evaluation of implementation success. There are, of course, several interpretation and measurement problems related to these costs, but it is beyond the scope of this paper to try to operationalize this aspect of implementation success. In any case, they all serve to make the dimension of implementation success/failure continuous rather than dichotomous. We use the term 'implementabililty', i.e. ease or difficulty of implementation, to describe this continuum. In some connections, e.g. in expressions such as the 'probability of implementation success', success and failure are interpreted as more discrete values in order to simplify our discussion.

CRITERIA FOR IS IMPLEMENTATION SUCCESS

The definition above gives only a general, theoretical idea of the concept of IS implementation success. The purpose of this section is to concretize it by defining operational criteria for the concept.

According to Ginzberg (1980) and Lucas (1981), three major criteria for IS implementation success can be found in the literature, user satisfaction with the information system, use of the system and the effectiveness of the system. Effectiveness entails improved performance on the part of the host organization (e.g. increased payoff). It is clear that the effectiveness is usually influenced by a range of factors other than the information system. In the case of IS implementation success we agree with Schneider's idea, applied here to an IS implementation context, that implementation success should be measured as far as possible independently of whether the information/data system achievs the expected results, which are beyond the immediate control of the implementation agency (Schneider, 1982, p. 718). We use the phrase 'as far as possible' to point out that the direct outcome of IS implementation cannot be expected to be totally controlled, since the controllability assumption would largely eliminate the whole IS implementation problem. Schneider's idea suggests, however, that the effectiveness criterion is not appropriate as a criterion for IS implementation success, even though it is a very important criterion for IS development success.

As far as the user satisfaction and use criteria are concerned, Lucas proposes user satisfaction as an IS implementation success criterion for involuntary information systems and use for voluntary systems (Lucas, 1981). We are not quite sure about the soundness of this distinction in the present case, since the use of a "voluntary" system may in practice be "involuntary" due to the lack of alternative information systems (cf. Ginzberg, 1980).

We defined IS implementation success as "a decreasing function of the costs of the producing a state in which . . .". It is clear that user satisfaction as a subjective assessment is not very suitable for evaluating whether that state has been achieved. Consequently we prefer to have a uniform criterion, actual use, as the major criterion for IS implementation success. If we omit the cost aspect of implementation success and the possibility of misuse, it is clear that non-use of an administratively involuntary system is an indicator of a failure, i.e. an inability to make involuntariness viable. In the absence of misuse, the actual use, which should be equal to the intended use, indicates implementation success. In the case of administratively voluntary information/data systems a high level of appropriate use is a clear indicator of implementation success, while non-existent or low-level use requires a deeper analysis. In addition to implementation problems this situation may be due to factors which are attributable to the bad quality of the system and to the existence of better alternatives, which are more basically design "failures".

Without going into the various variants of misuse, this phenomenon can be regarded as an indicator of a failure during implementation to impose the norms concerning acceptable and legal use.

A Planning Theory Framework

INTRODUCTION

The general state of planning theory is very similar to the state of IS science. There are several well-known prescriptively-oriented or prescriptively interpreted methodologies or approaches to planning (e.g. Ackoff, 1974, Churchman, 1979, Lindblom, 1959), but little conceptual and descriptive research which identifies the underlying principles of planning and empirically illustrates the soundness of alternative principles and approaches. Faludi's book, 'Planning Theory' (Faludi, 1973), provides a notable exception in this respect concerning the principles of planning particular. Brunson's article on 'The Irrationality of Action and Action Rationality' (Brunson, 1982) has also made an important contribution to our thinking concerning the cognitive, motivational and committal aspects of planning.

Faludi distinguishes procedural and substantive theories of planning, (cf. March and Simon, 1957) and identifies three major procedural dimensions: the blueprint versus the process mode of planning, the rational-comprehensive versus the disjointed-incrementalist mode of planning and the normative versus the functional mode of planning. We have suggested elsewhere (Iivari and Kerola, 1983) that the second dimension can be regarded as an aggregate which reflects different principles of interest group analysis, goal analysis, situation analysis and the generation of alternatives, to which we would like to add the evaluation of alternatives. We shall pursue this idea of an analytical classification of planning activities in the following. Our general notion is that there are various procedural alternatives related to each type of planning or IS design activity and that these alternatives may be relevant from the viewpoint of implementation success.

We have suggested earlier an information economy explanation for IS design in which it is regarded as information production for the related decision-making (Iivari, 1983-1, 1983-2) focusing on the principal alternatives concerning the information system (cf. King, 1982) and controlling the IS design process. It is obvious that the same interpretation can be applied in the context of planning, too. Hildebrandt has also put forward quite similar ideas in the context of OR (Hildebrandt, 1981), distinguishing three kinds of information: objective information, activity information and state information, and suggesting that these can be evaluated using a uniform framework of information quantity (= intensity and

extent) and quality (= completeness, topicality, correctness and precision). In the following we shall use a very similar framework, in which we distinguish the deepness and the comprehensiveness of the analysis, roughly corresponding to Hildebrandt's concepts of information quantity and quality. Their exact semantics is dependent on the type of planning activity and is explained in the following section.

THE FRAMEWORK

The framework distinguishes five major activity categories in IS design: interest group analysis, goal analysis, situation analysis, generation and refinement of alternatives and evaluation of alternatives. Table 1 defines these categories briefly and characterizes the deepness and comprehensiveness dimensions of the activities concerned.

Interest Group Analysis

The definition of interest group analysis, based on Carnall (Carnall, 1980, p. 893), clearly illustrates its role as a preparatory step for goal analysis (cf. interests) and situation analysis (cf. ideas and attitudes), and more indirectly for the generation and evaluation of alternatives. Deepness in this context describes the relevance of IS development to the people in question. Since its relevance can be expected to be highly dependent on its consequences, this deepness is closely related to the deepness of the evaluation of alternatives. Comprehensiveness describes how exhaustively or narrowly the various interest groups are identified. We have suggested earlier (Iivari and Kerola, 1983) a scale for the comprehensiveness of interest group analysis, illustrated by three discrete points:

1. a formal approach, in which the interest groups are restricted to formal decision-makers who have the formal responsibilty for the information system, its implementation and consequences

2. a political approach, which aims at forming sufficient organizational power to support the information system and its implementation

3. a comprehensive approach which aims at identifying the interests of all groups affected by the information system.

In fact this is a continuous scale on which the first and last approaches are the extremes and the political approach lies somewhere in between. Furthermore, the comprehensive approach is an ideal which cannot be fulfilled completely in practice due to the endless chain of impacts (cf. Churchman, 1979, pp. 47, 63), but can be approximated as far as is desired (ibid., p. 135).

The reasons for the comprehensive approach are ethical, philosophical and practical. The ethical reason states that everybody affected by the information system should have the right to influence its development. This position is also accompanied by a consensus idea, according to which the plan to be selected for implementation should be acceptable to all participants. The comprehensive approach reflects a holistic systems view, according to which every system is a subsystem in a larger system which has certain essential (Ackoff, 1981) or emergent (Checkland, 1981) properties which are not separately attributable to its parts (cf. the holistic image of society, Faludi, 1973). Systems thinking usually emphasizes the mutual interdependence of the subsystems. Applied to our context, this means that those affected by the information system usually have some means of influencing the plan, especially its implementation (cf. the inducement-contribution theory, March and Simon, 1958, underlying most current coalition views of organizations). This leads us to the practical reason for comprehensive interest group analysis: it is a means of involving the interest groups in the planning process and in this way of ensuring their support and commitment (e.g. Nadler, 1981, Nutt, 1983).

In view of its inherent political nature it is no surprise that the politics of planning and IS development are generally recognized even though the conclusions about their implications vary considerably between different schools of thought. In this context we wish to point out once more that the scale describing the scope of interest group analysis is continuous. Consequently the idea of a political approach can be interpreted quite broadly without denying the political nature of practically all collective planning. In this paper, however, we interpret it more discretely as an approach which emphasizes the importance of sufficient organizational power generally and of some 'key' interest groups, without explicit adherence to the ideals of comprehensive interest group analysis concerning its scope and the consensus idea.

In the formal approach, interest group analysis involves no particular problems, because it is restricted to formal decision-makers. The main difficulty is that of defining the locus of the managers in the organization who have the authority to make the required decisions and are thus directly responsible for the consequences. This formal approach in its pure form is not very common in modern treatises on planning and IS design, but it has its tradition in micro and business economics (the owner-manager as a decision maker) and traditional organization theory. In a more modern sense, approaches which very emphatically underline the special role of management come closest to this extreme.

Table 1

ACTIVITY	DEEPNESS	COMPREHENSIVENESS
Interest group analysis Identification of groups of people located in a given structural reality capable of articulating similar interests in respect of the IS development	Relevance of the IS development issue to the potential interest groups	Number and variety of potential interest groups taken into account
Goal analysis Analysis of values, objectives and goals related to the IS development situation	Explicitness, the subjective/objective dimension, the temporal dimension and the formalization of values, objectives and goals	Number and variety of values, objectives and goals taken into account
Situation analysis Diagnosis of various uncontrollable exogenous factors in the past, present and future which are assumed to be relevant to the generation of alternatives and their evaluation	Truthfulness and relevance of the analysis and the factors identified	Number and variety of factors taken into account, including the temporal dimension
Generation of alternatives Generation and refinement of alternative models for the information systems to be implemented	Detailness of the IS models	Number of alternatives generated
Evaluation of alternatives Evaluation of the consequences of alternative IS models	Truthfulness and relevance of the analysis and the consequences identified	Number and variety of consequences taken into account

Goal Analysis

Historically, goal analysis has been one of the most controversial issues in planning theory. This is largely due to the fact that in classical accounts of planning and decision-making within economics, OR, systems approaches etc., there has usually been an assumption of a well-defined objective function (e.g. profit in classical micro economics) which was taken to be quantitative (as in OR), and the 'rational choice' was based on the evaluation of alternatives against this objective function. This idea was, of course, an easy target for attack as being unrealistic from various perspectives (see Cyert and March, 1963, Lindblom, 1959, Checkland, 1981). It is unnecessary to repeat even the main lines of this criticism here. Referring specifically to Checkland (1981), we assume that the planning problem is a 'soft' one, in which the designation of values, objectives and goals is problematic.

The controversy is also partly due to the fact that there are several dimensions of goal analysis. We interpret deepness as having a number of dimensions, such as:

- explicitness, i.e. to what extent the values, objectives and goals of different interest groups are made explicit
- the subjective/objective dimension, i.e. to what extent the values, objectives and goals expressed by the interest groups are taken for granted and to which extent they are subjected to 'rational' analysis and criticism
- the temporal dimension, i.e. to what extent the values, objectives and goals are based on the longer-term ideals (cf. e.g. Ackoff, 1971)

- the formalization of values, objectives and goals, i.e. their precision, quantification and possibly aggregation.

The four dimensions are clearly interdependent. The temporal dimension of values, objectives and goals, for example, may be used in the evaluation of expressed values in the sense of the second point. The subjective/objective dimension also has an independent dimension related to the philosphical "ought-to" question and to the existence of objective values (cf. e.g. Churchman, 1979, Ahmavaara, 1976). Similarily the temporal dimension and formalization may be used in the explication of values, objectives and goals, although this explication may just as well be restricted to purely subjective short-term goals and objectives.

It is beyond the scope of this paper to discuss the dimensions of goal analysis in greater depth. Recognizing the non-orthogonality discussed above, we shall simplify our discussion by defining the deepness of the goal analysis as a product of the four dimensions in the sense that ceteris paribus any increase in explicitness, objectiveness, temporal dimension and formality will also increase the deepness of the goal analysis.

The comprehensiveness of a goal analysis describes the variety of values, goals and objectives to be taken into account, i.e. whether the analysis is restricted to technical and economic goals, for instance, or whether it covers various human and social goals as well. Comprehensiveness is orthogonal to deepness in the sense that goal analysis may be deep or superficial independently of its comprehensiveness. There is nevertheless an empirical dependency, in that increased deepness, and in particular its formalization dimension, tends to lead to a more restricted goal analysis which concentrates on goals which are easiest to measure and evaluate (cf. Høyer, 1979).

Situation Analysis

Situation analysis refers to the diagnosis of various uncontrollable exogenous factors in the past, present and future which are assumed to be relevant to the generation of alternatives (e.g. constraints) and their evaluation (e.g. factors co-producing impacts). The adjective exogenous is used here to make a distinction between goal and situation analysis, since the borderline between the two is not yet sharply defined (cf. the distinction between goals and constraints).

The adjective 'uncontrollable' should not be interpreted too strictly. It does not mean that the factors are necessarily uncontrollable in any absolute sense, but only that they are regarded as uncontrollable in the relevant IS design context in question. Partially controllable factors are regarded as dependent intervening entities which are influenced by certain controllable and uncontrollable factors.

The deepness of situation analysis, concerning the truthfulness and relevance of its results, evidently requires no explanation. It is the cornerstone of the 'scientific ideal' of planning, organizational design and development, and also of IS design, emphasizing the importance of the proper diagnosis and prediction of various situational factors (cf. IS implementation research).

The comprehensiveness of situation analysis includes the subjective/objective dimension, i.e. to what extent attention is paid to subjective perceptions of the relevant actors, to intersubjective factors applying to various groups and to factors related to the socially constructed reality, and to what extent to various physical and physiological factors. In this respect we have some experience from such fields as IS and MS to suggest that implementation success is influenced by a large variety of factors (cf. Powell, 1976, Ginzberg, 1980), which seems to lead to the extensiveness problem attached to situation analysis, since the number of factors to be considered may grow fairly large. This may be illustrated by Ginzberg's study (1975), which identified 140 factors potentially affecting the outcome of implementing OR/MS models (Hildebrandt, 1980).

Generation of Alternatives

Deepness in this context describes the detailedness of the IS model generated. Taking the importance of computers into account as the technical environment for information systems, it is clear that IS models must be quite detailed in the technical sense, even the development of higher level and abstract information technology has led to less severe requirements in this respect. Due to our restriction to the institutionalization aspect of implementation, we nevertheless omit this technical side and restrict our attention to the role of IS models as a prescription of human and organizational action.

The *comprehensiveness* of alternative generation describes the number of alternatives to be generated. This has also been quite a controversial issue historically (cf. optimizing vs. satisficing, e.g. Cyert and March, 1963, and rational-comprehensive vs. disjointed-incrementalist modes of planning, Faludi, 1973). It is unnecessary to repeat that discussion here. We can simply state that highly comprehensive or exhaustive searching for and evaluation of alternatives is not possible or reasonable in most practical cases.

Evaluation of Alternatives

Deepness in the evaluation of alternatives describes how truthfully and reliably the various consequences are traced and evaluated, while *comprehensiveness* describes the variety of consequences taken into account. Comprehensiveness covers the question of whether we aim at identifying all consequences, negative as well as positive, intended as well as unintended, or whether the evaluation is confined to some selected, usually intended, positive consequences. Traditionally this dimension has also been one of features discriminating between the rational-comprehensive and disjointed-incremental approaches (cf. Lindblom, 1959, Faludi, 1973). We used the verb 'aim' above in order to emphasize that comprehensiveness in this respect is hard to achieve. In fact it can be regarded as an ideal which can never be totally achieved, but can be approached as far as is desired (cf. Churchman, 1979, Ackoff, 1981).

PROCEDURAL FEATURES OF IS DESIGN AND IS IMPLEMENTATION RESEARCH

The features of IS design introduced above do not form a complete list even of all the procedural features of the design process. We have consciously omitted user involvement or participation, for instance, since its importance is generally recognized.[3] We shall discuss some aspects related to user participation, however, in the context of interest group analysis in particular.

More generally, the factors influencing IS implementation success can be classified into six categories (cf. Ginzberg, 1980, Ives, Hamilton and Davis, 1980, see also figure 1):

1. Characteristics of the IS development process, including design and implementation processes.

2. Characteristics of the information system, including its model and institutionalized real component.

3. Characteristics of the IS development environment.

4. Characteristics of the IS environment, including its user, operations, organizational and external environments.

5. The fit between IS development and its environment (cf. category 3).

6. The fit between the information system and its environment (cf. category 4).

The procedural features of the IS design process are most closely related to the first category. We use the phase 'most closely', since we cannot omit the possibility that they could be studied as relationships between the IS development process and its environment (cf. category 5). The idea of congruence in category 5 leads, of course, to a contingency analysis of the IS design process, which is not yet applied in this paper.

We distinguish two major groups of actors or more strictly their roles in the IS development environment:

1. Developers, which include professional and user IS designers and those people who make the final decision about the principal features of the information system.

2. Implementors, which include all actors, with users as one subtype, whose actions influence implementation success or failure during implementation itself.

In the following our interest lies in the cognitive, motivational and committal influence of the procedural features of IS design in the case of implementors.[4] Implementors in our terminology include both formal implementors with the assigned responsibility for the implementation and more informal ones whose actions are anyhow critical in the ultimate implementation of the system. The role of users may be formal (the case of administratively involuntary information systems) or more informal (the case of administratively voluntary information systems).

The main point of this paper is that the rationality of action of comprehensive and deep IS design may have side effects upon the cognitive, motivational and committal state of the implementors which impede the implementation or make it more difficult and lead to a situation in which the rationality above does not coincide with action rationality (cf. Brunson, 1982).

The Conjectures

INTRODUCTION

In order to concretize our interpretation of the cognitive, motivational and committal determinants of action, our assumptions about the decision-making action of an arbitrary implementor are depicted in figure 2.

His *cognitive state* includes a greater or lesser knowledge of his own values and goals and of those of other actors, knowledge concerning the decision made, i.e. the IS alternative selected and the alternatives available, and knowledge about expectations concerning his actions

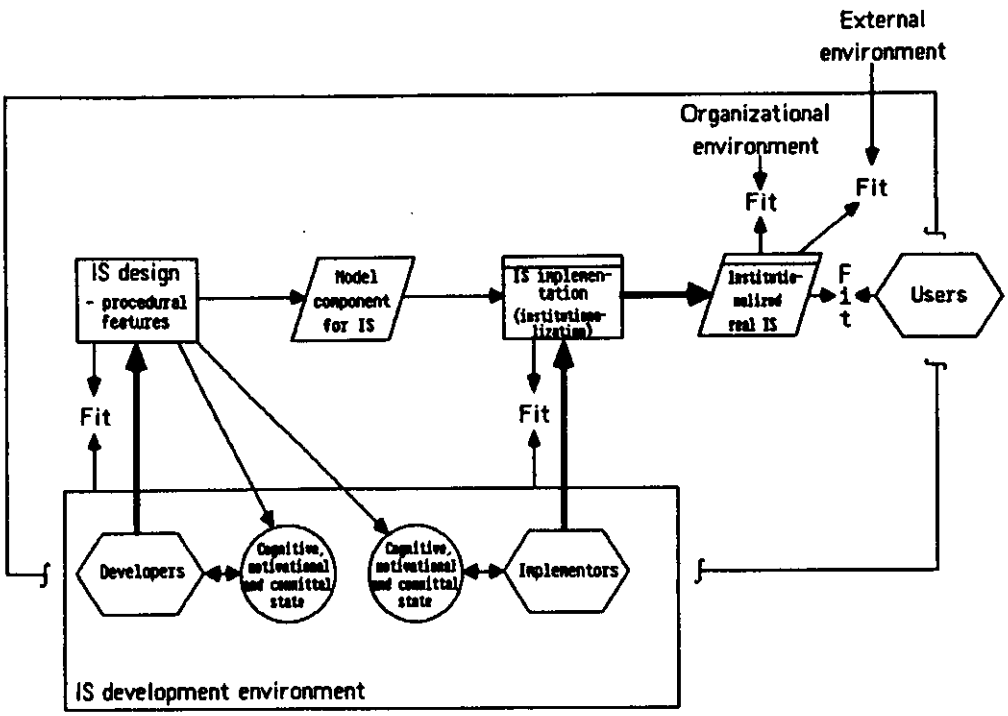

Figure 1

Factors influencing IS implementation success

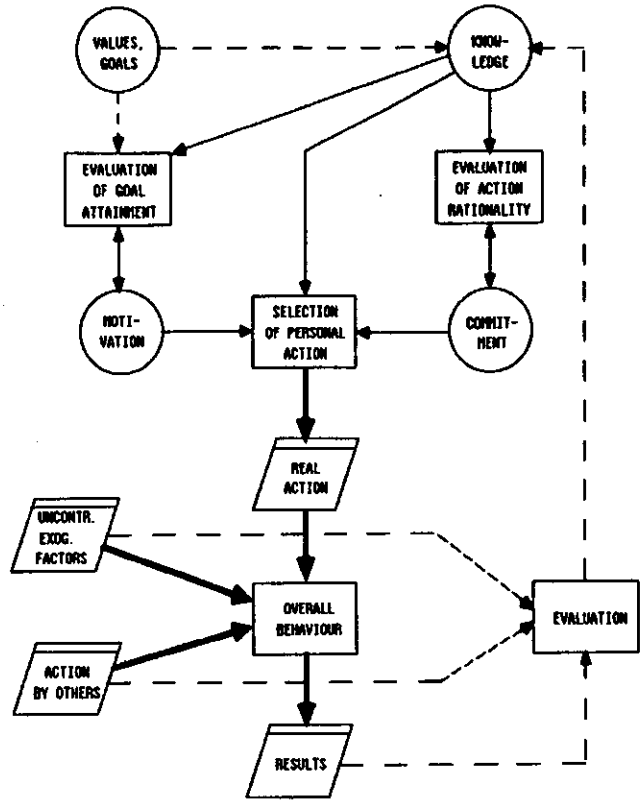

Figure 2

The Decision-Making Action of an Arbitrary Implementor

(action required, norms, role expectations) and the alternatives actions open to him, his personal expectations and beliefs concerning the potential consequences of his alternative actions and beliefs concerning the potential actions of other implementors and other contingencies. His motivation is based on his evaluation of goal attainment. His goals and values may include not only his personal outcome goals, but also more altruistic goals concerning the "well-being" of the host organization and social values related to such matters as conformity and loyality. The commitment to the decision made is dependent on his evaluation of action rationality, taking into consideration his values (e.g. conformity and loyality), his beliefs concerning the action of other implementors and the alternative actions available to him.

Referring to the analysis of Chin and Benne (Chin and Benne, 1969), we also find that implementation strategies are quite directly based on the "manipulation" of these three determinants of action. The 'empirical-rational' strategies rely on the dissemination of knowledge, the 'normative-re-educative' strategies include both cognitive influence and committal influence, commitment to social norms, and finally the 'power-coercive' strategies may resort to motivational influence in the form of various moral, political or economic rewards or sanctions (ibid.).

In the following five sections our conjectures about the impact of the ten procedural features of IS design upon the implementability of information systems are introduced and explained using as a reference the model described in figure 2.

INTEREST GROUP ANALYSIS

Conjecture 1: Increased deepness of the interest group analysis has a positive impact upon the implementability of information systems.

This conjecture is based on the assumption that interest group analysis usually presupposes some kind of involvement of such groups in the IS design process, as participants in the decisions, as "user-designers" or as actors to be consulted. Zaltman, Duncan and Holbek discuss participation relatively extensively in the context of innovation decisions (Zaltman, Duncan and Holbek, 1973, pp. 78–85) and conclude that "the participative approach facilitates innovation," including its implementation, "only when organizational members feel some benefit or reward for their efforts" (ibid., p. 81). They should feel the situation to be relevant for their lives, they should have the competence to participate and the authority to carry out the innovation. If these conditions are not met, the reaction of participants may be "rejection and withdrawal from assuming any role in the decision process" (ibid., p. 85).

The analysis above leads to the idea that there should be some kind of balance between the relevance of the IS development situation and the degree of participation in the case of interest groups. Consequently there is a risk of under-participation as well as over-participation, both being motivationally and committally harmful from the viewpoint of IS implementation. Assuming that this is true, the interest group analysis should be deep enough to provide information for selecting the appropriate form of participation or involvement for the interest groups.

Conjecture 2: Increased comprehensiveness of the interest group analysis has a positive impact upon the implementability of information systems.

We identified above three discrete points on the scale of the comprehensiveness of interest group analysis—the comprehensive, political and formal approaches. In the context of the comprehensive approach we concluded that this is a means of involving the interest groups in the planning, or in our case in the IS on design process, and in this way of ensuring their support and commitment (e.g. Nadler, 1981, Nutt, 1983). With reference to our discussion in the context of Conjecture 1, we must remark, however, that this support and commitment requires that the interest groups should feel that they have had a fair chance to influence the planning process.

This involvement could also be expected to have positive informational effects from the implementation viewpoint. Even though we cannot assume that the information provided by the interest groups is credible and unbiased, it seems reasonable to presume that this communicaton usually increases the state of knowledge about the values of the interest groups, their potential reactions, etc. It should also be observed that differing values and outlooks may permit the identification of new alternatives which may be better from the implementation viewpoint and at least as good as other alternatives in other respects, and also the identification of potential direct and indirect impacts (cf. Van de Ven, 1980 p. 730, Nutt, 1983 p. 604).

We also remarked that comprehensive interest group analysis is closely related to the consensus idea. Referring to Schein's discussion of decision-making practices (Schein, 1969, pp. 53–58) we can conclude that decision by consensus is most effective from the implementation viewpoint (cf. also Zaltman, Duncan and Holbek, 1973). March and Simon also remark that "most task-oriented organizations have strong tendencies to seek consensus" (March and Simon, 1958, p. 118).

The political approach has been recommended as a means of implementation management in several contexts. If we assume in the customary way that power is the capacity of one party to achieve its goals and objectives irrespective of potential opposition and resistance (cf. Hage, 1980, Astley and Sachdeva, 1984), consensus does not require any exercise of power (Doucet and Gol, 1983). Consequently various power strategies entailed in implementation (Chin and Benne, 1969, Zaltman and Duncan, 1977, Nutt, 1983) can be regarded as indicators of political or formal approaches. Since no single interest group (e.g. top management) may have the power to get plans implemented, the power strategies may include the formation of coalitions in order to broaden the political support for a plan (Hasenfeldt, 1980, Quinn, 1980, 1982, Nadler, 1981).

Finally, in the context of formal interest group analysis, it is interesting to observe that top management support is one of the few IS implementation factors which has been reported on consistently (e.g. Christensen, 1984). This is not unexpected when one takes into account the focal position of top management in the cognitive, committal and motivational sense and its role as the controller of the necessary implementation resources. This finding does not yet contradict our Conjecture 2. We can conclude that it is vital in any case to have top management support, but the implementation prospects are best if this support is a part of a comprehensive consensus approach. If consensus is not possible, it is important for the top management to have sufficient organizational power, either of its own or from a coalition supporting it, to achieve IS implementation.

GOAL ANALYSIS

Conjecture 3: Increased deepness of the goal analysis has a mixed positive and negative impact upon the implementability of information systems.

This positive part of the conjecture is based on the finding that "implementation will achieve greater success when

the organization/group/individual involved is more explicit in goals and outputs . . . " (Hildebrandt, 1980, p. 6, cf. Powell, 1976, see also Ginzberg, 1978, p. 62), because "poorly defined change goals (. . .) are likely to create ambiguity, uncertainty, and anxiety for those who are going to be affected by the change." (Zaltman and Duncan, 1977, p. 20). Ackoff, confining himself specifically to his 'idealized design', states (Ackoff, 1981, p. 11): "Idealized design facilitates participation in the planning process" and continues (ibid., p. 119). "Participation in the preparation of an idealized design and the consensus that emerges from it generate a commitment to the realization of the design. (. . .) Such commitments considerably reduce the number and difficulty of problems associated with implementation of plans." He does not provide any definite empirical support for this claim, but taking his experience into account, his contention must be taken seriously.

Reduced uncertainty about the goals pursued can also be expected to reduce the uncertainty concerning the action of other implementors. This increased cognitive control of the situation obviously has a positive motivational and committal influence, too.

Goals are at the same time expectations, however,and consequently, increased certainty about goals may lead to more realistic or less ambitious goals, and may in this way reduce the motivation. We shall return to this issue in another section, but in this context we can summarize our conclusion that increased realism has a positive effect in the case of short-term goals which are tested immediately during implementation, while the influence may be negative from the IS implementation viewpoint in the case of longer-term goals.

Referring to the concept of 'quasi resolution of conflict' (Cyert and March, 1963), we could also expect that increased deepness might make it more difficult to reach any kind of consensus, which was assumed in Conjecture 2 to have a positive impact upon IS implementability. One could, of course, state that consensus at the level of very ambiguous goals is only an illusion. This situation obviously leads to the question of the realistic nature of expectations, to which we shall return in another section.

Our final comment is that deepness, its formality in particular, may contradict the comprehensiveness of goal analysis, which we expect to have a positive effect on the implementabilty of an information system according to Conjecture 4.

Conjecture 4: Increased comprehensiveness of the goal analysis has a positive impact upon the implementability of information systems.

Since goals are also arguments (cf. Brunson, 1982, p. 33), it could be expected that acceptable recognition of the various goals of different interest groups might have a positive motivational and committal effect on the probability of successful implementation. A second point is that the various alternatives to be identified always reflect values and goals whether implicit or explicit. There are some suggestions, especially in the area of information/data systems, that narrowly defined goals/objectives tend to lead to narrowly defined means, i.e. if the goals are confined to technical and economic ones, the alternatives to be considered tend to be highly technically oriented and the whole design process tends to take place in quite technical terms (cf. Mumford, 1973, Björn-Andersen and Hedberg, 1977). There is considerable evidence in IS implementation research that this is one of the major reasons for implementation failures (see DeSanctis and Courtney, 1983, Ginzberg, 1980, Keen, 1981, Lucas, 1981, Markus and Robey, 1983, Zmud and Cox, 1979).

SITUATION ANALYSIS

Conjecture 5: Increased deepness of the situation analysis has a mixed positive and negative impact upon the implementability of information systems.

The deepness of the situation analysis is closely related to the deepness of the evaluation of alternatives (cf. the exogenous co-producing factors of the potential consequences). Consequently we refer the reader to section 4.6 for an explanation of Conjecture 5.

Conjecture 6: Increased comprehensiveness of the situation analysis has a mixed positive and negative impact upon the implementability of information systems.

It seems obvious that proper recognition of the various factors influencing implementation success has a positive cognitive impact. This increased complexity may lead to greater uncertainty, however, and in this way may reduce motivation and commitment.

The second aspect of the comprehensiveness of situation analysis concerns its temporal dimension. Referring to Ackoff (1974, 1981), we can distinguish reactive and preactive approaches (cf. also Susman, 1981). Susman suggests that much of the OD literature "is premised on the assumption that a problem exists before the OD consultant is called in and that the change effort is not likely to succeed unless a system is "hurting," dissatisfaction with the present state of affairs is high, and there is both internal and external pressure to change" (ibid., p. 147). This reflects the idea of a 'problemistic search' put for-

ward by Cyert and March (1963), who suggest that this "is stimulated by a problem and is directed toward finding a solution to that problem" (ibid., p. 121).

Hage hypothesizes in his theory of (radical) innovation that agreement or consensus about the extent or depth of a crisis or performance gap facing an organization may be a factor alleviating conflict and resistance in innovations (Hage, 1980, pp. 221–225), even though he also puts forward a hypothesis that a longer time-span or perspective for planning may increase the extent of the performance gap which is detected (ibid., pp. 216–217). His usage of the word 'crisis' refers to a reactive situation (see ibid., pp. 154, 192, 247–250).

GENERATION OF ALTERNATIVES

Conjecture 7: Increased deepness of the generation of alternatives has a mixed positive and negative impact upon the implementability of information systems.

Deepness of the generation of alternatives was restricted to concern the detailedness of the non-technical parts of IS models as prescriptions for human and organizational action. From the viewpoint of the implementors, this detailedness may be beneficial in a cognitive sense, as a prescription for the implementor's own actions and those of other implementors, since detailedness may be used as a means of preventing idiosyncratic interpretations of plans during the implementation. At the same time, the low degree of self-control allowed may have negative motivational implications. A second point is that detailed plans or IS models impose tighter criteria for the implementation and tend to be unreflective to different situations and thus may lead to practical implementation problems (cf. Bresser and Bishop, 1983).

Conjecture 8: Increased comprehensiveness of the generation of alternatives has a mixed positive and negative impact upon the implementability of information systems.

It is obvious that comprehensivenss has a positive cognitive impact in the sense that more comprehensive generation may lead to the identification of truly better alternatives, which are better from the implementation viewpoint and at least as good as other alternatives in other respects. Concerning the motivational and committal implications, Brunson puts forward an interesting idea that too many alternatives have a negative effect, because multiple alternatives evoke uncertainty (Brunson, 1982). This leads him to recommend that "very early in decision processes, if possible before the processes even start, decision makers should get rid of alternatives that have weak to moderate chances of being chosen" (ibid., p. 34). He points out, however, that clearly unacceptable alternatives might be used as contrasts to the 'candidate alternative' in order to increase motivation and committment.

Brunson's proposal obviously implies some kind of restriction of the flow of information and an assumption that decision-makers and implementors are separate actors, which, of course, contradicts the idea of user participation. Anyhow, Brunson clearly highlights comprehensiveness as having distinctly negative consequences from the IS implementation viewpoint.

EVALUATION OF ALTERNATIVES

Conjecture 9: Increased deepness of the evaluation of alternatives has a mixed positive and negative impact upon the implementability of information systems.

It is obvious that increased deepness has a positive cognitive impact, but what about its motivational and committal influence? Related to this dimension, there are some suggestions that unrealistically high expectations concerning a change or a system may be reasons for an implementation failure (see Ginzberg, 1981). We suggest that in the analysis of this impact it is obviously necessary to make a distinction between immediate short-term and longer-term expectations and consequences. Short-term expectations concern immediate consequences or characteristics of the information system and can be tested and evaluated immediately during implementation. Long-term expectations or consequences cannot be evaluated immediately, and when they can be assessed in principle, it is extremely difficult to say to what extent they are consequences of the information system and to what extent of various exogenous co-producing factors.

It seems obvious that unrealistically high expectations may lead to implementation problems in the case of short-term consequences in particular. This is due to the fact that even though the increased deepness may reduce the a priori motivation and commitment, the reduced frustration during implementation may by far offset this effect. Since one can evidently assume that increased deepness in the case of unrealistically low expectations increases motivation, we can hypothesize that increased deepness in the case of short-term consequences has a positive impact upon implementabilty.

In the case of longer-term consequences, we presumed that the actual realization of the consequences does not influence implementation. Thus we can assume that inasfar as these longer-term consequences are taken into account in the decisions made by individual implementors, the impact of increased deepness is positive or negative depending on whether the desired consequences are more or less probable than initially expected.

Conjecture 10: Increased comprehensiveness of the evaluation of alternatives has a mixed positive and negative impact upon the implementability of information systems.

Related to our comprehensiveness dimension, Brunson suggests that the evaluation of alternatives should be restricted to positive consequences (Brunson, 1982 p. 33). Referring to our previous discussion, it seems obvious that in the case of immediate short-term consequences this may have an adverse effect upon implementability, whereas in the case of longer-term consequences this omission may increase the probability of successful implementation provided that there is unanimity about what is positive and what is negative. It is nevertheless questionable whether this conscious manipulation of the participant actors can be regarded as ethically justified.

Summary

The results of the paper are summarized in Figure 3. The most outstanding feature of the conjectures is that the results are contradictory in the sense that most procedural factors have both positive and negative effects from the implementation viewpoint. This does not mean, of course, that the pros and cons offset each other or that the factors are unimportant from the implementation viewpoint. The conjectures are not directly empirically testable hypotheses. Assuming for instance that the pros and cons may vary in different IS development situations, it is possible that the direction of the "net influence" may vary and the findings of potential empirical research into these relationships will be in this sense contradictory, making the direct confirmation or rejection of the conjectures impossible. Resolving this difficulty requires the formalization of our argumentation of the positive and negative impacts above, i.e. the identification of the intervening variables and the definition of the influence relationships. Furthermore there is the whole problematique of operationalizing and measuring the relevant variables.

Our basic argument is, however, that there are both positive and negative consequences involved. Taking into account the possibilty of the contradictory nature of the net impacts the procedural features of IS design discussed in this paper cannot be suggested as "fool-proof" means for facilitating successful IS implementation. It is significant, however, that they are highly controllable during IS design. Deepness and comprehensiveness questions are more or less explicitly or implicitly solved daily in actual IS development projects, and our hope is that the analysis provided in this paper will help in making that selection more explicit and conscious.

FOOTNOTES

[1]Observe that we use the term implementor to refer to those actors whose action in fact implements the information system (cf. Churchman, 1979, see section 3.3)

[2]This paper is a part of the development of the pragmatic (P) level in the PIOCO model for IS design (e.g. Iivari, 1983–1). The acronym PIOCO is derived from the three major levels of IS design:

1. the pragmatic (P) level at which the information system is designed as a part of an organizational change

2. the input-output (I/O) level, closely corresponding to information requirements analysis and IS specification, and

3. the constructive-operative (C/O) level at which the technical features of the information system are designed.

In the PIOCO model implementation (including institutionalization) follows the P, I/O and C/O main phases, but the implementation perspective is highly important in all phases and in particular in the earliest, the P main phase.

[3]In order to illustrate its relationship to the framework in the previous section, we wish only to point out that user participation could be taken as a third column in Table 1.

[4]The case of developers can be briefly summarized as follows: any increase in the deepness and comprehensiveness of any of the five activity categories will increase the cognitive base of the developers, and the better that state is, the better the "quality" the IS model to be implemented can be expected to be. The quality covers both the characteristics of the information system (category 2 above) and their congruence with the IS environment (category 6). Referring to our discussion on the dilemma between IS development success and implementation success, we do not yet expect truly "good" IS models, especially in the longer run, to be easy to implement, even though truly "bad" models may be hard to implement.

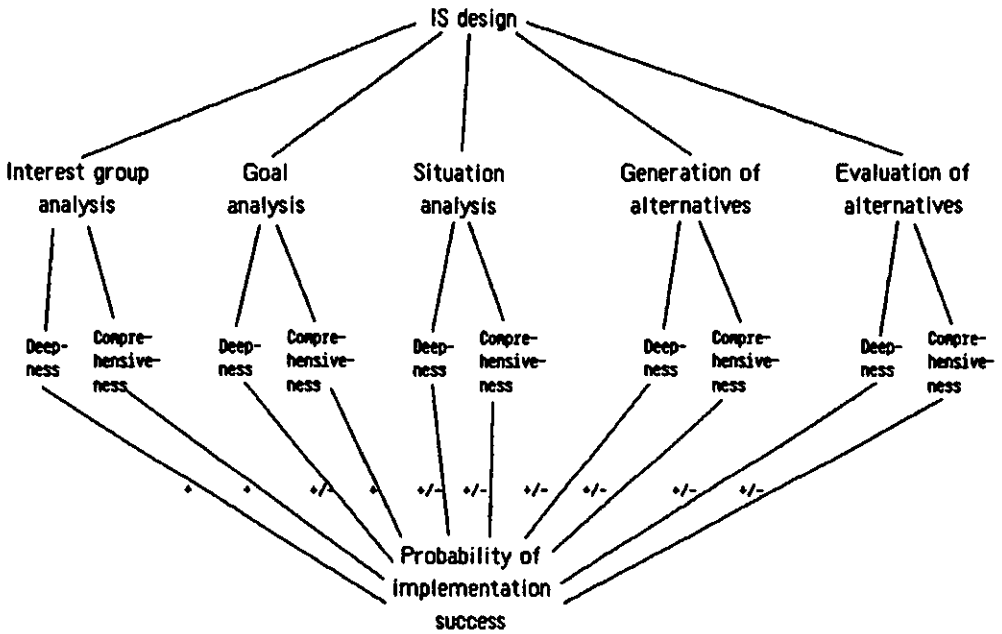

Figure 3

The Summary of the Ten Conjectures

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