A Behavioral Analysis for Planning MIS Implementation

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Abstract
Planning for a successful MIS implementation requires understanding the effects of the introduction of a new system on the work lives of potential adopters. The effects can be assessed by the MIS practitioner/ change agent if the agent will first obtain a thorough and specific understanding of the task activities performed by potential adopters, the interactions they engage in as they perform their tasks, and their preferences for, or feelings about, those activities and interactions. An interview based approach to gathering this data is described, and a short description of an implementation in which the approach was used is provided.

Keywords: Implementation, potential adopters, behavioral data, task activities, interactions, role preferences
ACM Categories: 2.0, 2.11, 2.40, 2.49

Introduction
Managing toward successful implementation of a new system requires understanding the effects of the new system on its potential adopters. In order to understand the effects, the change agent, who may be the MIS practitioner, must be able to obtain data which describes the current situation through the eyes of the potential adopter, so that changes adopters would feel as a result of a new system can be identified, and the consequences of the changes on the likelihood of a successful implementation can be assessed. This article describes in considerable detail an interview based approach to obtaining this useful descriptive data from potential adopters.

The approach described here is consistent with socio-technical theory, which holds that the organization's operating system is an emergent blend of its technical and social systems [24, 25], and is a direct descendent of basic research in the behavioral sciences on communication networks and group structures.

The approach is disarmingly simple. There are three data components — all gathered through interviews with potential adopters. The components are 1) the specific task activities each potential adopter performs, 2) the interactions they have with others as they carry out these activities, and 3) their feelings about these task activities and interactions which define their "role." Since the label "user" is somewhat presumptuous when our concern is implementation, the clumsier, but more appropriate, phrase "potential adopter" will be used.

The article first outlines existing implementation research, then describes the three data components, provides guidelines on the interview process through which the information is gathered, describes how the data can be used, and concludes with a short case study of a system implementation in which the approach was used.

Implementation Research
Some of the earliest implementation research investigated the relationships between cognitive style and personality characteristics of adopters.
and nonadopters [5,6,7,10]. Another stream of behavioral research looks at the contextual factors surrounding system implementation, and attempts to identify the critical factors associated with successful implementation. In a review of fourteen factor studies up to 1975, Ginzberg noted that 140 factors were reported, but 73% of those factors did not appear in more than one study [8], so it is difficult to see that we are “accumulating knowledge” in the theory builder’s sense.

The problem common to both the psychological and factor streams is that statistically significant relationships between variables reported in a study can be expected to hold across a large sample chosen at random from a population. Unfortunately, that is not the situation implementers face. To them, every situation is unique, and their career and the organization’s effectiveness do not progress on a statistically significant number of MIS successes over a large sample of trials. For both, each implementation should be a success.

Keen [11] describes another source of knowledge about implementation as “conventional wisdom” gleaned from case studies of unsuccessful implementations. But as Keen [12] and Ginzberg [8] note, these negative models of single implementations can lead to ambiguous conclusions, evidenced by the differences between Ackoff [1] and Argyris [2,3]. From such case studies, Ackoff concludes that successful implementation requires adequate power in the change agent, while Argyris concludes that the change agent should rely less on power and more on interaction with the potential adopter.

Another relevant stream of research addresses the role of the change agent. The dominant framework is the Lewin [14] and Schein [22] three stage process of change, in which behavior is unfrozen, moved, and refrozen. This framework was extended by Kolb and Frohman [13], who identify seven stages to the consultant’s change process, consisting of “scouting, entry, diagnosis, planning, action, evaluation, and termination.” These frameworks are conceptually appealing, but both provide only generalized guidance to a change agent who is responsible for implementing an MIS, but is not an organizational development specialist.

There has been relatively little research which focuses on the effects of implementation. Effects on the decision itself, and variables surrounding it, such as the amount of information requested, have been studied, along with some effects on the organizational context. The primary variable in the latter category has been effects of system implementation on the distribution of power among units [9,18,19,20].

**Behavioral Data for Implementation**

Each of the research streams described above addresses legitimate variables which deserve attention as researchers and practitioners seek the keys to successful implementation. However, this article assumes that the basic variables which describe the effects of a system are those which measure the changes in potential adopters’ task activities, and their interactions with other people in carrying out those activities. The approach used for obtaining this data assumes that the best source of information on activities, interactions, and feelings about them is the person experiencing them.

The theoretical basis for the approach is found in communication network experiments initiated by Bavelas [4] and Shaw [23], and later extended by Mackenzie [16,17] and others. As a result of these experiments we have learned that when people are presented with a task, they respond by performing certain task activities and forming communication structures for getting the work done efficiently and in a need-satisfying manner. Using this as a conceptual lens, we can look upon an organization as consisting of a large set of dynamic structures, where structures are patterns of interaction. Different structures for different sets of tasks can be seen, and these structures can be seen to change as the tasks change slightly, as individuals’ preferences, based on needs, are altered, and/or as the demands of the situation change [16,17]. These structures are very flexible, yet they can be stable as long as they remain need-satisfying to participants. Applications of these ideas in the field of organizational design have been made by Lippitt and Mackenzie [15]. A new MIS affects these most basic patterns of task activities and inter-
actions. To assess the potential effects of a new MIS, the person(s) charged with implementation responsibility needs three pieces of information:

1. the specific task activities the potential adopters actually perform,
2. the interactions/communications the potential adopters engage in, in performing those activities, and
3. how the potential adopters feel about each of the activities and interactions.

The specific task activities of potential adopters comprise the first component and may be numerous. It is data reflecting the detailed task activities through which responsibilities are met, not data about general responsibilities, which are relevant to implementation success. General responsibilities may not change with the introduction of a new system, but specific task activities will surely change.

The second component of the database, consisting of potential adopters' interactions with others in carrying out their task activities, is a critical element because the interactions facilitate both work and social needs. Implementation of a system may directly affect these communication structures by changing the work flow so that people who formerly had to interact no longer need to do so. The change agent should bear in mind that these structures may serve indirect functions.

In the case study a manager was encountered who must physically inspect the raw material inventory regularly. He gets to know the warehouse workers as he does his visual inspection. Through his visits to the warehouse he established good relationships with the workers, gained their confidence and support, which paid off when he was in a bind, learned of problems before they would normally surface, got some much needed exercise, greeted friends whom he enjoyed, and got a welcome break from the sterility of the administrative offices. A new system which would eliminate this useful and satisfying routine would thus produce several undesirable changes from his point of view. This is important data for a change agent to have as implementation of changes is planned. The data is directly related to potential adopters' perceptions of what makes them effective in their current positions, and what brings them satisfaction in it.

Having gathered detailed data on the activities potential adopters perform and who they interact with, the third relevant piece of information is how potential adopters feel about each of those activities and interactions. These feelings are simply classified as "like, dislike, or indifferent." Some changes will be perceived as positive, such as when tedious, undesirable activities are eliminated from someone's role as a result of a new MIS. However, some changes are perceived as negative, such as the change which removed the manager's need to walk to the warehouse regularly. The strength of the analysis rests in the ability to look at the changes through potential adopters' eyes. Although an activity might have appeared to be merely a tedious one to the designer or a change agent, potential adopters might have some reason to feel it confers status among their peers, gains their boss's appreciation, or is intrinsically rewarding. The reason potential adopters report that it is a well-liked part of their role is not important — the fact is they like it, and it might be changed. The key to obtaining the data for this type of analysis rests in the effectiveness of the interview.

The Interview

Interviews should be conducted with the personnel who are targeted to use the MIS, and who will be affected by its implementation. The interviews should be conducted by someone who is perceived as neutral. Selecting an interviewer who will be perceived as neutral may not be an easy task, depending upon the degree of knowledge the potential adopters have about a proposed system and their attitudes toward it. In cases of little information or favorable attitudes, a member of the design group, or an outside staff member, might be perceived as acceptably neutral. Neither person should be seen as having a prior stake in the design of the system. On the other hand, where attitudes are already resistant, an outside consultant or even an interviewer selected by the potential adopters, would be a more appropriate choice. In any case, the interviews must be held privately. There are four key phases in the interview process:

1. preparation,
2. entry,
3. conducting the interview, and
4. closing.
Preparation

To prepare for the interview, the key organizational task and decision processes which will be affected by the MIS should be identified. The change agent may find it helpful to flow chart these processes. A major benefit of thinking in terms of "processes" is that it frees the analyst from thinking of the organization "hierarchically" and of individuals' work as being within their domain of "authority" or "responsibility." These concepts never bear a perfect relationship to how work actually gets done, and can be misleading to the analyst. The processes, on the other hand, are much more transparent. They allow the analyst to see who is involved, either directly or indirectly, in the processes to be affected by the MIS, and therefore aid in identifying the appropriate personnel to interview. The processes also cause the analyst to think in terms of what specific task activities and interactions might be involved in achieving each milestone in the process. Then in the interview the analyst can ask the potential adopters what they do vis-a-vis a particular milestone.

Another critical aspect of the preparation phase of the interview is for the interviewer to adopt the appropriate attitude toward the task. The key to establishing an effective relationship is to come to the interviewees needing to learn from them. The relationship and information will be easily distorted if the interviewees perceive that the interviewer is there to sell them on the system, or wants to hear something which agrees with the interviewer's feelings about the system, or is going through the process and is not really interested in the information the interviewees possess.

Entry

The most successful entry to the interview is to simply state that, "I am trying to be of help in the implementation/design of the XYZ system. In order to be of help I need your help in understanding what you do. Could you just take me through a day and tell me in as much detail as you can what you do?"

People typically are pleased to have someone inquire and find it easy to talk at considerable length about what they do, provided the interviewer does not suffer the disabilities discussed above in association with the interviewer's attitude. The lower in organizations that this author has interviewed, the more anxious people are to talk about the many activities they see themselves performing.

Conducting the interview

The interviewer's objective in this phase of the process is to get the potential adopter to identify all of the task activities performed, and the interactions associated with performing these activities. The interviewer can rely on the task and decision processes identified in the preparation phase to prompt the potential adopters to look at all aspects of their individual roles. The interviewer may need to remind the potential adopters of the interviewer's interest in learning of specific activities from them rather than merely broad responsibility areas. In gathering information on interactions the interviewer must be alert to opportunities to probe for the existence of important informal structures, as in the case of the manager performing raw material inventory inspections who engaged in many productive and satisfying interactions in the process of inspections.

The focus throughout this phase of the interview must be on objective information — i.e., "what do you do" and "who do you talk with or work with?" If the interviewer probes for feelings or rumors, or in any other way departs from questions which can be answered objectively, the interview gets sidetracked and the interviewee may begin to doubt the motives of the interviewer and become guarded.

Closing

Following the collection of objective data, the final phase of the interview seeks data on potential adopters' feelings about the activities they perform and the interactions in which they participate. Many of these feelings will have been expressed voluntarily during the course of the interview. At the close of the interview, it is effective to signal that the interview is about over by ceasing notetaking, sitting back and making the following kind of statement: "We all have things about our jobs that we like and dislike. Of the
activities you have told me about, and the communications you maintain, which do you like and which do you dislike?" Apparently this signal allows the potential adopters to feel they are going to get the last word, so not only does the interviewer get candid responses, but often the potential adopters lean forward and give the interviewer information about potential problems they see. Sometimes the problem is with their boss, or higher management, or sometimes they convey rumors they have heard which will have a bearing on implementation. In the case study, several operations-level people who were interviewed warned that supervision in the warehouse was sloppy, but that this author would not likely hear that from the warehouse people. They were concerned that this was the "weak link" in making the system successful.

Use of Data

The three pieces of data obtained in the interview can be useful at several stages of the MIS development cycle. As part of the feasibility study for a new system, this data could help management determine the need for and willingness to accept a new system. A forecast of serious implementation problems might, in some cases, have persuaded management to scrap systems that created serious problems and were eventually abandoned or unused anyway.

In the initial design phase, the designers anticipate and hopefully avoid implementation problems that arise because the system does not serve its users' task needs and because it does not meet their personal needs.

The data is also useful after the system is designed, but prior to its implementation. At this stage potential adoption problems can be identified and some can be avoided in the way user procedures are developed. Where that is not possible, dissatisfaction with prospective changes in activities and interactions can be handled head-on by working with an individual to overcome any dissatisfaction or by enhancing the user's role in some other way. It may also be the case that the activity changes to be produced will not fit properly with the current mode of organizing, or the system of controls and rewards. A clear example of this lack of fit will emerge in the case to be described.

If the new system is already designed, the basic analysis performed on the data is to compare, on an individual-by-individual basis, the prospective user's reported activities and interactions before the system implementation, with the activities and interactions anticipated by the designers after implementation, assuming it is adopted by the prospective user. These role changes are then assessed against the potential adopter's stated preferences for activities and interactions, and the analyst must make a judgment about whether and how the system can be adjusted to the prospective adopter's needs, how the organizational context can be adjusted to accommodate the needs, or how the prospective adopter can be brought to adopt the system.

A Case Study Using the Behavioral Analysis

A Product Tracking System (PTS) had been under development by the corporate systems design group of a large multi-plant manufacturer for two years when the author became involved in the project. The author's role was to interview potential adopters of the PTS in order to anticipate areas of resistance to the changes and to recommend steps management could take to achieve a more successful implementation. The purpose of the system is to provide the ability to accurately track the product as it comes off the production line or is received as a finished product from another plant, through warehousing and shipping, and then to provide the ability for recall in the event of such a need after shipping. The information on the system serves as input to operations planners, who use it to plan production schedules, order raw materials, and schedule shipments; by accountants who use it to maintain inventory control; and by warehouse dispatchers, supervisors, and fork lift drivers who use it for warehousing operations. The system was being designed and introduced into a single plant as a prototype for use in other plants.

It could, perhaps, go without saying that the first step in the implementation study was to seek the support of the plant manager. This was readily
accomplished. Flow charts of the task and decision processes were developed and used to identify the people who would be significantly affected by the PTS. They included six operations planners, three accountants, the warehouse dispatcher and five warehouse floor supervisors, two warehouse clerks, and two data input operators in accounting. A total of nineteen people were interviewed. While forklift drivers in the warehouse were to be affected by the system because they would get their dispatching orders from a terminal screen rather than a dispatcher, it was infeasible to interview them due to potential union complications.

Each interview proceeded in the manner described earlier. The interview focused first, and foremost, on specific, objective reporting of activities and interactions, without seeking for feelings until the objective data was available so the objective and subjective data could be specifically related.

It is not the intent of this article to claim that the approach outlined here is better than some other unspecified approach. It has been my experience, however, that it is effective in producing useful data and that it is efficient. The case study of the PTS reported in the following paragraphs involved one and one-half days of interviewing, with no prior contact with any plant personnel. The interviews provided a very rich picture of what people experienced in their jobs, what motivated them, and what management practices existed. This picture was then translated into a set of recommendations for managing the implementation process, and these too are described.

**Operations planners**

Interviews with the operations planners followed an interesting pattern. At the outset they described activities which their manager could have related to the MIS team, or which could easily have been inferred from the job descriptions, namely, that they manually updated production and inventory reports, and then used these reports to prepare production schedules, raw material orders, and to schedule shipments of finished products. However, when asked how much time this consumed, they reported that it required an average of three hours daily, and then they perked up and reported that most of the rest of their time is devoted to solving problems and dealing with "emergencies," such as raw materials that have not arrived on schedule or orders that cannot be filled with the existing inventory. Solving these problems required that they be on the phone talking with various people throughout the day, and they also interacted with each other a good deal in order to juggle orders and schedules.

Even before reaching the last portion of the interview in which they were asked which of the activities and interactions were desirable or undesirable, the answers were obvious. They reported that the elimination of manual updating of reports was desirable and would make their jobs much easier, but they all reported that they found their jobs very challenging, and that the problem solving, which was termed by PTS designers as "fire-fighting" was very rewarding. Comments from the planners included "I like being able to respond to people, to make decisions, and I enjoy the personal telephone contact," and "I like the problem solving, the variability, and decisions in my work." Several reported that they like the personal contacts required by their jobs, and their problem solving required interaction personally and over the telephone with each other, warehouse people, production people, other plants, salesmen, and others. They were the hub of activities in the plant and derived a good deal of status from that.

The intent of the PTS was to eliminate the need for the time consuming updating of reports and to significantly eliminate the amount of emergency work they do. System designers intended that ultimately the operations planners' jobs would be planning oriented rather than reactive. Clearly, the PTS would change the "character" of the work they experience. Since much of it involved communication with others, it should be remembered that the work life of whomever was previously on the other end of the communication would change after implementation as well. In this case it was not worth investigating, but in some cases it might be more critical.

**Warehouse**

It became apparent that the warehouse was the key to the success of this system. The
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warehouse dispatcher received production and shipping reports from operations planners, and then issued orders to forklift drivers, telling them the bay rows in which finished products were to be stored and the bay rows from which goods were to be retrieved in order to be shipped. The new PTS would generate loading and storing orders automatically and the dispatcher would become a supervisor.

The forklift supervisors were not influenced directly by the PTS, but the operators whom they supervised were directly affected. However, since the operators could not be interviewed, for reasons involving the plant's labor relations, the supervisors were interviewed to learn what the operators do, and to learn what motivates their behavior. What was learned from the supervisors was very interesting. In addition to recounting what operators do, they reported that an estimated 25% of the lift drivers do not store and retrieve pallets from the rows they were assigned by the dispatcher. It appeared that there were no incentives for drivers to be accurate in the storage and retrieval of a product. Indeed, the incentives worked the other way. By picking from "convenient" rather than assigned rows, and otherwise "cutting corners," drivers were able to finish a load and break for a cigarette. Furthermore, this warehouse had been touted within the company for its high productivity. The accuracy and thoroughness required by the new system would, at least in the short run, tend to be perceived as lowering their speed and productivity.

The activities of the supervisors themselves were straightforward supervisory activities, described by one as the "good cop role." They interacted with all of the drivers and all of the supervisors, which is not surprising because they are not responsible for supervising a particular crew, but instead for roaming the floor and checking loading docks.

Administration

The accountants reported that they did a great deal of handposting and verifying of reports, which they did not like. The PTS would require significantly less of this, and free them to do more work on trouble-shooting projects than they can do now. They reported that they liked the problem solving work in the projects they did have time to tackle, and were optimistic about being able to do more of it when the new system was operating. There appeared to be no changes in the work of Administration personnel that would hamper successful implementation.

Recommendations

The data obtained in the interviews provided a clear picture of how potential adopters saw their jobs; how they had adapted them to the plants' management practices, such as the incentive for the warehouse personnel to emphasize speed; what communication structures supported their work; and how their jobs and communications fit their own personal need structures, e.g., operations planners like fire-fighting. Against this backdrop, the effects of the new PTS were assessed, and recommendations were developed regarding what management should do to attain both adoption and continued effective use of the PTS. The following are the key recommendations which were made.

The most threatening problem area was the lift drivers in the warehouse. If they were not conscientious in following loading and storing orders generated by the PTS, and if they did not take time to report adjustments due to damage, etc., the information in the system would be inaccurate and its value as a planning and accounting tool completely undermined. The two key recommendations involved 1) creating incentives in the warehouse compatible with the accuracy needs of the new PTS, and 2) developing accountability for accuracy. A specific recommendation made to management was to place accountability for accuracy on the supervisors by dividing the drivers into teams and assigning them to a supervisor, who then plays the role of team leader rather than warehouse policeman. Being accountable for their teams, supervisors would then have incentives to build norms that support the accuracy objectives, to build esprit de corps in the teams, and to spend more time assuring the accuracy of the orders going into the cars and trucks. In addition, the basis of recognition for the warehouse must shift, at least temporarily, away from productivity to success in making the PTS work. Repeatedly it can be seen that when quantity is rewarded, there is a tendency to drive out quality and accuracy. Certainly this was the state of affairs in the plant, so the entrenched reward
system worked at cross purposes to successful implementation.

With respect to operations planners, it appeared that their motivation and commitment to their work would probably assure their adoption of the PTS. However, the recommendation to management was that they be alert to opportunities to provide future sources of challenge and responsibility to operations planners to substitute for the current challenges that the PTS will eliminate.

**Summary**

The data, data gathering procedures, and guidelines for using it, are not offered as a sure-fire solution to implementation problems for the practitioner. It may be most appropriate to view the approach as a means to act upon all of the good and sensible things which socio-technical theorists and behavioral scientists have been saying we should be concerned about, and that MIS practitioners are coming to accept and want to act upon. The approach is offered as a step toward the goal of successful implementation when it is used relatively skillfully. Indeed, one of its advantages is that it is specific and straightforward, and can be used "relatively skillfully" by organizationally sensitive, if even untrained, change agents.

The interview procedure is the central feature of the approach which opens it to practitioners/change agents who need not be organization development specialists. The interview, if conducted as described, appears to be successful for several reasons:

1. The questions about activities and interactions which serve as the heart of the interview are objective and non-threatening.
2. Potential adopters find the questions easy to respond to.
3. The questions give potential adopters an opportunity to convey to an apparently interested person the rich detail of how they work and how much they do.
4. These objective questions contribute to a climate of trust, in which candid and reliable expressions of what satisfies them in their work are more likely to come.
5. The approach helps convey the attitude that the interviewer needs to learn from the potential adopter, and is interested in basic and important things.

What the approach does then is place in the hands of the practitioner/change agent a rich source of insight into the effects of a new system on the working lives people would experience if the system were adopted by them. This insight can then help the analyst anticipate, avoid, or smooth potential adoption problems.

Besides the valuable uses for data on activities and interactions at several stages of the MIS development cycle, the process of gathering the data itself is beneficial. Behavioral scientists learned long ago in the famous Hawthorne studies that the mere expression of interest and concern by a researcher/change agent has a positive influence on behavior and attitudes [21]. Thus, it was not surprising to find in the field study that potential adopters responded very favorably to the interview itself; the management reported later that it had received supportive feedback from employees. The exact effect would be difficult to measure, but research has repeatedly shown it to be positive.

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