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Implementing and Managing Change: A Guide for Assessing Information Technology

Jonathan A. Morell
Reid Gryder
Mitchell Fleischer

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Energy Division

IMPLEMENTING AND MANAGING CHANGE: A GUIDE FOR ASSESSING INFORMATION TECHNOLOGY

by

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ABSTRACT

Assessing the impact of office automation (OA) requires expertise in the generic aspects of evaluation and innovation adoption, combined with specialized knowledge of OA. There is an extensive literature on the two generic subjects, but no companion literature concerning the application of that knowledge to the unique case of OA. By providing that specialized information, this report assists the implementors of OA in two ways: it shows them how to monitor implementation efforts, thus providing feedback to facilitate adoption of OA technology; and it provides guidance for measuring OA's impact on people and organizations.

The report assumes an immediate impact of OA on the work groups where the technology is implemented, and a continually spreading effect from that locus of immediate use. Included in the report are discussions of: sources of data, methods of data collection, factors which affect implementation, and measures of impact. Special attention is given to measuring productivity changes that may result from the use of OA.

A detailed appendix supplies a variety of examples which show how the variables discussed in the report were actually measured in applied settings.

EXECUTIVE SUMMARY

This document provides a framework for assessing the implementation and impact of office automation technology within shore-based facilities of the United States Navy. It is intended to help the Navy make effective use of any office automation (OA) it implements. The plan's basic goals are to help personnel to:

- monitor the process of implementation;
- assess the impact of OA use;
- clarify relationships between implementation strategies, user acceptance, and impact; and
- identify organizational changes that would facilitate the greatest possible exploitation of OA technology.

The two levels of information are conveyed. On the first level, the concepts required to evaluate the implementation of OA technology are discussed. On the second level, specific examples are given of how those concepts were measured in actual studies. In order to avoid excessive, complicating detail in the presentation of concepts, the examples all appear in an appendix.

Together, the body of the report and the appendix represent a detailed and comprehensive list of issues related to assessing the implementation and impact of OA. However, the intention is not to advocate an all-or-nothing approach to these recommendations. Rather, the goal is to provide OA implementors with an overview of what can be done, so they can make informed choices about the areas they need to pursue for their specific situation.

This report is not a complete treatise on evaluation or innovation adoption, but deals with special issues which must be considered when OA is the subject of an impact assessment.

Four assumptions guide this report:

- The process of implementing OA can be planned and managed;
- The quality of that management will affect the value of OA's use;
- Understanding the course of implementation entails an appreciation of interaction of three factors - the technology itself, the people who use the technology, and the setting where the technology is used; and
- OA can affect organizations in different ways, and each way must be assessed if the value of OA's contribution to organizational functioning is to be maximized.

This report employs a model which views OA use as an ongoing process that begins with implementation, has an immediate impact on end-users and their work groups, and spreads its impact from the immediate locus of use. Throughout the process, feedback loops are operating; that is, the users of OA are influenced by the way their work affects others.

MEASUREMENT STRATEGY

To provide a context for the work, it would be useful to begin with an understanding of other efforts to assess the impact of OA. These efforts fall into two main categories - assessment of the nature of OA technology, and of its impact. In each category, a crucial distinction must be made between studies that deal with variables in a more general way, and those concerned with specifics. For example, in some cases OA is referred to as a global concept, without specification of particular applications or hardware; other studies do make these specifications. The same is true for impact studies. Respondents can be asked general questions about impact, or questions which specify particular aspects of work - communications, report quality, decision making, and so on.

For economy and efficiency, special attention must be paid to archival data - that information which already exists as a result of the normal course of events, and does not have to be collected as part of a special effort. In addition, much useful data can be gathered with a small amount of extra effort during routine interaction with end-users. For example, useful data on training needs can be collected with a few simple questions each time a help center staff member gives advice to an end-user.

It is useful to employ multiple sources of data to measure each concept, for two reasons: first, the multiple sources serve as validity checks on each other; and second, different measures of impact may cast light on the size of an observed change. For example, archival data may show that reports are being written more clearly and contain more information, while another indicator of report quality - reader perception - may show no change. Such a finding would indicate that although OA has affected report quality, more effort is needed if the change is to have any practical significance.

The ideal strategy for wording questions is to use the responses to open ended questions as a basis for constructing more probing short-answer questions, which capture all relevant information. "Ease of response" should be the primary consideration when placing a series of questions in order. Questions which prompt the respondent to recall relevant information should serve as a prelude to questions which require value judgments on specific events in answer.

Because value judgments on the importance of OA-induced changes are inescapable, data on these judgments should be formally incorporated into an assessment strategy. For example, consider the use of OA in the assignment of personnel. If the technology is used to help improve the assignment of scarce personnel to critical specialties, even a small

increase in efficiency could have very important benefits. However, the same amount of improvement in efficiency would be relatively unimportant when dealing with large numbers of qualified people being assigned to non-critical specialties.

Special consideration should be given to the issue of productivity improvement, which is particularly important when studying OA impact. First, all accepted measures of productivity - whether affected by OA or not - must be catalogued, to provide a sense of the range of OA's effect on productivity. Next, the appropriateness of those measures must be considered. For example, standard measures may rate a group equally on its accomplishment of both high and low priority work, but OA implementors may wish to differentiate between the two when measuring impact. Finally, data on any "value added" component that OA may contribute to the quality of the work should be collected. One aspect of "value adding" is the ability to carry out new types of work that could not be accomplished without OA. The creation of new, previously-unavailable information is another aspect of OA "value adding."

DATA TO BE COLLECTED

Several variables can be useful in explaining why an OA implementation process seems to be succeeding or failing. These include: the reasons for OA acquisition (need driven vs. technology driven); the actions of key players in the process; the number of key players involved; the structure and amount of support for end-use of OA; the amount of expertise available to users, the relative ability of implementation planning process to change in light of new circumstances, and incentives for people to use the technology.

Successful implementation does not guarantee continued use, so it is important to collect information on the routinization of OA use. Routinization-related factors include such things as organizing work to require OA use, formal training procedures, and user friendliness.

In addition to the above factors, understanding implementation requires an understanding of end-users and their work groups, because they represent the immediate context where the hard choices on OA use will be made. Information should be collected on how OA fits into work routines, and on users' satisfaction with the OA that's available to them; a description of how the work groups are constituted, and their function, should also be made.

Beyond understanding the implementation process, it is important to measure its consequences. Those fall into five categories:

- amount of products or services produced by user groups,
- quality of those services,
- groups' ability to adapt to new circumstances,
- possible changes in the group's role in the organization,

- communication patterns, and

- consequences outside the work group.

Each of these represent a unique type of change that OA can bring about within an organization.

A final important consideration to keep in mind is that any given change may be for better or worse. It is, therefore, very important to construct questions - and to maintain a perspective - that keeps the assessment process open to potentially negative consequences as well as to positive ones.

THE DATA COLLECTION PROCESS

Once the format and the substance of the questions have been decided upon, a schedule for data collection must be established. The first step is determining when information will be collected. Naturally, the ideal situation is one where data can be collected both before and after OA implementation, thus allowing precise estimates of the change wrought by OA. But even in the absence of before-and-after comparisons, the timing of data collection can be critical. While some data can be gathered at any convenient time (archival data, for example), others must be obtained within a narrow window of opportunity. A delay in collection is one major problem, as accurate recollections of specific circumstances are lost. But collecting data too early is also a problem; users may not have had time to adapt and reflect on changes. Too-early collection may show detrimental effects of OA when in fact, the long-run impact was positive.

In the early stages of implementation it is important to collect data from as many people as possible, to insure a good information base from which more structured questions can be developed. As OA usage spreads, however, a sampling plan will be required. Six principles must underlie any such plan:

- Any groups of particular interest to OA implementors must be included.

- The remainder of the sample must be representative of the population of interest.

- Because some data will have to be collected early in the implementation process, respondents should be identified as soon as possible.

- A special effort should be made to include groups who have special relationships with end-users.

- The recipients of OA use products must be included in impact studies.

- The amount of information required from any given population may increase to the point of overburdening any single representative of that group. In such cases, it may be advisable to ask each respondent for only a portion of the required information, and rely on multiple respondents to supply all the necessary data.

NETWORKING AS AN INNOVATION

Networking and stand-alone workstations must be considered as a separate innovation. Although the basic approach to their evaluation is the same, there are important differences in emphasis. For example, understanding computer-computer interaction may require analysis of a setting's mainframe environment, or of group processes related to agreements on file structures and data elements among grouped workstations. These issues are not critical for understanding the use of stand-alone workstations. These differences of emphasis apply to studies of both the implementation and impact of OA technology.

In terms of implementation, networking will require much greater attention to the role of key players, and to the use of an adaptive planning strategy. The reason for this shift is that networking brings about tighter linkages among parts of an organization, thus increasing the mutual influence of innovation on organizational process, and vice versa.

As examples of the difficulties that may result from tightening organizational linkages, consider the following questions: (1) As a result of networking, what might happen to relationships among groups who previously had unique functions, but which relied on each other for information? (2) Once a group has gone to the trouble of setting up its own "private" databases, will it readily agree to participate in a new shared-file system that requires changes in their already-proven file structure?

The shift from stand-alone to networked systems also has implications for assessing outcome. Although the variables of interest remain the same (output, quality, adaptability, evolving roles, communication and organization-wide consequences), there are shifts in the likelihood that changes will occur, and in the direction, and size of those changes.

Likelihood of Change

There is an increased risk that networked systems will have no impact because changes can only occur if a system is implemented, and organizational difficulties increase the chance that effective implementation won't happen.

Direction of Change

Linking workstations increases the dependence of different parts of the organization on each other, which thus increases the probability of undesirable effects for three reasons: First, technical malfunctions

will affect all groups linked to the system. Second, the more sharing of information, the greater the negative consequences of passing incorrect information, or of disseminating error-prone programs. Third, since sharing increases the dependence of work-groups on each other, there are increased difficulties if one group does not do its job well.

Size of Change

Networked systems may result in greater beneficial change than would standing workstations. One reason is that networking may free many work groups from the tedious job of data entry, thus providing opportunities to accomplish other work. More important, networking provides a vast increase in available information, and much faster communication.

1. PURPOSE

This document provides a framework for assessing the implementation and impact of office automation technology within shore-based facilities of the United States Navy. It is intended to help the Navy make effective use of any office automation (OA) it implements.

Several factors underscore the importance of making strenuous efforts to increase the efficiency of shore-based operations.

- The 600-ship Navy will place severe limitations on the number of people available for the complex shore duty tasks required to maintain the military readiness of a 500,000 person force.
- Because of the frequent changes in jobs by almost all Navy personnel, efficiency suffers from a lack of continuity and institutional memory.
- Effective organizations require personnel who have good working relationships with each other, both on formal and informal levels. Frequent job changes and the press of business threaten the development of such relationships.

If appropriately implemented and supported, information technology can assist in achieving a high level of organizational functioning in light of the above-stated threats to efficient operations. Properly used, office automation will contribute to better decision making, greater coordination among functions, and more efficient operation of routine office activities.

2. SCOPE OF THE EVALUATION PLAN

This evaluation plan is constructed so that its overall goals will remain constant, while its range and depth of analysis parallel the extent to which information technology is actually implemented. The basic goals of the project are to:

- monitor the process of implementation;
- assess the impact of OA use;
- clarify relationships between implementation strategies, user acceptance, and impact; and
- identify organizational changes that would facilitate the greatest possible exploitation of OA technology.

Throughout, the plan calls for a continual flow of information to those charged with implementing OA. They will need to know how implementation can be improved, what impact the technology is having, and how the effort can be justified in terms of its contribution to Navy readiness.

The bulk of this report will emphasize the analysis of stand-alone workstations, because they represent the most likely situation for OA implementation. End-users will begin using their equipment immediately upon delivery, without waiting for networking to become operational. Because networking is likely to arise at some point, special considerations related to networking are presented in a special section.

The intention in this report is to convey information on two levels. On the first level, the concepts required to evaluate the implementation of OA technology, and the relationships among those concepts are discussed. On the second level, specific ways to measure those concepts are detailed. An example of a statement on the general level would be:

"User support is required if OA is to improve the quality of a work group's reporting." The second level would explain specifically what to look for in measuring these concepts. Briefly, we might define "quality of reporting" as plans which are based on more information, faster response time to requests, or better use of graphs and tables. (Much more on definitions of quality will come later.)

Presenting information on these levels will give the reader a sense of how evaluation efforts should first be conceptualized, then put into operation. In order to avoid excessive complicating detail in the presentation of concepts, examples of specific measurement are presented in Appendix A. That appendix is drawn from actual studies of the impact of information technology. If a real example of measuring a concept mentioned in this report could be found, that example was included in the appendix.

It is beyond the scope of this report to present complete details on the measurement of each concept. There will, however, be at least one example of measurement for each concept. These examples can be used as they appear, or they can be viewed as a lesson in how to move from abstract concepts about the evaluating information technology, to the specifics of assessment.

It is <u>not</u> our intention to argue that all recommendations in this report be implemented in an all-or-nothing fashion. Elements can be chosen as needed, and choices can be made about the value of information from more or less complex evaluations. For example, one could monitor implementation without assessing impact, or vice versa. Leaving out one or the other may result in less insight into the contribution of

information technology, but each type of information still has value in its own right.

It is also not our intention to present a complete treatise on evaluation, including topics of research design, instrument construction and statistical analysis. Such a presentation is far beyond the scope of this report, and would merely repeat information contained in many other sources. Rather, the intent is to remain close to the special factors which must be considered when assessing the implementation and impact of information technology. For basic information on generic issues in evaluation, the following are recommended: introductions and overviews of evaluation methodology - Rossi and Freeman (1985); and qualitative evaluation methods - Guba and Lincoln (1981), or Patton (1978); survey and questionnaire methods - Dillman (1978).

Throughout, we assume the reader does not have a deep background in evaluation; consequently, technical matters are discussed in lay terms.

3. BASIC ASSUMPTIONS

Several basic assumptions guided the evaluation plan outlined in this report.

1. The process of implementing information technology can be planned and managed. It need not be a haphazard process.

2. The nature of that management will make a difference in terms of whether the technology is used, what advantages come from its use, what problems will arise, and how well those problems can be overcome. For example, many different strategies for training can accompany the arrival of OA. Users can be left to their own devices, electronic tutorials can be provided, help centers can be established, or formal training can be made available. Further, the timing of these types of training can be varied relative to the implementation of the technology. Explicit decisions about these issues can be made, and those decisions will affect the course of OA use.

3. Understanding the course of implementation involves an appreciation of interactions among three factors - the nature of the technology, the people using the technology, and the nature of the organization where the implementation is taking place. For example, consider the frequent personnel turnover within the Navy, and the high probability that new rotations will not arrive with an expertise in OA use. This situation places a special burden on those whose job it is to insure continuity in work tasks.

4. If effective plans are to be developed to maximize the contribution of information technology, the benefits of the technology cannot all be collapsed into a single metric. There are classes of outcomes

that need to be understood on their own terms. For example, two advantages of OA use might be: better graphs in briefing documents, and the accomplishment of more work due to time saved through computer use. Depending on which of these outcomes is most desired, different actions have to be taken in terms of training, demands made upon personnel, and rewards given for OA use.

4. MODEL FOR DATA COLLECTION

We view the use of OA as an ongoing process that begins with implementation; has an immediate impact on end-users and their work groups; and through the activities of those work groups, spreads its impact from the immediate locus of use. (Work groups are defined as that small number of individuals with whom a person regularly interacts in the pursuit of his or her assigned tasks.) Throughout the process, "feedback loops" are operating; that is, users of OA are influenced by the way their work affects others. This work-group/diffusion perspective lays the groundwork for addressing four important issues of practical concern to the Navy:

1. What is the process by which groups adjust to OA, and why do some do it better than others?

2. What is the most immediate impact of OA use? That impact is likely to occur through interaction between groups using OA and those who receive their products or services. Thus, a work group perspective provides a strong framework for assessing impact and justifying the acquisition of OA technology.

3. How might the nature of work be affected by OA? Here too, the most immediate effects are likely to be at the work group level, where two types of changes might occur: (1) Work groups may become more adaptable, ie. better able to handle a variety of tasks or respond to new circumstances. (2) Because of the ability to do different types of tasks, a work group's role within the organization may shift.

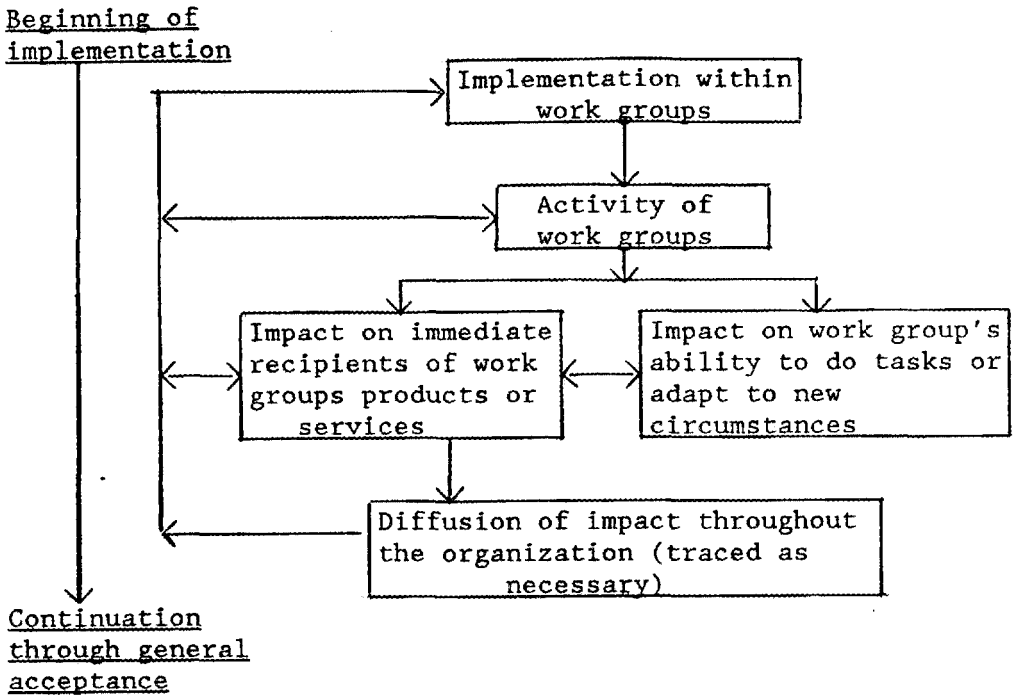
In addition to its practical value, a work group/impact diffusion perspective offers important methodological advantages: (1) It allows

comparisons across many instances of implementation, thus yielding much useful information about the OA implementation process. (2) The pace of data collection can be matched to the actual pace of OA implementation. (3) There is a good starting point for assessing impact as it diffuses throughout the organization. Such a starting point is critical because as the diffusion of impact proceeds, it becomes progressively more difficult to detect the role played by information technology in the general run of organizational processes. Sampling becomes more difficult because of uncertainties in knowing in advance who should supply data. The nature of OA's impact becomes harder to predict, thus making it difficult to anticipate specific questions which should be asked.

Because of the above considerations, any OA evaluation plan must meet five conditions:

- Implementation must be understood in terms of the work groups where that implementation is actually taking place.
- The link between implementation and impact must be studied.
- The impact of OA use must be traced as far as is possible, given constraints on time and access to data.
- Interaction and feedback loops among elements in the implementation-use process must be included.
- Because implementation and use are processes, efforts must be made to assess its evolution, and to track any important changes in direction which might have implications for planners.

Figure 1 is a schematic diagram of a model which meets these conditions.



This model will serve as a guide through four steps in the evaluation design process:

1- formulation of a measurement strategy,
2- identification of relevant variables,
3- scheduling of data collection, and
4- developing a sampling scheme.

Fig. 1. Schematic illustration of analysis plan.

5. MEASUREMENT STRATEGY

REVIEW OF PREVIOUS MEASUREMENT EFFORTS

Others' efforts to assess the impact of OA provide a valuable context for conceptualizing any new assessment strategy. Those efforts can be conveniently grouped by means of a two-way table in which rows refer to OA technology, and columns refer to impact. In each case, the crucial distinction is whether variables are dealt with primarily in general or in specific terms. This framework is shown schematically in figure 2.

		Reference to impact	
		Global	Specific
Reference to office automation	Global		
	Specific		

Figure 2 - Schematic representation of efforts to assess the impact of Office Automation.

All of the cells in figure 2 are represented in the literature except for the "global-global" cell, which is so general that it is not used.

The following are brief examples of how each category was dealt with in a variety of research studies.

Global Technology - Specific Impact

In an effort to determine the impact of OA on managers, Fleischer and Morell (1986, 1987) surveyed 168 managers in 15 organizations. One

part of their forced-choice mailed questionnaire asked respondents to use a five point scale to rate OA's impact on the amount of time they spent doing 11 common business activities. Examples of elements of the list include: "talking on the telephone," "preparing presentations," "using data to make decisions," and "business travel." (The scale points were (1) much more time, (2) more time, (3) same time, (4) less time, and (5) much less time. A "don't know" category was also included.)

Another example demonstrates how the "global technology-specific impact" approach can be used with a very different methodology. Bikson, Stasz and Mankin (1985) conducted a series of structured interviews in order to obtain an in-depth understanding of how computer-mediated work affected one large corporate headquarters. An important part of their data analysis was to determine how the technology affected a series of variables related to organizational behavior: (1) work changes (enrichment, demands, reinvention, management style), (2) communication, (3) ability to return to old ways of accomplishing tasks, (4) productivity (time savings), (5) physical and psychological complaints, (6) formal job changes, and (7) job satisfaction.

Specific Technology - Global Impact

One example of this approach is provided by DeLong and Rockart (1986), whose effort to study executive support systems involved telephone interviews of knowledgeable information systems personnel in 45 Fortune 500 companies. Part of their analysis involved imposing three categories of impact (extensive, moderate, and low), on three elements of executive support, - office automation, status access, and query and analysis. Each of these terms represented a step in an ascending scale of end-users' ability to access and manipulate information.

A second example is again provided by Fleischer and Morell's (1986, 1987) study of managers. One section of their instrument was a long list of specific OA applications (word processing, spreadsheets, statistical analysis, etc.), each of which had to be rated on a six point scale of impact on work life: (1) profound change for the better, (2) major beneficial impact, (3) some beneficial impact, (4) slight beneficial impact, (5) no impact, and (6) negative consequences have outweighed benefits.

Finally, research of this type often substitutes "frequency of use" for direct estimates of impact. Laudon (1986) for instance, used this approach in his effort to assess the influence of networking on the use of personal computer (PC) technology. His study dealt with a variety of specific offices within 25 firms in the financial services industry. Data were collected by means of both open-ended interviews and through structured questionnaires filled out by the researchers. One aspect of the study asked respondents to estimate how often (never, monthly, weekly, daily) they used PCs for a variety of purposes - searching databases, external communications, learning aids, and the like.

Specific Technology - Specific Impact

One part of the Fleischer and Morell (1986, 1987) study was an effort to ascertain how OA affects managers' decision making. A section of their instrument defined three types of problem: "cut and dried," "analytic," and "unstructured." These problem types form a decreasing scale of the extent to which specific information can help find a well-defined solution. Respondents were then asked to use a five-point scale to rate how helpful various aspects of OA were in finding solutions for each type of problem.

SOURCES OF DATA

Archival Data

Archival data has the great advantage of not requiring people to answer questions, thus eliminating a potential source of bias and minimizing requests for respondents' time. Although relatively few of the concepts detailed in this report are amenable to study through archival means, some are, and these should be used whenever possible. The few examples presented below will convey a sense of the type of information that might be available through such means:

- The quality of written documents, in terms of format and use of graphics, can be compared before and after the advent of OA use.
- People may be able to do more work as a result of time saved by the new technology. Thus one might look at the number of low priority tasks completed, or the number of products (plans, orders, budgets, etc.).

If OA is used to generate information that was not previously available, that capacity should be reflected in the contents of plans and briefing documents.

Unfortunately, much of the data needed will not be available without asking people to take the time to answer questions. Because time is a scarce resource, a strategy is needed to make personal data collection as efficient as possible.

An important element of that strategy is to collect as much information as possible during the normal course of implementation and system management. Because those activities require frequent contact with end-users, much evaluation data can be collected in this way. For example, much information on training needs could be garnered from ordinary discussions between help center consultants and end-users. A little

foresight would insure that training data were collected in a systematic fashion that would allow its incorporation into a formal evaluation.

Multiple Sources of Data

Multiple perspectives are always useful as a way of checking the validity of data. For example, we have encountered many users of OA who claimed that computer use resulted in their being more convincing in their arguments. The better arguments came from better use of graphics, more frequent revisions of documents, and the inclusion of more relevant data. Examples and details provided by respondents indicate that their claims are probably true. But how is the situation seen from the point of view of people on the receiving end of those arguments? Is the increase observable to them? Is it large enough to make a practical difference?

A second perspective on multiple data sources is the combination of personal and archival data. To continue the example cited above, more convincing arguments might be reflected in the use of graphics in briefing documents, or a greater richness of data used to support arguments.

Another advantage of multiple data sources is that they can provide a sense of the "size" of any change that occurs. In our "better argument" example, OA users may be able to document that new information is included in their reports, even though an increase in quality is not perceived by the recipients of those reports. In such a case, we would have a sense that OA has had an impact on quality, but that some action may be needed to increase that impact to the point where it makes a practical difference.

In sum, any use of multiple data will promote greater confidence in findings, a higher probability of detecting events, and a finer sense of how consequential any detected change may be.

ASKING QUESTIONS

Question Construction

In all cases where data must be collected from individuals, the goal is to work towards a closed ended question which can be answered easily, allows comparisons across settings, and which is anchored in the reality of the respondents' work. For example, respondents may be asked if they use their OA to keep "private" files to make up for deficiencies in a mainframe system. This is a very specific question which conveys information about one special use of information technology. On the other hand, the question is general enough that it applies to many contexts, and can be aggregated across diverse respondents.

The only way to construct relevant questions is to begin with a small number of open-ended interviews, and use that data to generate specific response categories. Two examples from a study done for the Naval Military Personnel Command illustrate this process, (Morell 1987).

> Context of the study: Individual work groups obtained micro-computers on their own initiative and taught themselves how to use the technology. Without specific orders to do so, they began to use computers to work more efficiently. Although micro-computer use greatly affected the work groups' operating routine, that use was not embedded in a careful "microcomputer use support plan."
>
> Example # 1: Given these circumstances, we became concerned with difficulties that might arise when experienced users rotated out of their jobs and new people came in who were neither committed to the technology, nor expert in its use. To address this question we asked an open-ended question about what would happen when the end-user rotated out of his or her position. Although all answers were slightly different, it was possible to collapse them into four basic categories.

- Routines are institutionalized by setting up data entry screens, computerizing files, and the like. The assumption here is that new personnel cannot ignore so institutionalized a system.
- Replacements are sought who already have some facility with OA.
- OA-related duties are transferred to a person who is remaining in the group.
- Use is left to the discretion of the new person.

Following this example, one part of a question about "strategies for continuity" might be to list specific strategies, and ask respondents to estimate their groups' reliance on each. Then, as a check on these categories, respondents would be asked to briefly describe what was actually done when an end-user rotated out of his or her position. That description would be used to further refine the categories in the forced choice part of the question. As this process proceeded, it would become less and less necessary to ask people to write or narrate long answers.

> Example #2: One set of open-ended questions in the study was designed to ascertain the impact of personal computers on activities related to planning and administration. Analysis showed that several themes were common to a wide variety of responses. First, many users talked about uses where the primary advantage was getting information faster. A second theme was the advantage of obtaining more current information than would otherwise be available. Third was the notion of a wider range of data. Finally, there was a newfound ability to interrelate sets of data elements. Although there was a great diversity in what people actually did with their machines, these four themes were able to summarize almost all of the responses.

There are several advantages to abstracting themes as was done above. First, doing so removes the unit of analysis from the unique use of any given end-user. Thus, it becomes possible to aggregate information across contexts, or to compare settings. Second, these themes are close enough to the experience of end-users (and those they deal with) that proper questioning technique still has the potential to elicit

meaningful data. Finally, there may well be opportunities to measure these factors through archival means. As examples, one might find a paper trail relating to the adequacy of budget projections, or to the number of requests for ad hoc data analysis.

Advice about using short questions will become progressively more difficult to follow as impact is traced further and further from the immediate source of use. This is because as impact diffuses, there is less prior knowledge about who will experience that impact, or in what ways. What is certain is that diffusion of impact will bring ever greater difficulties in teasing out the effect of OA from the multitude of events that govern organizational process. Thus, a commitment to a broad understanding of impact must be accompanied by a willingness to engage in open-ended interviewing. To uncover the sought after information, that interviewing must be based on a deep prior knowledge of how OA has been used.

Question format. Should data be collected in questionnaire or interview format, or some combination of both? In the early stages, interviewing is required to make sure questions are appropriate. Once questions are refined however, most of the data can be collected in either an interview or a questionnaire format. The choice must strike a balance among such factors as respondents' reaction to different formats, researcher time, and finances.

Beyond the issue of format for individual questions, the matter of formatting sets of questions in an interview or questionnaire must be considered. In general, the best policy is to begin with factual questions that are easy to answer, and will facilitate respondents' answering more subtle questions. As an example, consider the following

possibilities for ordering of sets of questions about the impact of OA technology on work life.

Order 1	Order 2
a- description of OA technology available to the respondent;	ways the use of OA has changed the tasks done by the respondent
b- amount of time respondent spends using various elements of OA;	amount of time respondent spends using various elements of OA
c- ways the use of OA has changed the tasks done by respondents;	value judgments about the impact of changes due to OA
d- value judgments about the impact of changes due to uses of OA.	description of OA technology available to the respondent

Order 1 follows a logical progression. Each set of questions is more "concrete" than the set that follows it. Also, each set calls for information that is prerequisite for answering the set that follows. By the time respondents get to the "value judgments" section, they will have refreshed their memories as to how they have used OA and how it has changed their work life, and thus be able to think seriously about the difficult questions that make up the last section. Order 2, however, does not follow such a progression, and is thus much less likely to elicit the desired information.

MAGNITUDE OF IMPACT

The previous discussion of multiple measures raised the notion that any given impact of information technology can vary on a continuum from "strong" to "weak". This concept must be applied to all important variables if an evaluation of OA use is to be truly useful. One reason for its inclusion is to convey a sense of where action is needed in order to

improve the value of computer use. Another reason is that it allows judgments about the value of the technology to the Navy.

Consider the use of OA to aid with budgeting for small "shops" within the Navy, which we have found to be a common application. What might be some of the consequences of this budget keeping?

- People may gain a newfound ability to finish their work on time.
- There may be time to accomplish low-priority tasks which were previously uncompleted, or not done well.
- Better accounting may lead to fewer funds being "lost" by the group to the system.
- Knowledge of when funds are available may result in better service by the group to the Navy, as for example, when a detailing group needs to cancel or reschedule fewer orders for lack of funds.

Although some value judgments are involved, most people would agree with two assertions:

- These outcomes are generally listed in ascending order of importance to the Navy.
- Each outcome has some value in its own right.

If there were available data on only one of the outcomes, there would be little sense of what kind of a contribution OA was making, or the extent to which it was fulfilling its potential.

VALUE JUDGMENTS ABOUT CHANGE

Because value judgments about the importance of observed changes are inescapable, data on those judgments should be formally incorporated into any assessment strategy. Consider the "order rescheduling" example in the previous section. If the orders involve assignments of scarce personnel to critical specialties, a small increase in efficiency could have very important benefits. When dealing with billets that have large

numbers of qualified people, and which do not require highly specialized training, small increases in detailing efficiency may be a minor contribution, at best.

A small group of people charged with evaluating OA cannot presume to make these value judgments for all the diverse settings they will be studying. Thus in addition to questions about what actually happened, it is critical to ask respondents about the importance of those events.

MEASURING PRODUCTIVITY

Because productivity is such an important issue in the evaluation of OA, it is worthwhile to clearly define a strategy for determining how productivity should be measured. In addition to the general issues of measurement mentioned above, there are several special issues that must be considered when measuring productivity.

The first step is to catalogue all accepted measures of a work group's productivity. OA may not affect all of those measures, but comparing specific impact with the full range will provide a sense of the extent to which OA affects the group's functioning. Furthermore, data based on accepted indicators are more likely to be understood and used than will be findings based on unfamiliar measures.

The next step is to elicit information about the appropriateness of those measures. Suppose, for example, a group is rated equally for accomplishing high and low priority tasks. This might be defensible for some purposes, but it can lead to a distorted picture of the impact of OA technology.

It is also possible that accepted measures do not capture the essence of a group's contribution to Navy functioning. For example, a

group may be rated on whether it develops plans in time to be incorporated into a general planning process, but is not rated on the plan's contribution to that process. Such a possibility is quite likely because on-time completion is easily observable, while quality is not. Again, this might be acceptable from a bureaucratic point of view, but reliance on the "on-time" measure would indicate that OA is having a less important affect than it actually is. Thus, although accepted measures of productivity can serve as a starting point, they should not be assumed to be the only relevant indicators.

In particular, it is important to be sensitive to the "value added" elements of productivity that can be easily overlooked when using standard organizational measures of productivity. One aspect of "value adding" is the ability to perform new, or different types of tasks which are not easily observed in their own right, but which may improve the quality of a product or a service. A second type of added value is "information creation," a concept which can be viewed as analogous to "job creation" within the economy. Just as economic activity can generate employment opportunities that did not previously exist, use of a computer might generate new information which has value for the organization.

Information must also be collected on the difficulty of effecting observed changes in productivity. For example, an order processing group may - with a little extra effort but without the use of fancy technology - easily increase its productivity by 15 percent. But a group charged with in-depth analyses of complex problems may find it very difficult to increase their output even slightly. For them, and for those who rely on their work, a small change might require an OA system, and might be a very significant contribution to Navy functioning.

The purpose of this section was to articulate a methodology for developing measures related to the implementation and impact of OA systems. The intent was to show <u>how</u> things should be measured. We now turn to a detailed list of <u>what</u> should be measured.

6. DATA TO BE COLLECTED

The presentation in this section will follow the order represented in the model presented in the previous section: implementation, activity within work groups, uses of the technology, immediate impact of work group outputs, changes in the role and adaptability of work groups, and remote impact.

IMPLEMENTATION

The variables proposed to study implementation are drawn from the social science literature on innovation adoption, and modified by our knowledge of salient issues within the Navy:

1. Reason for adoption Innovation implementation tends to succeed when it is need driven rather than technology driven. Thus, OA use will develop more quickly within groups who begin with a clear sense of the need for such technology. Those who obtain OA simply because it is available, will tend not to make good use of their acquisitions.

2. Key players, critical mass Within each setting, how many people are active advocates for the use of OA technology? OA use should increase with the size of this group, because increased size: (1) increases the probability of a person quickly receiving technical and moral support, and (2) makes it easier to induce change in the work style of a group.

3. Support for training and OA use Effective use of a new technology requires that users' have both the opportunity to learn and the ability to make whatever changes in work-style are needed to exploit the technology. This support can be manifested in different ways - support from a superior, assistance from colleagues, or discretion over the use of one's time.

4. Available expertise Effective OA use requires some combination of expertise by end-users, and available help when problems arise. As a result, it is important to assess training opportunities, previous knowledge of OA, and extent of available expert help.

5. Adaptive planning/user participation Do the users have input into how their OA will be configured and used? The greater the user participation, the greater will be the extent of OA use.

6. Incentives for use Perceived advantages must outweigh the difficulties of: (1) learning to use the technology, (2) adapting

work style to exploit the technology, (3) time spent in data entry, and (4) any other difficulties that users may perceive.

Another important aspect of implementation is the extent to which an innovation is routinized within an organization. A routinized innovation stays after its original supporters have left and people's attention has turned to other priorities. Because of the staff turnover problem in the Navy, the goal of insuring routinization is particularly important. In order to understand how different groups handle the routinization problem, several specific issues must be studied. (Unfortunately, no real examples could be found of instruments which used these variables to study information technology).

- formal training for new personnel;
- informal arrangements to acquaint new people with automated procedures;
- efforts to insure that incoming personnel have a familiarity with OA;
- construction of software routines to make OA use easy for the uninitiated;
- organizing work to require OA use;
- setting expectations that OA will be used;
- recognition for people who make good use of OA;
- transfer of OA-related duties to personnel who will be at their jobs for the longest possible period of time; and,
- transfer of OA duties from a person who is leaving to one who is remaining.

WORK GROUPS

In order to plan effective implementation, several types of information about work groups are needed.

Basic Descriptions of Work Groups.

It is useful to have a sense of how the work groups fit into their larger organization, of the internal structure of the groups, and of the work done by each group - whether or not that work relates to information technology. This contextual knowledge will help in understanding how much of a group's work can potentially be affected by the new technology, how that work might contribute to the organization, how large a change in work routine has been brought about, and the possibilities for further change.

OA use. A second type of knowledge concerns how the work group actually uses its OA on a routine basis. One facet of this knowledge is the applications used by members of the group. Another facet is the role played by OA in carrying out assigned tasks.

Satisfaction with OA technology. Over and above knowledge of what the group does, it is extremely useful to know how satisfied end-users are with their OA. Such information is valuable in understanding why the group structured its OA related activities as it did, and what limitations need to be overcome if the technology is to be used for other purposes.

Impact of OA

A full understanding of the impact of OA technology must include data on the technology's impact in six areas:

- amount of products or services produced by user groups,
- quality of those services,
- groups' ability to adapt to new circumstances,
- changes in the group's role in the organization,

- communication patterns, and
- larger (outside the work group) organizational consequences.

Data collection on these topics must be based on principles set forward in the section on Measurement Strategy - multiple measures, multiple perspectives, personal and archival data, remote impact, and assessment of both the amount and value of change. Schematically, such a data collection effort can be depicted as shown in figure 3.

Amount of production. Here we refer to the "things" that a work group actually transmits outside of its boundaries. Examples include advice, reports, orders, budgets, briefings, and plans. The important issue is not how much it produces, but how much it produces relative to the personnel on hand, i.e., the group's productivity.

As an aid to understanding their impact, it is useful to classify these outputs in two ways:

- more outputs of the type always produced, versus new types of outputs; and
- budget or financial related work, versus non-financial aspects of planning and administration.

These distinctions provide a sense of what elements of work are being affected by OA, and of how the nature of that work is changing.

Quality. In addition to the amount of output, OA can also bring about a change in the quality of production. Consider the following examples: more precise schedules; more accurate forecasts; personnel assignments better matched to the needs of a job; quicker action on requests for information; and better data for analyses.

Adaptability. Because of its members' facility with information technology, a work group may increase its capacity to adjust activities

		User group	Direct users of product or service	Archival data (when possible)	Remote impact (when possible)
Amount of production					
description:	data source #1				
	data source n				
value assessment:	data source #1				
	data source n				
Quality of production					
description:	data source #1				
	data source #n				
value assessment:	data source #1				
	data source n				
Work group adaptability					
description:	data source #1				
	data source #n				
value assessment:	data source #1				
	data source n				
Changes in group's role					
description:	data source #1				
	data source #n				
value assessment:	data source #1				
	data source n				
Communication					
description:	data source #1				
	data source #n				
value assessment:	data source #1				
	data source n				
Organization-wide consequences					
description:	data source #1				
	data source #n				
value assessment:	data source #1				
	data source n				

Figure 3 - structure for collection of impact data

to new demands or circumstances. Since adaptability is a critical factor in organizational success, it is important to understand how OA contribute to adaptability, and thus, how that contribution can be maximized. Examples of increased adaptability include speed of responses to ad-hoc

requests for information; the format of responses (use of graphics, electronic communication, etc.); the shape of the "learning curve" for new tasks, the capacity to obtain and analyze new types of information, and the capacity to produce different products or services.

Changes in work group's activities. As recognition spreads about what a work group can do because of its use of OA, the group may begin to experience new demands made upon it. Examples of such demands might include requests for different information or analysis, or giving the group oversight of new activities. In some cases these new demands might involve a formal change in the group's mission. More likely, formal roles will remain intact, but new demands will be made as people recognize those groups' new capacity, and follow a natural inclination to use all available resources to get a job done.

Knowledge of evolving roles for work groups is important for both short and long term decisions. In the short term, managers need to know what resources are available for accomplishing tasks. In the longer run, a sense of the direction of evolution in an organization is important when, as inevitably happens, choices have to be made about formal changes in structure and assignments.

Communication. A large part of how a work group interacts with its environment can be understood in terms of communication patterns between the group and the rest of the organization. Three elements of communication are important - the parties involved, the form of communication, and its content. Through these one can discern a work group's importance in the scheme of things, the way it contributes to organizational functioning, and the impact of its contributions. Because this topic is so

important, it should be treated separately, and not lost as an afterthought in the general category of "work group functioning."

Organization-wide change. Although the most immediate and dramatic impacts of information technology are closely tied to work groups, one should not lose sight of other important organizational changes. For example, better budget keeping throughout many parts of an organization can have fiscal implications far beyond any small group's ability to keep better track of its money. A complete study of the impact of information technology must include a determined effort to assess these larger scale changes.

Negative Consequences

Although we have found the impact of OA to be generally beneficial, the possibility of negative consequences cannot be ignored. Any outcome - quantity, quality, adaptability or group role - can be adversely affected. Thus in the course of data collection, it is important to ask questions and search for information in ways that will detect both positive and negative consequences.

7. THE DATA COLLECTION PROCESS

TIMING OF DATA COLLECTION

Two facts must be borne in mind when setting up a schedule of data collection. First, comparisons of impact before and after implementation are important. Such comparisons make it possible to assess the affects of particular implementation efforts, and to estimate the amount of change wrought by OA. Second, some data in the evaluation will be much more time-sensitive than others. While some data can be collected at any convenient time (archival information, for instance), others must be obtained within a narrow window of opportunity.

One type of timing problem is waiting too long; and delay in data collection is a major timing problem, as accurate recollections of specific pre-implementation circumstances are lost. For example, consider how one can judge the quality of recommendations made, based on an analysis of the type, amount and currency of information that went into those recommendations. In some cases, those recommendations will be contained in short memos or briefing documents which do not reflect the depth of analysis that went into their making the recommendation. If people are not interviewed prior to implementation (or very shortly thereafter), it may be impossible to make any kind of before-and-after comparison.

A second timing error is collecting data too soon. Any innovation is accompanied by an adjustment period during which productivity may well decrease. If people must be interviewed, it may be necessary to time data collection for as far past the actual implementation as possible, while still reaching people before they rotate out of their

positions, or before their accurate recollection of the pre-implementation setting fades.

SAMPLING STRATEGY

In the early stages of implementation it's important to collect data from as many end-users as possible, and from as many people as possible who are affected by end-users. Important sources of data include members of end-users' work groups, their commanding officers, and recipients of the products of information technology. Extensive data collection will be required on this small sample because of the important contribution they will make to the instrument development process.

As usage spreads, however, the number of potential respondents will quickly exceed anyone's capacity to collect data. At that point it will be critical to develop a sampling scheme. Although the precise nature of that scheme cannot be specified in advance, it is possible to articulate basic principles to guide the process.

Any groups of particular interest to those charged with OA implementation should be sampled. These may include groups where data is needed to help solve an implementation problem, or groups which are succeeding, and thus deserve special mention.

The remainder of the sample must be representative of the range of people affected by OA use. This includes end-users, other members of their groups, and users of OA based information.

Because some data must be collected early in the implementation process, groups and individuals targeted for inclusion in the study should be identified as early as possible.

There are some groups who should be included in the study because of their special relationship to the OA use process. For example, "support for use" and "available expertise" are important in the implementation process. Thus, people involved in end-user support and training may have valuable insights that should be included in the analysis.

OA users are likely to have a variety of customers for their products or services. In order to assess the full range of OA's impact, this variety should be reflected in any sample of those customers from whom data is collected. A corollary of this principle is that a prior analysis must be done in order to determine who those customers are.

The final guideline about sampling deals with what data should be collected from those who are selected. It should be obvious by now that a very great deal of information will need to be collected, and that there is a great risk of placing too heavy a burden on any given respondent. One solution is not to ask all questions of all respondents.

As an example, one might want to address many questions to the recipients of reports that are generated with the aid of OA. Included in the list would be questions about: timeliness, readability, format, length, number, revisions, relevance, information drawn upon, and quality of analysis. Although each of these items is important, it may not be important to ask each recipient of each report to address every issue. A few questions may be so important that they should always be included. Others, however, might be addressed to only a subset of recipients, or the entire question set may be subdivided. Many variations on this theme are possible, all of which require a trade-off between the completeness of the data set and the burden placed on respondents.

8. EXTENDING THE INNOVATION TO NETWORKING

Networking and stand-alone workstations must be considered as separate innovations. Although the basic approach to their evaluation is the same, there are important differences in emphasis. For example, understanding computer-computer interaction may require an analysis of a setting's mainframe environment, or of group processes related to agreements over file structures and data elements among linked workstations. Issues such as these are not critical for understanding the use of stand-alone workstations. These differences of emphasis apply to studies of both the implementation and impact of OA technology.

IMPLEMENTATION

In terms of implementation, networking will require a much greater attention to the role of key players, and to the use of an adaptive planning strategy. The reason for this is that networking has the effect of bringing about tighter linkages among parts of an organization, thus increasing the mutual influence of innovation on organizational process, and vice versa. As examples of this process, consider the following questions, each of which indicates how networking might act to tighten organizational linkages.

- What might happen to relationships among groups who previously had unique functions, but which relied on each other for information?
- Would the extent of cooperation and mutual dependance change among groups with mutual interests, but who did not previously interact?
- Could networking bring about an integration of functioning across previously autonomous groups?
- What are the implications for the overseers of mainframe systems when many users have the capacity to access data? Are

there legitimate concerns about input/output capacity, file integrity, and security?

- How much power will groups have to give up when they begin to share their information with others?

- Once a group has gone to the trouble of setting up its own "private" databases, will it readily agree to participate in a new shared file system that will require changes in their already proven file structure?

As organizational linkages tighten, those in charge of implementation must work carefully to bring about effective coalitions among groups with diverse interests. Doing so will require a careful planning process that recognizes the legitimacy of divergent needs, and which can facilitate compromises among them. The success or failure of that planning effort will have a profound affect on the ultimate shape of the innovation.

While the importance of key players and adaptive planning will increase as implementation moves from stand-alone machines to networked systems, there may be a corresponding decrease in the importance of other implementation variables - support for training, available expertise, and similar factors which relate to the ability of an individual end-user to operate the technology. The reason for a decreased emphasis on these factors is that by the time networking goes into effect, the general level of computer literacy among users may have risen quite high because of their previous experience with the stand-alone systems.

IMPACT

The shift from stand-alone to networked systems also has implications for evaluating outcome. Although the variables of interest remain the same (output, quality, adaptability and evolving roles), there

are shifts in the likelihood that changes will occur, and in the direction, and size of those changes.

There is an increased risk that networked systems will have no impact, because changes can only occur if a system is implemented, and as we have seen, organizational difficulties increase the chance that effective implementation will not happen.

Linking workstations increases the dependence of different parts of the organization on each other. As a result networked systems are more likely than stand-alone systems to produce undesirable effects. This is so for three reasons. First, technical malfunctions will affect all groups linked to the system. Second, the more sharing of information that is done, the greater the negative consequences of sharing incorrect information, or of disseminating error-prone programs. Third, sharing increases the dependence of work-groups on each other, thus increasing the difficulties if one of the work groups does not do its job well.

Finally, networked systems have the potential to result in larger changes than may be observed with free standing workstations. This is because networking may free many work groups from the tedious job of data entry, thus providing opportunity to accomplish other work. More important, networking provides a vast increase in available information and much faster communication.

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APPENDIX A - EXAMPLES OF MEASUREMENT

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PURPOSE AND STRUCTURE

This Appendix provides specific examples of questions that can be used to assess the implementation and impact of office automation (OA). As much as possible, multiple examples are presented from a variety of studies that have actually been carried out. This range of questions is intended to help the reader in three ways.

1. The large number of examples may include a question that can be used as is, thus saving effort in the item construction process.

2. Showing how similar information can be sought in different ways will help the reader adapt questions to special circumstances, or to write new questions as the need arises. The ability to construct questions is important because studies of OA often have unique needs for information which cannot be addressed by an existing stock of questions.

3. In some cases we present a series of questions on the same topic from the same study. Inspection of these series will convey a sense of how multiple questions can be used to get at different aspects of an issue.

Much of the wording in these questions is not appropriate for a military context, as these studies were conducted in a variety of settings. The original wording is presented here in order to remain as faithful as possible to how the authors' actually constructed their questions, and to convey a sense of how these researchers went about their work.

The examples are arranged in sections which correspond to the variables mentioned in the text of the report. This arrangement facilitates finding questions on any given topic. What is lost, however, is an overall sense of how a questionnaire should be put together.

INSTRUMENT CONSTRUCTION - BRIEF REVIEW OF PRINCIPLES

Writing questionnaires and interviews is an art in which the author must guess what order of questions will best fulfill several criteria. First, respondents' interest must be attracted and held throughout the series of questions. It would probably not do, for example, to begin with a boring set of detailed questions about the minutia of a respondent's education.

Second, the order of questions must be chosen to help respondents' locate the information they are seeking. As an example, consider an opening question such as: How has the computer affected the productivity of your work group? This can be an almost impossible question in the absence of previous questions which helped he respondent recall information needed to make an informed judgement about productivity. Better to begin with questions about how the computer is actually used, and under what circumstances. The answers to those questions are close to the respondent's immediate knowledge, and the act of answering forces a review of information that will allow a thoughtful response about the more difficult issue of assessing productivity.

Third, the appearance of sensitive questions may make respondents' unwilling to continue. Clearly it is best to leave such questions toward the end.

The above three considerations lead to a general prescription for questionnaire construction. Begin with questions whose answers are both interesting and easily available to the respondent. Use questions early on to help people remember information they will need to address difficult questions. End with questions that are likely to be sensitive or boring.

It is impossible to always follow the above advice, as much of it is contradictory. As examples, questions that are easy to answer might be boring, or sensitive questions might have to appear early to help respondents make difficult judgements. There is no formula. There is only general advice which must be tempered by a knowledge of a particular situation, <u>and by as much pretesting as possible</u>.

Finally, no matter how appropriate an ordering of questions, no interview or questionnaire will work if questions are not clear. The intent of the question, as well as its vocabulary, must be understood. Here too, pre-testing is of immense help.

A critical decision is the choice between using an interview and a questionnaire format. Interviews give the researcher two valuable opportunities. First, unanticipated - but interesting - issues can be pursued in depth. Second, the researcher can rephrase questions or change their order, and thus avoid many problems of sensitivity and miscommunication without recourse to elaborate pretesting. (No interview will go well, however, unless the interviewer has a clear sense of what questions will be asked, why those questions are

important, and how respondents may react to particular questions.) Related to the smaller pretesting requirement is the advantage that instruments can be developed relatively quickly.

Unfortunately a high price is paid for the flexibility of open ended questioning. Part of the price is that by requiring the presence of a researcher, open ended questions severely limit the amount of data that can be collected. Another problem is that the length and unstructured format of open ended data make analysis very difficult. The time saved in instrument construction can easily be gained back in the analysis process.

The above discussion contains an implicit assumption that is usually correct. Open-ended questions tend to be administered personally, while short answer and forced choice questions tend to be part of written questionnaires. This need not, however, always be the case. As an example, consider a situation where the rank of the respondent essentially requires that questions be administered personally. The actual instrument may still contain many forced choice and short answer questions, even though the respondent answers these questions within the context of an interactive personal interview.

OVERVIEW OF QUESTION SOURCES

There are relatively few empirical studies of OA, and only a small subset of those publicize their data collection instruments. Thus the pool of sample questions for this appendix was small. The questions presented here derive from literature reviews we have done over the years, or from studies we have been involved with personally. Below are short summaries of those studies. These summaries are intended to provide a sense of both the context in which the questions were asked, and the range of organizations where this type of research has been carried out.

Computer Mediated Work - Individual and Organizational Impact in One Corporate Headquarters: Tora K. Bikson, Cathleen Stasz, and Donald Mankin, Santa Monica Cal., The Rand Corporation, 1985, (Prepared for the Office of Technology Assessment, U.S. Congress, document #R-3308-OTA).

"This report describes how computer-based information technology was introduced into one white-collar work setting, and explores the consequences to employees and the organization. The research extends prior work on information systems in varied user contexts and illustrates factors that underlie successful technological innovation in organizations." (From the Preface, page iii).

This research used work-groups as the unit of analysis, and semi-structured interviews as the means of data collection. The number of respondents, and their place within the organization, are listed below.

"Organization
- Executive management (2)
- Personnel department (1)
- Technical department (2)
- Key actors, that is, other people who played key roles at the organization level in the implementation process (2)

Work Group
- Department Heads (4)
- Linking actors, that is, individuals outside the focal work groups identified as links in the intra-organizational diffusion process (8)

Individual: employees of focal departments (20)" (p7).

An important element in this study was its attempt to collect data on the same issues from the point of view of different people in the organization. This is clearly shown in the way the same questions are asked in slightly different ways to a variety of respondents. Whenever the form of the question changes in important ways depending on the respondent, these alternative versions are presented.

Personal and Organizational Consequences of Microcomputer use in the Naval Military Personnel Command Jonathan A. Morell, Oak Ridge National Laboratory, Oak Ridge TN. 1987 (ORNL-6370).

This study was an effort to assess the impact of personal computer use (PC) within the N4 (detailing) branch of the Naval Military Personnel Command (NMPC). The primary goal was to obtain a sense of how PCs were being used within NMPC; and the impact of that use both on people's work lives and on the organization as a whole. A second objective was to obtain the knowledge required to facilitate wider scale implementation of PCs, and to assess the impact of that implementation.

The study employed semi-structured interviews to collect in-depth information. About six months after the initial interview, efforts were made to re-interview the respondents in order to see what changes had taken place in PC use.

Wang Word Processing Systems: A Descriptive Study of Users and Quality of Training Programs Norma Rotman, unpublished Masters thesis, Hahnemann University, Program in Evaluation and Applied Social Research, Philadelphia PA, 1985.

"In order to expand the existing limited knowledge about individuals utilizing word processing in their offices, a study was conducted on users of WANG systems in New Jersey, Delaware, and Pennsylvania. Over 600 self-administered questionnaires were completed in this non-randomized, one-group post-test research design.

Training issues, white collar productivity, human factors, ergonomics, and user and company profiles were analyzed with SAS using cross tabulations, frequencies, and chi squares."

Office Automation Research Project: Manager Questionnaire Preliminary results from this study can be found in: Mitchell Fleischer and Jonathan A. Morell (1): Managers as Information Technology End Users proceedings of the 1986 International Congress of Technology and Technology Exchange, Pittsburgh PA, Oct 6 - 8, 1986. Further details of the study are available from the authors.

This study was intended to shed light on two issues, first, how microcomputer use affects managerial work, and second, factors which influence the extent of managers' use of OA. Data from a closed-ended questionnaire was collected from 168 managers in fifteen large corporations. Major sections in the questionnaire were: (1) use of office automation applications, (2) process of equipment acquisition, (3) OA's fit with respondent's work life, (4) changes in activities due to OA, (5) technical support for use of OA, (6) quality, availability and use of training, and (7) characteristics of the respondent and his or her company.

Assessment of an Effort to Integrate Computer Functions in an Engineering Design Firm Jonathan A. Morell and James Leemon Data Base. vol. 18, #2, 1987, pp. 17-21.

This study is an assessment of a large engineering design firm's efforts to integrate diverse elements of computer use. Three basic issues were studied: differential impacts on professional and clerical workers, impact of the system on document production, and effects the system had on the nature of work in the organization. Open-ended interviews were used to generate a closed-ended questionnaire. Data were collected from 28 technical personnel and 25 clerical workers.

General Survey of Office Automation Use Results reported in: Managers as Information Technology End Users, Mitchell Fleischer and Jonathan A. Morell (2) proceedings of the 1986 International Congress on Technology and Technology Exchange, Pittsburgh PA, Oct 6 - 8, 1986.

This was a survey of 88 working managers who were either enrolled in executive MBA programs, were part-time MBA students, or who were part-time students in a graduate program of Public Administration. Most questions required a short written response to a specific open-ended question. Respondents were asked about their personal use of OA, OA use by their immediate superior, and such use by a person supervised by the respondent.

EXAMPLES OF MEASUREMENT

As much as possible, examples in this section are taken as-is from their sources. An attempt has been made to preserve the original layout, in order to provide a sense of how questions like these should be presented. Some liberties have been taken, however in order to make the layout conform to the format of this report. When a series of questions are presented from the same study on the same topic, an attempt was made to preserve the order in the original source. This was not always possible, however, because of the attempt to present questions within the categories of variables used in the body of this report. (Those categories do not always perfectly coincide with how other researchers structured their efforts).

In some cases a question might legitimately appear as representing two variables. Good examples appear in the categories of "training" and "available expertise", where there is a fine line between the functions of training and consultation. Other difficulties of categorization appear when items within the same forced choice question seem better placed in multiple categories. An example appears in a question on the impact of micro-computers, where respondents are asked to rank both the impact of micro-computers on "coordination among groups" and "dollar savings." The first touches on work life, while the second is a value judgement about outputs. In order to convey a sense of the original question, the items are not split into separate categories. When either of the above two ambiguities appear, questions are placed in the category that represents their major emphasis, even if it is not its sole emphasis.

REASON FOR ADOPTION

Source: Bikson et al., Protocol for Technical Expert

1. What were the organization's main objectives in converting to online computer use? (If productivity, efficiency or effectiveness is mentioned, probe for how it is defined or measured.)

2. How do the missions of the focal departments fit into this overall picture?

Source: Bikson et al., Protocol for Managers

3. What were you trying to accomplish in converting to online computer use? (If productivity, efficiency or effectiveness is mentioned, probe for how it is defined or measured.)

4. How does that relate to what's going on in the organization?

Source: Bikson et al., Protocol for Users

5. What was the department trying to accomplish in converting to online computer use?

Source: Morell

6. How did you obtain the first PC used in your work group? Please circle the most appropriate choice from the list below.

   1. standard purchase requisition
   2. on loan to perform a special project
   3. discovery of equipment not being utilized by others
   4. P C was available when I began my present job
   5. allocated without specific request from my office
   6. other (please explain)
   7. don't know

Note 1. The items in this question were developed from a previous set of open-ended interviews with a subset of the respondents. Thus, the response categories reflect the various ways in which PCs were actually obtained in this setting.

Note 2. This question does not reveal the specific purpose for acquisition, but it does provide information on whether special efforts were made to obtain the equipment. As an example, consider the difference in motivation for choices number 4 and 5, versus choices 1 or 3. The first set implies a passive receipt of the PCs, while the second set implies special efforts to obtain microcomputer technology.

KEY ACTORS, CRITICAL MASS

Successful implementation depends on an innovation's having supporters in key parts of the organization. On a micro-level, this means support from the leaders of work-groups and of the other small organizational subunits with immediate influence over the work tasks of end-users.

On a wider organizational scale, it means having active support from quarters within the organization who have a vested interest in the innovation. Examples of such groups include: planning bodies, groups with control over how money will be spent, procurement bureaucracies, information system groups, and higher command levels.

On each level, the greater the number of constituencies sampled, the greater the ability to understand implementation dynamics. A surface analysis would ask respondents to rate the extent of support from their immediate superior and from their organization. A more in-depth analysis would probe for the respondents' vested interests in seeing the innovation succeed (or fail), and what was done to further that interest. Existing sample questions are all on the work-group level.

Source: Fleischer and Morell (1)

1. To what extent does your immediate supervisor encourage your use of OA?

   1.____ totally
   2.____ very much
   3.____ some
   4.____ a little
   5.____ not at all

2. To what extent do your peers at work encourage your use of OA? (Same response categories as above.)

3. To what extent do your subordinates encourage your use of OA? (Same response categories as above.)

SUPPORT FOR TRAINING

Source: Bikson et al., Protocol for Users

1. Now I would like some information about training from your viewpoint.

   a- Was learning to use the computer system voluntary for you and others in this department? (Probe: Does it differ for different users?)

   b- What's the main goal of the training program, as you see it? (Probe for concrete operations vs. model-based understanding.)

2. After initial training, about how long did it take before you were up to speed on the computer and using it regularly for your work?

3. Can you describe any formal follow-up support for using the system (e.g. useful documentation, reference manuals, online help, whether error messages help the user correct his/her mistakes)?

4. What about informal support?

5. Long term learning:

   a- What are your opportunities for advanced learning and development? (Note whether employee has had any learning beyond initial training and whether he/she has pursued or will pursue it outside of the firm.)

   b- Have you needed any additional training for new equipment or new software acquired by the department? (If so, how was it handled?)

6. Overall, how satisfactory is the support for learning in this department?

Source: Bikson et al., Protocol for Managers

7. Tell me about the training conducted for the computer system. How long is initial user training in your department? How much was the department involved in designing the training?

8. After initial training, about how long does it take for an employee to use the computer as a regular work tool, or get up to speed on the system?

9. Is formal follow-up support provided? (Describe) Note instances of useful documentation, reference manuals, on-line help, and whether error messages are clear enough to correct the user.

10. Describe any informal support

11. Are there opportunities for advanced learning? (Describe) Note whether employees pursue training on their own, outside the firm.

12. When new equipment or software is acquired how is retraining handled? (How often do they expect to retrain?)

13. About what proportion of the operating budget does the department spend on training/staff development? Does the budget provide for follow-up or retraining?

14. Overall, how satisfied are you with learning support?

Source: Bikson et al., Protocol for Technical Expert

15. General description of training, from a Technical Resources viewpoint.

16. After initial training, is formal follow-up support provided? (Describe) (Note instances of useful documentation, reference manuals, online help, hotline, and whether error messages are clear enough to correct the user.)

17. How does the organization view long-term learning?

    a- Are advanced learning opportunities currently available? (Note whether employees pursue training on their own, outside the firm.)

    b- When new equipment or software is acquired, how is retraining handled? How often do you expect to have to retrain?

18. In relation to the total cost of converting to interactive systems use, what sorts of proportions do the following represent (approximately):

    hardware
    software
    modifications
    implementation
    documentation and training support.

Source: Morell

19. Please briefly describe what knowledge you had (if any) about computers prior to coming to your present job.

20. What methods have you and your staff made use of to learn about personal computers. Please use the following scale to rate each method listed below.

    1- A very important contributor to our knowledge of PCs
    2- An important contributor to our knowledge of PCs.
    3- Has made some contributions to our knowledge about PCs
    4- A minor contributor to our knowledge about PCs
    5- Has had almost no impact on our knowledge of PCs.

	Very important	Important	Some contribution	Minor contribution	Almost no impact
20.1 Formal training (courses, workshops, etc.)					
20.2 Interaction with informed friends or colleagues					
20.3 Self directed learning (personal reading, practice with PC, etc.					

21. Now that you told us about the training you have used, please give us some information on which sources of information you expect will be important over the next few months. Again, use the scale we outlined above.

Same items and response categories as above.

22. Most people would like more formal training for themselves and their staff than they actually use. Using the scale below, please let us know the major barriers to using formal training, as you see them.

1-Training is not available on the specific topics we need.
2-Training is available, but requires people being away from their work for too long a period of time.
3-Scheduling is a problem, training is not available when we need it.

1- The most important impediment to training.
2- A major impediment to training
3- A problem, but not a serious one
4- A very minor problem
5- Not a problem at all.
6- Don't know, or no opinion.

	Most important (1)	Major impediment (2)	Problem, not serious (3)	Very minor problem (4)	Not a problem (5)	No opinion (6)
22.1 No training on specific topics we need						
22.2 Training unavailable when needed (scheduling problem)						
22.3 Training requires too much absence from work						
22.4 Not enough advance notice of courses						

Source: Rotman

23. How were you trained for WANG word processing? (check as many as apply)

specify course(s)or topic(s)

Courses at WANG laboratories
Programmed instruction books
WANG instructor at your company
Company's in-house trainer
Self-instruction, experimentation
From other users or key operators
From tapes or audio-visual methods
At a business school
Other (please specify)

24. For the system you use most often, did you receive formal training (with an instructor) before the system was installed?
_____YES _____NO

If yes, please specify

25. For the system you use most often, did you receive formal training (with an instructor) after the system was installed?
_____YES _____NO

If yes, please specify

26. Was the system already in use when you received your training? If YES, how long had it been operational?
____years, _____ months.

27. I am interested in finding out what formal training (with an instructor) you have received on the system you are currently using. Please indicate which of the following courses you have had and what kind of WANG system you operate.

Course	System	OIS	VS	ALLIANCE	OTHER ( )
Intro to word processing		____	____	_____	_____
Advanced functions		____	____	_____	_____
Advanced word processing		____	____	_____	_____
Decision processing		____	____	_____	_____
Other _____		____	____	_____	_____
_____		____	____	_____	_____
_____		____	____	_____	_____

28. To the best of your recollection, please rate the quality of Training on any of the courses you indicated you had taken.

	Poor	Fair	Good	Excellent
Intro to word processing	____	____	_____	_____
Advanced functions	____	____	_____	_____
Advanced word processing	____	____	_____	_____
Decision processing	____	____	_____	_____
Other _____	____	____	_____	_____
_____	____	____	_____	_____
_____	____	____	_____	_____

Source: Fleischer and Morell (1)

If you have received any formal training in the use of your OA please answer the following questions. "Formal" training is any training that involved a trainer who does training as part of his/her job. If you have not received and formal training, please skip this section.

29. How many training courses have you attended related to your present OA equipment? _____.

Please answer the following questions with regard to the most recent course you attended.

30. Who paid for the training?

1.____ the company/agency you work for
2.____ you did personally
3.____ vendor
4.____ don't know
5.____ other (describe) _____

31. Where was the instructor from?

1.____ supplied by vendor
2.____ outside consultant
3.____ staff from your company/agency
4.____ don't know

32. How knowledgeable was the instructor?

1.____ extremely knowledgeable
2.____ very knowledgeable
3.____ somewhat knowledgeable
4.____ a little knowledgeable
5.____ not at all knowledgeable

33. How long did the training last? _____ hours of training

34. Please rate the amount of "hands on" (direct experience using the equipment or application) time you had during the training (as opposed to lecture and discussion time).

1.____ much too much hands on time
2.____ a bit too much hands on time
3.____ just the right amount of hands on time
4.____ a bit too little hands on time
5.____ much too little hands-on time

35. How satisfied were you with the training you received?

1.____ completely satisfied
2.____ very satisfied
3.____ somewhat
4.____ a little satisfied
5.____ not at all satisfied

36. Have you used the information you gained in this course to train others in your unit?

1.____ No
2.____ Yes (how many others?)_____

37. Please briefly describe any problems you experienced with the training you received.

EXPERTISE (OF OTHERS) AVAILABLE TO END-USERS

Source: Bikson et al., Protocol for Managers

1. In most workplaces, a technology "expert" usually emerges. This is the person whom most people go to when they have a question or problem. Do you have an "expert"? What would you do (did you do) if he or she left?

Source: Morell

2. Do you have access to a "local expert" on personal computers?

   Definition of a "local expert": A person who works directly for you who applies specialized knowledge of personal computers to needs that are defined by you.

   if YES go to q# 9
   if NO go to q# ____.

3. Please use the following chart to tell us what that "local expert" does. (If you have more than one person who fills this role, please fill in the chart with 1's, 2's and so on to refer to these different individuals.)

	Major use of expert's time	Secondary use of expert's time	All lesser amounts of time
4.1 Writing programs/ developing special applications			
4.2 Training and giving advice			
4.3 Analyzing information			
4.4 Other (please specify)			

5. Does your "local expert" do other tasks besides the computer related work referred to above?

   if YES go to q# 6
   if NO go to q# ____

6. Please briefly describe the other work this person does.

7. Please check the category below that best describes how you obtained the services of your local expert.

Student intern..... (1)____
Regular Navy personnel allocation system.....(2)_____
Civilian Navy employee.....(3)_____
Loan from another group.....(4)_____
Paid consultant.....(5)_____
Other (please explain).....(6)_____

8. Are there any people who fulfill the "local expert" role for you, but who do not work directly for you? (As an example, someone in a computer support center or in some other group may be helping to develop a custom program for your use.)

if YES go to q# 18
if NO go to q#_____

9. Same wording and response categories as Q #10

10. Please briefly describe how you obtained the services of this expert.

Source: Rotman

11. I am interested in the ways you resolve problems with your system when they occur. Please indicate how often you use each of the following when you need help.

	Never	Rarely	Sometimes	Often
Read manuals	_____	_____	_____	_____
Call WANG hotline	_____	_____	_____	_____
Ask another user for help	_____	_____	_____	_____
Call WANG support analyst	_____	_____	_____	_____
Ask key operator/supervisor	_____	_____	_____	_____
Experiment - try things out	_____	_____	_____	_____
Other_____	_____	_____	_____	_____

12. How well do you feel each of the following problem solving techniques works?

1 - Always provides an acceptable solution.
2 - Usually provides an acceptable solution.
3 - Occasionally provides an acceptable solution.
4 - Rarely provides an acceptable solution.
5 - Never provides an acceptable solution.
6 - This source of assistance is not available to me.

	Always acceptable	Usually acceptable	Occasionally acceptable	Rarely acceptable	Never acceptable	Not available to to me
Read manuals						
Call WANG hotline						
Ask another user for help						
Call WANG support analyst						
Ask key operator/ supervisor						
Experiment - try things out						

Other _____

13. If you normally get help from another user, is he/she in your department? _____YES _____NO

14. Approximately how many WANG users are there in your company?

    a.____ fewer than 10
    b.____ 10 - 25
    c.____ 26 - 50
    d.____ 50 - 100
    e.____ over 100

15. How many WANG users are there in your department? (Answer only if applicable.)

    a.____ fewer than 10
    b.____ 10 - 25
    c.____ 26 - 50
    d.____ 50 - 100
    e.____ over 100

Note: Questions 5 and 6 are useful in estimating both the possible "richness" of informal support networks, and the amount of expertise an organization may need to support its employees.

16. Is there a person assigned to formally coordinate the WANG equipment in your company? _____YES _____NO

Source: Fleischer and Morell (1)

17. How many others in your work group use the same OA (same or very similar equipment) that you use? _____

18. How many others in your work group use OA for the same applications as you? _____

19. An Information Center is a special unit designed to assist users of OA and other information technologies in the use of that equipment. To your knowledge, is there an Information Center or something similar in your company/agency? ___YES ___NO

If NO, skip to question 20.
If yes, please answer the following.

A. About how many times have you used this center's services in the past year? _____

B. What Center resources have you used? (Check all that apply.)

19.01 _____ equipment or software manuals
19.02 _____ equipment to borrow
19.03 _____ software to borrow
19.04 _____ consultation help with purchasing decisions
19.05 _____ consultation help with use of OA
19.06 _____ programming for special projects
19.07 _____ programming for everyday projects
19.08 _____ training
19.09 _____ advice on OA purchases
19.10 _____ other (describe) _____

20. There are many potential sources of help and support for OA use. Please circle the number which indicates how important the following sources of help and support are to you.

	Extremely important (1)	Very important (2)	Somewhat portant (3)	A little important (4)	Not important (5)	Not available (6)
20.1 Formal expert in your work group (helping is part of person's job	1	2	3	4	5	6
20.2 Informal expert in your work group (helping not part of person's job	1	2	3	4	5	6
20.3 Informal expert outside of your work group (but in your company)	1	2	3	4	5	6
20.4 Formal users group	1	2	3	4	5	6
20.5 Informal users group	1	2	3	4	5	6
20.6 Information center	1	2	3	4	5	6
20.7 Outside consultant (paid to help)	1	2	3	4	5	6
20.8 Friend outside your company/agency (not paid)	1	2	3	4	5	6

END USERS' EXPERTISE

Source: Morell

1. Please briefly describe what knowledge you had (if any) about computers prior to coming to your present job?

Source: Rotman

2. Before accepting this job, did you use any of the following?

rarely - a few times a year
sometimes - a few times a month
often - every week

	Never	Rarely	Sometimes	Often
2.1- Electric typewriter	_____	_____	_____	_____
2.2- Electronic typewriter	_____	_____	_____	_____
2.3- Mag card machine	_____	_____	_____	_____
2.4- Microcomputer	_____	_____	_____	_____
2.5- CRT	_____	_____	_____	_____
2.6- Video game machine	_____	_____	_____	_____
2.7- Other word processor	_____	_____	_____	_____

3. Do you own any of the following?

	YES	NO
3.1- Electric typewriter	_____	_____
3.2- Electronic typewriter	_____	_____
3.3- Mag card machine	_____	_____
3.4- Microcomputer	_____	_____
3.5- CRT	_____	_____
3.6- Video game machine	_____	_____
3.7- Other word processor	_____	_____

Source: Fleischer and Morell (1)

4. Prior to graduation, did you ever take a high school or college computer course?

1.____ NO
2.____ YES

5. Do you have a computer at home?

1.____ NO
2.____ YES

5.1- If YES - do you personally use it?

1.____ NO
2.____ YES

ADAPTIVE PLANNING/USER PARTICIPATION

Source: Bikson et al., Protocol for Managers

1. When did this department first change to online? Tell me something about the process. When did planning for this change begin, and what was the general timing and pacing of the effort? How were the events sequenced? What was the general approach? The focus?

2. Tell me how you went about implementing the technology. How detailed was the planning? Was the process flexible or experimental? Was there more concern with technical issues or with human issues?

3. We're interested in who had decision making responsibilities in a number of domains. Consider the following group of people - executive management, technical resource persons, human resource persons, department managers, and users - who made decisions about:

   hardware
   software
   implementation process
   work environment issues
   employee impacts

(Note whether these actors were coordinated in the decision process; and if so, how? Probe for balancing of varied inputs, and especially for participatory processes.)

Source: Fleischer and Morell (1)

4. How much influence do you have concerning the purchase of OA equipment in your work group?

   1.____ almost complete control
   2.____ quite a bit of influence
   3.____ some influence
   4.____ a little influence
   5.____ almost no influence

5. How much influence do you have concerning the purchase of software or applications for OA in your work group?

   Same scale as above.

6. How much influence do you have concerning the use of OA in your work group?

   Same scale as above.

INCENTIVES FOR USE

One aspect of incentives for use - those which exist at the beginning of an implementation effort - can be discerned by using the same information collected under "reason for adoption." As implementation proceeds, the focus shifts to whether the advantages of using the new technology outweigh the problems that inevitably accompany any such implementation effort. Most studies address this issue indirectly, by collecting information on the positive and negative impacts of implementation.

A second aspect of "incentives for use" is the special case where micro-computers are used to make up for deficiencies in the respondents' overall information system environment. Because information on this type of use cannot be obtained without specifically asking for it, examples of appropriate questions are given below.

Source: Morell

1. We are interested in what information systems you use other than ones which reside on your personal computer. With regard to these systems, please fill out the chart below.

	Name of system	Major uses of system	Major disadvantages of system (if any)
system #1			
system #2			
.			
.			
.			
system n			

2. If you use personal computers to augment information from any of the above systems, or to make up for any of their deficiencies, please tell us how.

system #1

system #2

.

.

.

system n

DESCRIPTIONS OF WORK GROUPS AND THEIR ORGANIZATION

Source: Morell

1. Please describe your job.

2. How many people work for you, and what do they do?

Source: Fleischer and Morell (1)

3. Please check the description that best characterizes your company/agency.

1.____ government
2.____ education
3.____ health related products or services
4.____ financial services
5.____ consumer products or services
6.____ products or services to business or government
7.____ other _____

Note: Lists such as appear above can be modified to obtain data on sub-parts of a larger organization.

4. How many employees (of all types) does your work group have? _____

5. How many managers are part of your work group?

Source: Fleischer and Morell (1)

6. Which of the following best characterizes your present job?

1.____ first line supervisor
2.____ middle management
3.____ senior staff
4.____ senior management
5.____ executive
6.____ other (describe)

Source: Fleischer and Morell (2)

7. Job titles: (Use approximate or descriptive titles if you are not sure of precise wording.)

7.1 your own title

7.2 your direct supervisor's title

7.3 titles of people you immediately supervise

1-
2-
3-

8. How many people do you directly supervise?

9. What are your major responsibilities?

10. What are your company's major products or services?

11. Approximately how many employees does it have?

ACTIVITY WITHIN WORK GROUPS - USE OF OFFICE AUTOMATION

Source: Bikson et al., Protocol for Technical Expert

1. What percentage of your employees are computer users? _____

2. What percentage of employees have workstations? _____

3. What kinds of workstations do you have here?

4. Do terminals have local processing power (if applicable)? What kinds of processing units (mainframes, minis, micros, or multiples of these) drive the terminals (if applicable)?

5. How many different hardware vendors are represented in these departments? Where does the software come from? Is the software customized?

6. What are the major applications in use? What tasks are they used for?

7. In general, when employees interact with the computer system, does the process unfold automatically, or do the users guide the process?

8. What capabilities are there for user modification (e.g., user-modifiable menus, user-definable keys, an end-user programming language?)

9. Is computer-based mail in use? Who communicates with whom and for what purposes?

Source: Bikson et al., Protocol for Managers

10. What kind of workstations do you have here?

11. What major applications (tasks) are they used for?

12. Do you have computer-based mail? Who is on it so far? What percent of the employees use it? What do they use it for?

Source: Bikson et al., Protocol for Users

13. When did you first start using a computer here? _____

14. Do you have your own workstation? (If not, how is it shared?)

15. Do you have any procedures for modifying the system (e.g., user-modifiable menus, user-modifiable keys, an end-user programming language?) If so, do you get a lot of use out of them? (Explain)

16. Do you use computer-based mail? With whom do you mainly communicate? (Probe for informal as well as task-related communication.)

17. How much time, in a typical day, do you spend working at a workstation? _____ (hours or % of total time) Is it continuous?

Source: Morell

18. We are interested in the amount of time that you and your staff invest in using PCs. Please fill out the chart below with a general estimate of the number of hours that you and your staff have put into PC related work over the past month.

	Approximate hours - myself	Approximate hours - staff
Developing programs of special applications	(18.01)	(18.02)
Entering data into the PC	(18.03)	(18.04)
Word processing/ document production	(18.05)	(18.06)
Using data based management programs	(18.07)	(18.08)
Using spreadsheet programs	(18.09)	(18.10)
Training (both formal and self directed)	(18.11)	(18.12)
Other (please specify)	(18.13)	(18.14)

19. Do any of your staff engage in any of the above listed activities on personal time? If so, please briefly explain how much effort is put in, by whom, and to what purpose.

Source: Rotman

20. What kind of word processing systems do you primarily use in your department? (Check as many as apply.)

a.___OIS 40/50 b.___OIS 105/115 c.___OIS 130/140
d.___WP system e.___Alliance f.___WANG personal computers
g.___Wangwriter h.___ VS series i.___other(_____)

21. During the past month, approximately what percentage of your time did you spend using your WANG word processing system?

a.____ less than 10% b._____ 10 - 25% c.____ 26 - 50%
d.____ 51 - 75% e._____ 76 - 100%

22. Do you have any of the following options on your WANG system? If so, during the past month, how often did you generally use each one?

rarely = a few times a year
sometimes = a few times a month
often = every week

	Don't have	Never use	Rarely use	Sometimes use	Often use
22.1- List processing	____	____	____	____	____
22.2- BASIC	____	____	____	____	____
22.3- Readability Index	____	____	____	____	____
22.4- Dictionary	____	____	____	____	____
22.5- Telecommunications	____	____	____	____	____
22.6- Mailway	____	____	____	____	____
22.7- WISE	____	____	____	____	____
22.8- Glossary	____	____	____	____	____
22.9- Math	____	____	____	____	____

23. Following are tasks that can be performed on a word processing system. Please indicate which tasks you perform and how often.

	Never	Rarely	Sometimes	Often
23.1- Create letters,memos, etc.	____	____	____	____
23.2- Prepare financial reports	____	____	____	____
23.3- Print envelopes	____	____	____	____
23.4- Prepare/print labels	____	____	____	____
23.5- Create "merge" documents	____	____	____	____
23.6- Use pre-printed forms	____	____	____	____
23.7- Create/maintain lists	____	____	____	____
23.8- Produce contracts, etc.	____	____	____	____
23.9- Create newsletters, etc.	____	____	____	____

Source: Fleischer and Morell (1)

24. Circle your best estimate of how often you used the following OA equipment in the past month. For example, if you used a piece of equipment about every day in the past month, circle a "1" by that equipment.

	Daily	More than once per month	About once per month	Once or a few times	Available but not used	Not available
24.01 Electronic mail	1	2	3	4	5	6
24.02 Video conferencing equipment	1	2	3	4	5	6
24.03 Micro or personal computer	1	2	3	4	5	6
24.04 Terminal access to mainframe or minicomputer	1	2	3	4	5	6
24.05 Printer	1	2	3	4	5	6
24.06 Plotter	1	2	3	4	5	6
24.07 Modem (any phone access to a computer	1	2	3	4	5	6
24.08 Stand alone word processor	1	2	3	4	5	6
24.09 Local area network	1	2	3	4	5	6
24.10 Other (describe)	1	2	3	4	5	6

25. What types of OA do you have available to you in your <u>personal workspace</u> (i.e. at or near your desk?) (Check all that apply.)

25.01 _____ Electronic mail system
25.02 _____ Video conferencing equipment
25.03 _____ Micro- or personal computer (PC)
25.04 _____ Terminal access to mainframe or minicomputer
25.05 _____ Printer
25.06 _____ Plotter
25.07 _____ Modem (for telephone access to a computer)
25.08 _____ Stand alone word processor
25.09 _____ Local area network
25.10 _____ Other (describe)

26. Circle your best estimate of how often you (or your assistant) used the following OA applications in the past month.

	Daily	More than once per week	About once per week	Once or a few times	Available but not used	Not available
26.01 Word processing	1	2	3	4	5	6
26.02 Accessing data bases	1	2	3	4	5	6
26.03 Managing/ manipulating data	1	2	3	4	5	6
26.04 Spread-sheet	1	2	3	4	5	6
26.05 Modeling/ forecasting (other than spreadsheets)	1	2	3	4	5	6
26.06 Statistical analysis	1	2	3	4	5	6
26.07 Graphics	1	2	3	4	5	6
26.08 Electronic mail	1	2	3	4	5	6
26.09 Tele-conferencing	1	2	3	4	5	6
26.10 Account-ing	1	2	3	4	5	6
26.11 Training in work related activities	1	2	3	4	5	6
26.12 Other (describe)	1	2	3	4	5	6

Source: Fleischer and Morell (2)

27. Do you use office automation in a manner that involves your actually using the equipment yourself? _____YES _____NO

(If NO, skip to question #)

28. Please describe the last two times you remember personally using office automation equipment.

use #1

use #2

29. Does your answer to question #28 represent the most frequent uses you personally made of office automation?
_____ YES _____ NO

(If YES, skip to question #)

30. What is the most frequent use you personally make of office automation?

31. Besides the use listed in question #4, are there other common uses you have for office automation?
_____YES _____NO

(If NO, skip to question #)

32. Please briefly describe some of these other common uses for office automation.

use #1

use #2

Note: The above sequence (27 - 32) is repeated with slight wording changes to address use by an immediate superior and an immediate subordinate of the respondent.

ACTIVITY WITHIN WORK GROUPS - SATISFACTION WITH OFFICE AUTOMATION

Source: Bikson et al., Protocol for Technical Expert

1. Is the equipment reliable (crashes, downtime, slowness)? Can you estimate how much lost time costs the organization as a result of system malfunction?

2. Overall assessment of system (what's working well, what's still missing.)

Source: Bikson et al., Protocol for Managers

3. How reliable has the system been (crashes, downtime)? Can you estimate how much time your department loses as a result of system malfunction?

Source: Bikson et al., Protocol for Users

4. We're interested in any problems you may have with computer reliability or availability, for example:

   Can you easily get to use the equipment or software you need?
   Is the response time slow/adequate/fast?
   Does the equipment crash or have a long downtime?

5. Overall, from your perspective, what works well in the system? What doesn't work well?

Source: Rotman

For each of the four questions below, check which applies.

6. Noise level while you are on WANG

   a._____so quite, I hear no disturbing sounds
   b._____quite enough to get my work done without being disturbed.
   c._____noisy enough to make working very difficult, but not impossible
   d._____so noisy, I can't do my work

7. Interruptions while you are on the WANG

   a._____few, if any
   b._____an acceptable amount; they occur, but don't keep me from doing my work
   c._____enough to make working difficult, but not impossible
   d._____so many, I can't get my work done

8. Temperature of the room or area in which you use WANG

a._____too cold
b._____cool, but bearable
c._____not too hot or too cold, just right
d._____warm,
e._____hot enough to be uncomfortable

9. Privacy you have while on WANG

a._____WANG pool (a number of users doing nothing but WP in one area
b._____total privacy (a separate room)
c._____some privacy (partition in a larger area, separate part of a room)
d._____no privacy (users working in the "normal" area)

Source: Fleischer and Morell (1)

10. Many times a piece of OA equipment is available for the use of several different people in an office. Because of competing uses it is sometimes difficult to get access to that equipment. How series is this problem of "access for you?

1._____an extremely serious problem
2._____a very serious problem
3._____a slightly serious problem
4._____only a mild problem
5._____not at all a problem

Source: Morell and Leemon

11. Following is a list of some of the things that are often done by hand that, theoretically, can be performed on the Star. Please check those that you frequently, not always, do by hand rather than on the Star.

a._____ sketches
b._____ drawings
c._____ presentation material
d._____ text revisions
e._____ cut and paste specifications and documents
f._____ marking-up documents
g._____ mail functions
h._____ document logging
i._____ forms control
j._____ other _____

12. Please explain in one or two sentences your major reasons for wanting to do some of the above tasks by hand.

13. Do you believe the Star is being used to its full potential?
_____YES _____NO

If you checked "no", please answer the following question. If "yes" skip to question 15.

14. Please describe very briefly the ways in which utilization of the Star could be made better.

15. Please describe the two or three things you like most about the Star.

16. Please list two or three things that you dislike most about the Star that you would like to see changed. (for example, in terms of capacity, availability of software, etc.)

Source: Fleischer and Morell (2)

17. Are there any applications you would like to use office automation for, but cannot in your present job? ___YES ___NO

(If NO, skip to question #)

18. What are the major obstacles to the use you mentioned in the previous question? (ex: access to hardware, available software, training, approval of company, etc.)

QUALITY AND QUANTITY OF PRODUCTION

For two reasons, most studies of the impact of OA do not explicitly separate questions about the quality and quantity of production. First, the decision as to what is a quantitative or qualitative difference is often made by the researcher, and is dependent upon the circumstances the researcher is trying to explain. As an example, consider findings about using microcomputer based graphics. If a respondent's job is to produce graphs, an increased number of graphs may be seen as an issue of production or productivity. But if the respondent's job is to analyze data and present briefings, an increased use of graphs might be seen as a qualitative improvement. The decision is the researchers' and is based on a knowledge of the work context.

Second, because interpretations about quality and quantity are often based on data about what respondents actually do, the primary objective is to ask questions in a way that will allow the respondent to supply necessary detail. Often the best way to get that detail is to ask for specifics about work activities and the demands made upon people. Questions of that nature do not lend themselves to overt distinctions between quality and quantity. Many of the examples presented below will illustrate this point.

Just as issues of quality and quantity are often mixed in the same question (or set of questions), so too is there a mix of questions about the impact of OA and judgements about the value of that impact. As with the qualitative and quantitative distinction, the judgement about value is often left to the interpretation of the researcher. As an example, an increase in the amount of information reported at briefings may be positive or negative, depending on whether it leads to better decisions or more confusion. Also, the requirements of good question order sometimes require not separating questions about the value of a change from questions about the nature of the change itself. This too will be illustrated in the following examples.

<u>Source: Bikson et al., Protocol for Technical Experts</u>

1. What has been the impact of information technology on:

   a. productivity (how assessed?)
   b. labor costs (how assessed?)
   c. on other efficiency goals (how assessed?)
   d. Do any of the focal departments figure predominantly in these effects?

2. What have been the impacts on other strategic organizational goals?

<u>Source: Bikson et al., Protocol for Managers</u>

3. What changes have you seen over time in efficiency and effectiveness? (Efficiency usually means fewer people; effectiveness means doing a better job.) (Probe for changes in quality, speed, quantity and so on.)

4. Have these performance changes made any difference in the performance of the organization? (e.g., productivity, other strategic goals?)

Source: Morell

5. Describe how you use your PC (use #1).

6. Which of the following statements best characterizes the role of the personal computer in this task?

   1- This task would be done about as well, even without a personal computer.
   2- The personal computer is some help in doing this task.
   3- The personal computer is a great help in doing this task.
   4- It would not be practical to do this task without the help of a personal computer.

7. Using the scale below, please rate the consequence of this task for the Navy.

   1- This is extremely beneficial for the Navy.
   2- This has some benefit for the Navy.
   3- It makes no difference to the Navy whether a personal computer is or is not used for this task.
   4- This is somewhat detrimental for the Navy
   5- This is extremely detrimental for the Navy.
   6- I don't have enough information to form an opinion.

	Extremely beneficial (1)	Some benefit (2)	No difference (3)	Somewhat detrimental (4)	Extremely detrimental (5)	No opinion (6)
Dollar savings						
New information for planning						
Speed of obtaining information						
Number of people needed to do jobs						
Coordination among people or groups						
Response to requests from above						
Information for people of equal or lower rank						

The above set of questions can be repeated as often as necessary if the respondent has more than one use for OA.

Source: Fleischer and Morell (2)

8. Given all the times you can ever remember personally using office automation in your present job, what use had the greatest impact for you or your company?

9. Why was the use described in question #8 so important?

Note: These questions were asked three times, referring in turn to the respondent, his or her boss, and a person he or she supervised.

Source: Morell and Leemon

10. Of all the tasks that you used the Star for, what tasks do you think are the most important? Please explain why.

11. Since you have had access to the Star have there been any changes you've observed in the frequency of written documents?

_____YES _____NO

12. If yes, please describe what kinds of changes.

13. Since you have had access to the Star have there been any changes you've observed in the length of written documents?

_____YES _____NO

14. If yes, please describe what kinds of changes.

15. Do you find that the Star helps you to accomplish your old tasks faster?

_____YES _____NO

If yes, please answer the following. If no, skip to question _____

16. Now that you have more time, how do you use it? (Check as many of the following as apply.)

a.___ I do more old tasks.
b.___ I do more of the same tasks better.
c.___ I perform new kinds of tasks.
d.___ I do some of the same tasks differently.
e.___ I have more time to think about old tasks.

17. It is possible that having access to the Star may have an impact on several areas in your work life. How would you rate the Star's impact on the following:

	No impact	Very little impact	Minimal impact	Moderate impact	Great impact	Very great impact	Don't know
17.1-Preparing reports							
17.2-Monitoring schedules							
17.3-Tracking projects							
17.4-Meeting customer requests							
17.5-Meeting deadlines							
17.6-Meeting in-house requests							
17.7-Acquiring new business							
17.8-Finding effective solutions to engineering problems							

ADAPTABILITY AND CHANGES IN WORK GROUPS

As with the concepts of "quality and quantity of production," it is difficult to separate questions about a work group's functioning from questions about its adaptability to new circumstances. As an example, a new microcomputer may increase a group's use of dBase files in lieu of manual record keeping. That is a change in functioning which may also affect adaptability, as mediated through the new-found flexibility of data access. In such a case, the researcher must integrate information on use of dBase with other knowledge about how the work group changed, and make a judgement about adaptability. Even though some information about adaptability may come from direct questions about it, other relevant information must be inferred from descriptive data on work group functioning. Thus from a practical point of view, questions about "work group functioning" and "work group adaptability" are integrated.

Source: Bikson et al., Protocol for Technical Expert

1. How has the work changed as a result of the technology implementation? (e.g. managers, professionals do more keyboarding; secretaries have more tasks; new tasks are designed; new processes for doing work adopted.)

2. Have people invented new ways of doing their work as a result of the technology?

Source: Bikson et al., Protocol for Technical Expert

3. How has the work changed as a result of the technology implementation? (Probe for changes in managers, professionals, secretaries, other clerical employees.)

   a- Any changes in the ways you organize the work (work-flow/information-flow?)
   b- Any changes in the hours of work or place of work? (Probe for home work and work contracted out - especially offshore.)

4. Have people invented new ways of doing their work as a result of the technology?

5. As of now, could employees go back to the old way of doing things?

Source: Bikson et al., Protocol for Technical Expert

6. Now I would like to ask you about any changes in your work - the activities, what you do - related to the system. (Probe for expansion vs. constriction, and for redistribution of work.)

   a- Changes in variety/variability?
   b- Changes in control over your work, especially in what is left to your own judgment?
   c- Do you have new tasks and responsibilities, or do you do the same job with a new tool?
   d- Changes in type of supervisory support (Probe for machine pacing or monitoring of work.)

7. As of now, could you or other people in your department go back to the old way of doing things?

8. Has using the computer affected your job in official terms, e.g., Your job title? New job description? Computer-related pay increase?

   Other?

Source: Fleischer and Morell (1)

9. Office automation can fit into a manager's worklife in many different ways. One important way is in how managers solve problems. Below are three different types of problem solving situations that you might encounter in your work. Please briefly describe a recent example in which you dealt with each type of problem solving situation.

CUT AND DRIED Cut and dried problems are those in which there is a clear set of formal or informal rules which make a decision relatively straight forward, once the proper information is known. For example, many scheduling, inventory, and credit decisions can be made in this way.

Example:

ANALYTIC Analytic problems are those which are sufficiently complex to prevent a set of rules from acting as a routing formula to solve the problem. For example, a decision about whether to market a product in a particular location involves formal analysis, but is not determined by a formula.

Example:

UNSTRUCTURED Unstructured problems are those for which there are no formal guidelines and few tested decision making criteria. There may be a lot of information available, but no reliable guidelines for using the information. Hiring top managers and long range planning are some problems that usually fit into this category.

Example:

For each example that you gave, please indicate, using the following numbers, how much each of the advantages of OA below helped you to solve each problem

1- helped a very great deal
2- helped quite a bit
3- helped some
4- helped a little
5- did not help at all
6- is not available to me.

	Cut and dried problem	Analytic problem	Unstructured problem
a. Easily generate and revise text	9.01____	9.02____	9.03____
b. Quickly and cheaply gather information	9.04____	9.05____	9.06____
c. Work with data bases more easily	9.07____	9.08____	9.09____
d. Quickly and cheaply analyze data	9.10____	9.11____	9.12____
e. Make routine calculations more easily	9.13____	9.14____	9.15____
f. Test different models more easily	9.16____	9.17____	9.18____
g. Graphically display analyses	9.19____	9.20____	9.21____
h. Send messages to others without their having to be present to receive them	9.22____	9.23____	9.24____
i. Hold conferences without needing to travel	9.25____	9.26____	9.27____

10. Has your use of OA enabled you to deal with new problems, those which you had never been able to address before? If so, please describe what the new problem was and how OA helped.

11. How many new (to you) applications or programs have you tried during the past 3 months? _____

12. Please think about a recent project that involved significant, ongoing collaboration with people outside of your work group. Please describe what role, if any, OA played in this collaboration.

13. Some managers are frequently involved in collaborative projects such as that referred to in question 17, others not so frequently. Over the past 3 months, about how many different collaborative projects have you been involved in?

    (A collaborative project is a project that has its own budget or projected budget.)

    1. _____ none
    2. _____ 1 - 2
    3. _____ 3 - 4
    4. _____ 5 - 6
    5. _____ 7 or more

14. Have you ever used any form of OA for work related tasks at

home or while traveling?

1._____ NO
2._____ YES - IF YES, What applications have you used?

15. Since you have been working in your recent job, have you observed any impact of OA in the amount of time you spend on the following activities? Please circle the number corresponding to the amount of change for each activity.

	Much more time	More time	Same time	Less time	Much less time	Can't say
15.10 Talking on the telephone	1	2	3	4	5	6
15.20 Preparing reports	1	2	3	4	5	6
15.30 Preparing presentations	1	2	3	4	5	6
15.40 Meeting with subordinates	1	2	3	4	5	6
15.50 Meeting with peers	1	2	3	4	5	6
15.60 Meeting with superiors	1	2	3	4	5	6
15.70 Meeting with people from outside your organization	1	2	3	4	5	6
15.80 Using data in decision making	1	2	3	4	5	6
15.90 Analyzing data	1	2	3	4	5	6
15.10 Thinking	1	2	3	4	5	6
15.11 Traveling on business	1	2	3	4	5	6

16. Has the time you devote to other activities changed as a result of your use of OA? If so, please describe briefly.

17. Please indicate about how much impact each of these applications has had on your work. Circle the number by each application that corresponds to one of the following statements:

1- marked and profound change for the better
2- major beneficial impact
3- some beneficial impact
4- slight beneficial impact
5- no impact at all
6- negative consequences have outweighed benefits

	Profound	Major	Some	Slight	No	Negative

	Profound change	Major benefit	Some benefit	Slight benefit	No impact	Negative effect
18.01 Word processing	1	2	3	4	5	6
18.02 Accessing data bases	1	2	3	4	5	6
18.03 Managing/ manipulating data	1	2	3	4	5	6
18.04 Spreadsheet	1	2	3	4	5	6
18.05 Modeling/forecast-ing (other than spreadsheets)	1	2	3	4	5	6
18.06 Statistical analysis	1	2	3	4	5	6
18.07 Graphics	1	2	3	4	5	6
18.08 Electronic mail	1	2	3	4	5	6
18.09 Tele-conferencing-	1	2	3	4	5	6
18.10 Accounting -	1	2	3	4	5	6
18.11 Training in work related activities	1	2	3	4	5	6
18.12 Other (describe)	1	2	3	4	5	6

Source: Morell and Leemon

19. Since the Star was introduced have you received any additional work assignments, or new areas of responsibility?

    YES_____ NO_____

20. If yes, please provide an example.

21. Are there any tasks you are able to accomplish now that you could not accomplish without the Star?

    YES_____ NO_____

22. If yes, could you give an example?

23. If you had to do the work you do now without the Star, how difficult do you think it would be? (Check only one of the following.)

a_____ It would make no difference at all.
b_____ It would make a minor difference.
c_____ It would make a moderate difference.
d_____ It would make a significant difference.
e_____ It would be an impediment to my productivity.
f_____ It would be a major problem.
g_____ I would not be able to perform most of the work that I do.

COMMUNICATION

Source: Bikson et al., Protocol for Technical Expert

1. Have there been changes in communication and relationships between individuals or between departments? (Describe.)

2. Do computer-based communications replace memo's, phone calls, in-person discussion? (Explain)

3. Have computer-based communications created electronic "islands" as well as connections? Have they affected the work flow among departments or otherwise altered the coordination or structure of activities?

Source: Bikson et al., Protocol for Managers

4. Does computer-based mail affect communications, such as memos, phone calls, in-person discussion, range of contacts? Explain?

Source: Bikson et al., Protocol for Users

5. Have there been changes in communications, interactions, relationships among people here because of the computer system? (describe.)

Source: Morell

6. Please tell us about written reports you have prepared which incorporated PC-based information. (We are only interested in the more important examples. A complete list is not necessary.

Report #1

6.1- Descriptive title of report

6.2- Frequency of report (as needed, weekly, monthly, etc.)

6.3- Primary audience

6.4- Description of contents

6.5- Did the report contain any information from data sources other than your PC? If so, please explain briefly.

Report #2,.. The above set of questions can be repeated as necessary.

7. Please tell us about briefings you have prepared which incorporated PC-based information. (We are only interested in the more important examples. A complete list is not necessary.)

   Briefing #1

   Same format as above.

8. Please tell us about short communications (memos, conversations, etc.) you have had which incorporated PC-based information. (We are only interested in the more important examples. A complete list is not necessary.

   Communication #1

   Same format as above.

LARGER ORGANIZATIONAL CHANGES

Source: Bikson et al., Protocol for Managers

1. Think about the changes in the department's work in relation to the organization. What changes have there been in work flow in/out of this group in relation to other departments?

2. Have there been any changes in management styles and procedures? (Probe for keeping track of performance by computer and for number of people they can supervise.)

3. Has planning or decision making become more decentralized or department centered, or has it become more centralized, from the top down?

4. What do you think will be the net effect of computerization on the size and composition of the staff in this department? In the organization? (Probe for differences in sex ratios or age distribution.)

5. If sizable labor force shifts or reductions are anticipated, how will they be handled?

Source: Bikson et. al., Protocol for Users

6. Have there been any management innovations as a result of the technology? (e.g. quality circles?)

Source: Fleischer and Morell (2)

7. Given all the times you can remember ever personally using office automation in your present job, what use had the greatest impact for you or your company?

8. Why was the use described in question #7 so important?

9. Given all the times you know of where your supervisor has personally used office automation equipment, what use do you believe had the greatest impact for your supervisor or the company?

10. Why was the use described in question #9 so important?

    Note: Questions 9 and 10 are repeated relative to a person supervised by the respondent.

11. The advent of office automation has given rise to claims that it affects organizational dynamics such as supervisory relationships, getting one's way with peers or superiors, coalition formation, communication patterns, and the like. In your experience, is any of this speculation true? ___YES ___NO

(If NO, skip to question #)

12. What organizational consequences of office automation have you observed?

13. Do you have any pet theories about the effects of office automation on your company or the people who work there? If so, please share them with us.

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