

ARIZONA DEPARTMENT OF TRANSPORTATION

REPORT NUMBER FHWA/AZ-84/205

INFORMATION SYSTEMS IN ADOT: ANALYSIS OF; INTRA-FUNCTION FLOW, DECISION SUPPORT NEEDS, EXISTING SYSTEMS UTILITY AND USER ATTITUDES.

Final Report

Volume II: Manual for Evaluation of Needs and Attitudes of EDP Users

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March 1985

Prepared for

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206 South 17th Avenue
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in cooperation with
U.S. Department of Transportation
Federal Highway Administration

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1. Report No. FHWA/AZ-85/205 / II		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Information Systems in ADOT: An Analysis of Intra-Function Flow, Decision Support Needs, Existing Systems Utility and User Attitudes				5. Report Date MARCH, 1985	
7. Author(s) W. C. Moor, J.E. Bailey, P.A. Evans, and A. Roberts				6. Performing Organization Code	
9. Performing Organization Name and Address Department of Industrial and Management Systems Engrg College of Engineering and Applied Sciences Arizona State University Tempe, AZ 85287				8. Performing Organization Report No.	
12. Sponsoring Agency Name and Address Arizona Department of Transportation 206 South 17th Avenue Phoenix, Arizona 85007				10. Work Unit No. (TRIS)	
15. Supplementary Notes In cooperation with the U. S. Department of Transportation Federal Highway Administration				11. Contract or Grant No. HPR-PL-1(27) ITEM 205	
16. Abstract A report is offered on a study of the information activities within the Right-of-Way section of ADOT. The objectives of the study were to adapt and apply techniques to measure user-perceived needs, satisfaction and utility of services provided Right-of-Way by the Information Systems Group (ISG). A background of the four tested techniques is given along with a review of related literature. The techniques were: (1) a functional analysis using the IDEF methodology (LeClair, 1982) (2) a user needs analysis using the Bailey and Federle methodology (Bailey and Federle, 1983) (3) a systems utility analysis using the Krobock methodology (Krobock, 1981) (4) a user satisfaction analysis using the Pearson methodology (Bailey and Pearson, 1983) The procedure used to collect and analyze the data collected in Right-of-Way is briefly discussed. A manual for ISG use of the techniques is offered. Conclusions from the study include the following observations. The techniques are not hard to learn or use but are time consuming. With the exception of the IDEF technique, the techniques were applied at little cost to the Right-of-Way staff. The techniques by themselves did yield useful insights for ISG. Using the techniques in combination suggested insights not possible when they were used alone. The ISG users manual does provide a reasonable guide to further application of the techniques.				13. Type of Report and Period Covered FINAL MARCH, 1985	
17. Key Words •IDEF, User Needs, Information Systems, System Analysis and Design, User Satisfaction, Information System Utility				14. Sponsoring Agency Code	
18. Distribution Statement No Restrictions. Available to the public through the NTIS, Springfield, Virginia 22161				15. Supplementary Notes	
19. Security Classif. (of this report) UNCLASSIFIED		20. Security Classif. (of this page) UNCLASSIFIED		21. No. of Pages 86	22. Price

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APPENDIX A
MANUAL FOR EVALUATION OF NEEDS AND ATTITUDES OF EDP USERS

INTRODUCTION

The purpose of this manual is to assist in evaluating the needs and attitudes of groups of ISG users. An objective analysis of needs and attitudes is useful when prioritizing or tailoring new application and change requests. Such an analysis acts as a roadmap indicating the "best" way to go.

The following is a list of seven analysis objectives for which procedures have been developed and presented within this manual. To use these procedures, select the one or more objectives of interest. This manual also describes the methodology to interpret the study results and describes how to administer and compile the results.

USER OBJECTIVES

1. To ascertain general user satisfaction with the present information environment
2. To ascertain causes of satisfaction or dissatisfaction through a detailed analysis of satisfaction factors
3. To identify potential new computer applications through a detailed analysis of user needs
4. To ascertain user perceived utility value of existing reports by analysis
5. To ascertain activities which may be candidates for microprocessor applications
6. To prioritize specific new application requests
7. To ascertain information about the user community through a general audit

SPECIFIC APPLICATION: OBJECTIVE 1

OBJECTIVE: To ascertain general user satisfaction with the present information environment.

METHODOLOGY: PEARSON QUESTIONNAIRE -- Administer and compile data as instructed on pages 19-22 of this manual. Review the Pearson questionnaire to determine which subset of factors are significant to the target user community. Modify or X-out the questionnaire as needed. Arrange for a group meeting of the target users. Such a meeting should take 45 minutes to an hour. Explain that the purpose of the meeting is to identify areas where presently received ISG outputs are satisfying or dissatisfying so as to improve ISG services. Indicate the complete anonymity of responses. Suggest the importance of candid, well thought out and complete responses. Go over an example of how to fill out the questionnaire. Have users fill out questionnaire before they leave the meeting. Compile the data according to pages 19-22 of this manual. Interpret the results as suggested below.

INTERPRETATION OF DATA:

There are three levels at which the data can be interpreted. These levels are an organizational group of users, the users of a specific application or specific "key" individuals. Interpretation at each of these levels follows. For any of these views, one might study overall satisfaction attitude, just those factors deemed important by the users or just those factors rated highly satisfying/dissatisfying. Remember, attitudes are relative and should be viewed in relation to other similar users or previous attitudes. One should look for differences rather than absolute values.

VIEW I: The Organization

The overall level of user satisfaction with the present information system can be obtained by taking the average and distribution over all respondents of the normalized score, NS_i . Mathematically,

$$NS = \frac{\sum_{i=1}^n NS_i}{n} = \text{overall satisfaction}$$

where n = the number of respondents

The level of satisfaction can be interpreted using Table 1.

TABLE 1

<u>NS</u>	<u>Level of Satisfaction</u>
+1.00	Maximally satisfied
+0.67	Quite satisfied
+0.33	Slightly satisfied
0.0	Neither satisfied nor dissatisfied
-0.33	Slightly dissatisfied
-0.67	Quite dissatisfied
-1.00	Maximally dissatisfied

VIEW II: The Users of Specific Systems

Subsets of respondents can be averaged to get the satisfaction level for specific applications. In this case the same calculations as above are done except that only those NS_i in the selected group of respondents are used. Use Table 1 to interpret this score.

VIEW III: The Individual

For the individual, a microscopic analysis is best. Be sure to inform the person that he or she is being specifically studied. Look at each factor for importance and satisfaction/dissatisfaction. Look for patterns' for example, do significant factors indicate attitudes toward convenience, quality or organizational type factors. Once the significant factors are examined, arrange for an interview to explore why certain factors are causing the particular reaction.

SUGGESTIONS:

Respondents who have an inordinate number of zero responses are probably disinterested in the computer outputs and/or didn't take the questionnaire seriously. These respondents should be discounted and their scores removed from group averages.

SPECIFIC APPLICATION: OBJECTIVE 2

OBJECTIVE: To ascertain causes of satisfaction or dissatisfaction through a detailed analysis of satisfaction factors.

METHODOLOGY: PEARSON QUESTIONNAIRE -- Administer and compile data as instructed on pages 19-22 of this manual. Review and modify the Pearson questionnaire to determine which subset of factors are significant to the target user community. Arrange a group meeting of the target users. The meeting should take 45 minutes to a hour. Explain the purpose as identifying aspects of ISG outputs that could be improved. Indicate the complete anonymity of responses and the need for candid thoughtful responses. Go over an example of how to fill out the questionnaire. Have users fill out questionnaire before leaving the meeting. Compile data according to pages 19-22 of this manual. Interpret the results as suggested below.

INTERPRETATION OF DATA:

The following indicate how to look for inferences regarding the reasons for satisfaction and dissatisfaction. The desire is to look for trends and anomalies. Corrective or any other action is expressly not treated in this document.

In order to get a general feeling for the results, identify the top five or so factors in both the Satisfaction and Importance Matrices. Look at each of these identified questions on the questionnaire. This should provide an intuitive feel for those most satisfying and most important factors. Now, do the same for the least satisfying and least important factors. Look for patterns: for example, do significant factors indicate attitudes toward convenience, quality, or organizational type factors. For detailed analysis, follow the following steps. Use Steps 1 through 3 to analyze group anomalies. Use Step 4 to analyze individual or subgroup anomalies.

For large group anomalies:

STEP 1: Begin by looking at MATRIX I (Satisfaction Matrix). Identify the top five or so most satisfying factors (questions).

These should be the top five rows. Write down the factor names. Identify the relative importance of these most satisfying factors on MATRIX II (Importance Matrix).

Compare the level of satisfaction to the ranking of importance for each factor. Anomalies will be present if a highly satisfying factor is relatively unimportant. Such a situation might indicate where time or money could be saved at little loss in effectiveness.

STEP 2: Identify the five most dissatisfying factors. These should be the last five rows. Identify the relative importance of these factors on MATRIX II. Observe that least satisfying does not necessarily mean dissatisfying. Low satisfaction factors that are ranked high in importance indicate areas where changes could greatly improve effectiveness. If the factor has a negative rating (dissatisfying) it should be taken more seriously. If the least satisfactory factors group into categories like output convenience output quality etc., this may suggest a generalized problem.

STEP 3: Looking at the Importance Matrix, identify the five factors which are most important. Identify the relative satisfaction of these most important factors using the Satisfaction Matrix. Compare the ranking of importance to the ranking of the level of satisfaction for each factor. Anomalies will exist when important factors are not satisfying. Observe if the important factors group in categories like convenience, quality, etc. Grouping suggests areas for more indepth analysis through interviews.

For individual or subgroup anomalies:

STEP 4: Look at the upper left-hand corner of the Satisfaction Matrix. This represents the most satisfied people and the most satisfying factors. Look for any negative numbers in this general area. Ask why would otherwise satisfied people be dissatisfied with generally satisfactory factors? The opposite question could be ask for high positive numbers in the lower right hand corner. Look further at the scores for other factors by these individuals.

1. Do those scores indicate a large number of zeroes? If so, the respondent was either disinterested and/or didn't take the questionnaire seriously. In this case, the anomalies can probably be discounted and ignored.

2. Is this the only factor this user finds dissatisfying? This might indicate a serious situation.

Look further at the scores others gave to this factor.

1. Are there other dissatisfied people? Do they belong to the same organization or do they share the same application output? Can these people be associated to the same analyst? Is a training session called for?

Continue to ask yourself questions trying to draw out any relationships which may exist among individuals. The answers to any of the questions above may indicate a need for attention.

SPECIFIC APPLICATION: OBJECTIVE 3

OBJECTIVE: To identify potential new computer applications through a detailed analysis of user needs.

METHODOLOGY: FEDERLE QUESTIONNAIRE -- Administer and compile data as instructed on pages 27-29 of this manual. In addition, administer only the first page of the Krobock Questionnaire titled, "Data and Information for Job Responsibilities." To compile this data:

- A. Code both instruments with the same codes.
- B. From the Krobock questionnaire, multiply the score for NON-ELECTRONIC DATA PROCESSING (marked B on the questionnaire) by the score for PERCENTAGE YOU BELIEVE COULD BE COMPUTERIZED (marked C on questionnaire). This "Krobock" score represents the total percentage of an individual's information which they feel could be computerized, but isn't.

It may be appropriate to modify the list of activities associated with the Federle instrument to more accurately reflect what is done by the target user group. The instruments should be filled out in a group meeting requiring about one hour. Explain the purpose of the effort is to identify needs for new more useful ISG services. Indicate that the results lose value with anonymity but the response could in no way affect one's job situation. It is merely seeking where the computer might help them. Offer the opportunity to decline participation. For those who fill out the questionnaire, interpret the results as follows.

INTERPRETATION OF DATA:

In assessing computer potential, we are looking for activities which are structured, consistent, time-consuming, and important. In addition, activities to be computerized should involve as many people as possible.

STEP 1: Look at Matrix I (Total Activity Scores). Find the larger numbers in the Total Column. The term large is totally relative and its exact value will vary from group to group. These large numbers indicate activities, which if supported by the computer, would have a more significant impact on the organization.

STEP 2: Check the non-zero column for the number of people affected. If this number is relatively high, and the total (activity score) is relatively large, this activity is a candidate for possible computer application.

STEP 3: On Matrix II (Normalized Scores), find those activities which you identified in Steps one and two above. Look at the average score for each activity. The normalized average score will fall into one of these three categories below.

<u>CATEGORY</u>	<u>SCORE</u>	<u>POTENTIAL</u>
low	0-50	poor
moderate	51-75	questionable
high	76-100	good

If an activity falls into the low category, it is a poor candidate for computerization. If it falls into the moderate category, it is a questionable candidate for computerization. If this is the case with a high ranking total score, many other factors should be considered carefully before computerizing this activity. If an activity falls into the high category, it is a good candidate for computerization. If a large total score and good potential result from a given activity, the question becomes, "How can the computer help in this activity?"

STEP 4: To reconfirm the potential of activities identified in Step three, check the Krobok scores for each individual who scored the given activity. The higher the Krobok scores, the greater the impact will be on the individual if this activity is computerized. Note that some of the activities may already be supported by computer applications.

STEP 5: Look at Matrix II (Normalized Scores). Identify those activities whose average scores fall into the high category (above 75). Find each "high" activity on Matrix I. Look at the individual scores for a particular activity. If these scores are high, but not many people ranked this activity, it may still have excellent potential for organizational impact especially if the individuals or application is important. Consideration of a microprocessor may also be indicated.

STEP 6: Look on the Krobock list and find the score for the individual(s) identified in Step 5. If this score is also high, this potential application should probably not be ignored. This would tend to indicate that a very structured, consistent, time-consuming and important activity is done by one or a few people who feel they have a large potential for computerization in their job. The chances of successfully computerizing this activity is very high.

SPECIFIC APPLICATION: OBJECTIVE 4

OBJECTIVE: To ascertain user perceived utility value of existing reports by analysis

METHODOLOGY: KROBOCK QUESTIONNAIRE -- Administer the questionnaire and compile the data as directed on pages 27-29 of this manual.

It may be appropriate to modify the list of activities associated with the Federle instrument to more accurately reflect what is done by the target user group. The instruments should be filled out in a group meeting requiring about one hour. Explain the purpose of the effort is to identify needs for new more useful ISG services. Indicate that the results lose value if anonymity is offered but that could in no way affect one's job situation. It is merely seeking where the computer might help them. Offer the opportunity to decline participation. For those who fill out the questionnaire, interpret the results as follows.

INTERPRETATION OF DATA:

STEP 1: On Krobock report matrix look at each report by title. The column labeled "Utility of this Title" represents the total amount of a respondent's information requirements that are being satisfied by this particular report. Compare the values in this column from report to report. The total (sum) of this column for each report indicates its overall utility among the respondents.

Significance may be found if

- A. The total is high. This represents an important report.
- B. The total is low. This may indicate a need to review the efficacy of the report. Is the total utility of the output worth the cost to produce it?
- C. The total is significantly different from your expectations. This may indicate a need for a closer look at this report.

STEP 2: Wherever significance is found, carefully consider factors 1 through 7. These scores show which factors cause the report to be used or not to be used. These factors may be used as guidelines to improve a given report or to infer reasons for its success.

STEP 3: Wherever significance is found and a further look is deemed desirable, refer directly to the third page of the Krobock questionnaire. Data about the title's frequency of use and comments may be found here.

SUGGESTIONS:

Analysis of the utility value of existing reports can be taken to great depth. Factors 1 through 7 can be correlated back to Pearson's satisfaction factors. It may be possible to trace the reason for a user's satisfaction or dissatisfaction from Pearson's questionnaire to a specific report or reports evaluated by the same user in the Krobock questionnaire.

SPECIFIC APPLICATION: OBJECTIVE 5

OBJECTIVE: To ascertain inferences about activities which may be candidates for microprocessor applications

METHODOLOGY: FEDERLE QUESTIONNAIRE -- Administer and compile data as instructed on pages 23-26 of this manual. Optionally construct an IDEF₀ diagram of the area where there is a possibility of microcomputer applications.

It may be appropriate to modify the list of activities associated with the Federle instrument to more accurately reflect what is done by the target user group. The instruments should be filled out in a group meeting requiring about one hour. Explain the purpose of the effort is to identify needs for new more useful ISG services. Indicate that the results lose value with anonymity but the response could in no way affect one's job situation. It is merely seeking where the computer might help them. Offer the opportunity to decline participation. For those who fill out the questionnaire, interpret the results as follows.

INTERPRETATION OF DATA:

STEP 1: Look at the Federle Matrix I. Look for relatively large numbers where only one or a few respondents scored a particular activity. Find these activities on Matrix II. If the normalized individual score(s) are relatively high, this activity may be a candidate for microcomputer support. The case is even stronger if there is only one person involved in this activity, or those few who are involved do the same job or work in the same area.

STEP 2: If you choose to use IDEF₀, construct diagrams at least one level above the intended application and, if possible, one level more specific. Look for functions which are relatively self-contained, those with few or no outside inputs and few or no outside outputs. Look for functions performed by only one person or a few people who are in close physical proximity. It may be necessary to take a somewhat wider view to find out whether the same function is performed elsewhere in the organization.

SUGGESTIONS:

The steps above can only lead to indications of possible microcomputer applications. The decision or policy involving the use of a microcomputer is a much more complex problem than is dealt with in this section.

SPECIFIC APPLICATION: OBJECTIVE 6

OBJECTIVE: To prioritize specific new application requests.

METHODOLOGY: A variation of the FEDERLE QUESTIONNAIRE shown on pages 23-26 - Follow the steps below.

This analysis assumes that various new application requests have been submitted to ISG. It further assumes that all potential users are aware of the implications of the requests and their impact on user job performance.

Identify the users of the proposed project. These users will be the group of respondents for the questionnaire. About 2 weeks before a group meeting, circulate a list of "Possible Activities" (from the Federle Questionnaire) to each respondent. Ask them to identify those activities which they do that the proposed computer project would support. They may add any activities which are important and time-consuming to the list. Be sure to have them give a description of the activities which they added. Ask that these be returned by a deadline date. As an alternative, interview a few key personnel in each area to represent the personnel who will be respondents. Show them a copy of "Possible Activities". Ask each to identify activities they do that the proposed computer project would support. Also ask them to identify any important and time consuming activities which meet this criteria but are not on the list.

Arrange a time and place (or set of possible times) for the administration of the questionnaire. Schedule the respondents as a group (or several groups). Have the group complete the questionnaire. Approximate time per group will be 30 to 60 minutes. Interpret the data as follows.

Using the active list, create a Federle questionnaire similar to the one in Appendix A-6. Change direction number one on the "Critical Activities" page to read as follows:

- 1) Please list at most 10 activities which you do in your job that would be supported by the proposed xyz computer application. Select from the preceding list.

Add direction number four as below to the "Critical Activities" page.

4) Be sure to give proper attention to Activity 11 which encompasses "All Other Activities".

Prepare and duplicate the requisite number of questionnaires. Follow the direction in STEP 6 and STEP 7 for the Federle Questionnaire found in Section III of this manual. Compile the data as instructed.

INTERPRETATION OF DATA:

The key elements which may aid the prioritization of the application requests are the number of people affected by the related activities, and the "computerizability" of the activities.

1: Look at Matrix I (Total Activity Scores). Look for large numbers in the Total column. Sort the activities by this total score. The larger the number, the more impact the project will have on the organization. On Matrix II (Normalized Scores), find those activities which stood out as large numbers in Step 1. Look at the average score for each of these activities. The larger the normalized score the greater the potential for successful computerization. Tabulate each activity associated with a given application request by evaluating the size of its totals on Matrix I and its potential for successful computerization using Matrix II.

Comparisons may now be made among project proposals. Keep in mind that this instrument only infers potential success and organizational impact. Any conclusions must still be tempered with judgment.

SPECIFIC APPLICATION: OBJECTIVE 7

OBJECTIVE: To ascertain information about the user community through a general audit

METHODOLOGY: PEARSON QUESTIONNAIRE -- Administer and compile data as instructed on pages 19-22 of this manual.

KROBOCK QUESTIONNAIRE -- Also administer only the first page entitled "Data and Information for Job Responsibilities". Compile the data according to the directions on pages 23-27 of this manual.

Review the Pearson questionnaire to determine which subset of factors are significant to the target user community. Modify or X-out the questionnaire as needed. Arrange for a group meeting of the target users. Such a meeting should take 45 minutes to an hour. Explore the purpose of the meeting is to identify areas where presently received ISG outputs are satisfying or dissatisfying so as to improve ISG services. Indicate the complete anonymity of responses. Suggest the importance of candid, well thought out and complete responses. Go over an example of how to fill out the questionnaire. Have users fill out questionnaire before they leave the meeting. Compile the data according to pages of this manual. Interpret the results as suggested below.

INTERPRETATION OF DATA:

This general audit takes a look at general user satisfaction and an overview of the relative amount of computerization being offered. The general level of satisfaction can be obtained by following the direction for "Interpretation of Data" for SPECIFIC APPLICATION: OBJECTIVE 1.

In addition, to obtain insights into the level of computerization, use the Krobock report.

First, look at the column labeled "Not Satisfied" in the matrix. If these numbers are relatively high, the respondents perceive a great unsatisfied need for computerization. If these numbers are generally low, the respondents don't see a need for additional support.

Now, take a more specific view. Identify those users with relatively great unsatisfied needs. Do these respondents have any relation to one another? Are they from the same department or share the same job classification? Look at those with relatively low scores. Ask the same types of questions. Look for any possible relationships to explain the general group of those responding with large and those responding with small numbers.

Finally, look for anything which stands out in the "Satisfied" column. Use the same tactics as above to try to explain general and specific group trends. Find those individuals who are satisfied and dissatisfied by the Pearson measure on the Krobock report you prepared. In general, do the most satisfied people receive more or less computer support? Do they perceive their needs for additional computerization as high, low, or neither? Try to obtain any inference about this group in general. Next, take a look at those most dissatisfied users. Ask yourself similar questions to obtain any inferences about this group. Use these inferences and generalizations to describe the current state of affairs.

Section III

METHODOLOGY: PEARSON QUESTIONNAIRE

The Pearson questionnaire is relatively simple to administer and score. It consists of 39 factors and can be found in its entirety in Appendix A-3. Each question has a rating scale and three pairs of adjectives which assess the user's satisfaction with and perceived importance of each particular factor.

ADMINISTRATION

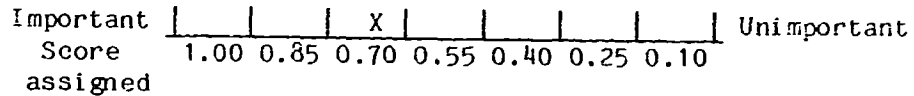
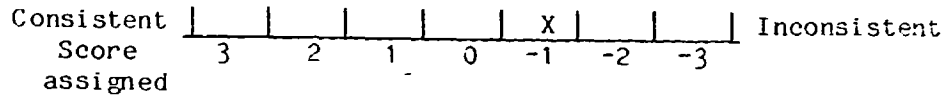
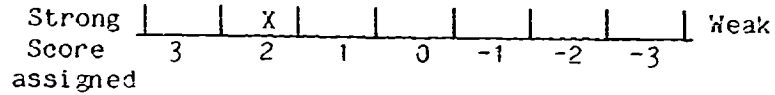
It has been found that completing the questionnaire at a group meeting greatly increased response. We suggest the following procedure.

- A. Read the directions aloud and answer any questions.
- B. Read each factor name and definition. Have the respondents respond to the factor as it is read. Allow the time for responses to be made.
- C. When all factors completed, collect the questionnaires.

COMPILATION OF DATA

Without losing anonymity, you may want to assign a code number to each respondent. If desired, the code may include relevant information such as department, level of job (management, clerical, etc.), and any other pertinent data you may wish to reference later.

Score each response to each of the 39 questions as follows.



Assign the appropriate score according to where the interval has been marked. The example above would be assigned the values of 2, -1, and 0.70 respectively.

Once the questionnaires have been scored, the factor and total satisfaction measures can be calculated. This can be done by hand or via a computer program provided ADOT/ISG. The following is a hand calculation procedure.

STEP 1: For each factor, average the values of the first 2 scales. We'll call this value R_{ij} . This average will range from 3.0 to -3.0.

STEP 2: For each factor, multiple the above average (R_{ij}) by the importance value for that factor (obtained from the third scale). The importance value is W_{ij} . The result of this will be one score for each factor for each respondent, the score being the product ($R_{ij})(W_{ij})$.

STEP 3: To arrive at a satisfaction measure for the respondent, the scores for all factors are totaled.

Mathematically,

$$S_i = \sum_{j=1}^{39} (R_{ij})(W_{ij})$$

where

R_{ij} = the average reaction to factor j for respondent i.

W_{ij} = the importance value of factor j for respondent i.

S_i = The total satisfaction measure for respondent i has a range from +117 to -117.

This sum reflects only the factors to which the respondent has a positive or negative reaction.

STEP 4: The S_i score is now normalized in order to discount consideration of those factors about which the respondent had only neutral reactions. The normalized satisfaction measure is found as follows:

$$NS_i = \frac{S_i}{(F_i)(3.0)}$$

where F_i = the number of meaningful factors (e.g. A meaningful factor is one with a reaction other than those assigned the value of 0 for either of the first two scales.) The range of this normalized score will be -1.00 to +1.00.

To examine questionnaires for implications of the results, 2 matrices should be developed as follows:

MATRIX I: SATISFACTION MATRIX

A. Factor numbers are listed down the vertical axis from 1 to 39. Each respondent by code number is listed at the top across the horizontal axis.

B. For each respondent, the $(R_{ij})(W_{ij})$ score is listed corresponding to the factor for which it was computed. C. All S_i scores (computed in Step 3) are listed along the bottom corresponding to each respondent's code number.

D. Under the S_i score, list the NS_i (Step 4) corresponding to each respondent.

E. In the bottom row, the number of $(R_{ij})(W_{ij})$ scores of 0 (zero) for each respondent is listed.

F. At the rightmost column, average each factor across all respondents.

G. For best results, sort the individual respondents from highest NS_i (normalized score) to lowest and place them from left (for highest) to right (lowest) which corresponds to sorting by most satisfied to least satisfied.

H. Also, sort the questions (factors) from those with the highest average satisfaction (obtained from rightmost column) to

lowest average satisfaction. Place the most satisfying in descending order to the bottom.

MATRIX II: IMPORTANCE MATRIX

- A. Organize as in Step A for MATRIX I.
- B. For each respondent, the w_{ij} (importance) score is listed corresponding to the factor for which it was computed.
- C. In the last row (bottom) list the average importance score for each individual after computing it.
- D. In the rightmost column, list the average importance of each factor.
- E. Sort the individual respondents from greatest individual average importance (from part C above) from left to right.
- F. Sort the questions or factors from most important (top) to least important (bottom) in descending order. (Sort on the average importance computed in D above.)

METHODOLOGY: BAILEY-FEDERLE QUESTIONNAIRE

The Bailey-Federle questionnaire identifies activities which users perform, their relative importance, and time-consumption. Each activity is rated as to the variety of circumstances and structure of the user's response while performing this activity. The questionnaire in its entirety is in Appendix A-2

ADMINISTRATION

The list of activities shown in Appendix A-2 for the Federle questionnaire is not exhaustive. In a given situation, new activities could replace many of those shown. The need is to develop a reasonably complete set of activities which contain the great majority of the target user groups jobs. Consider two methods to create this list of activities.

METHOD I: About two weeks before the group meeting, circulate a list of the "Possible Activities" (from the Federle Questionnaire) to each respondent. Ask them to identify 10 or fewer of those activities which relate to their job. Ask them to add any activities which are important and time consuming that are not on the list. Be sure to have them give a description of the activities which they added. Ask that these be returned by a deadline date.

METHOD II: Interview a few key personnel in each area to represent the personnel who will be respondents. Show them a copy of the "Possible Activities." Ask each to briefly describe which of those activities they do and to identify and describe any important and time consuming activities which are not on the list.

Once the list of activities is created, condense and augment the "Possible Activities" list to encompass the activities of the respondents. Modify the Bailey-Federle questionnaire to correspond to the new activities. Prepare and duplicate the requisite number of questionnaires.

At the group meeting:

- A. Read the directions aloud and answer any questions.
- B. Ask the respondents to mark each activity they feel relates to their job performance as you read them aloud.
- C. Read aloud all three directions on the page titled "Critical Activities."
- D. Allow time for the respondents to fill in the 10 or fewer activities.
- E. After 10-15 minutes ask the group to turn to the first page of "Semantic Differential." Assure respondents they may return to complete this section in just a moment.
- F. Read the directions aloud and answer any questions. Those who have completed the previous page "Critical Activities" may now progress through the remaining pages. Those who have not completed the previous page may return to complete it and then progress through the remainder of the questionnaire.
- G. Collect the questionnaires as they are completed.

Score the questionnaires and compile the data as instructed below. This can be done by hand or via a computer program ADOT/ISG. The following is a hand calculation procedure.

STEP 1: Assign a code number to each respondent. If desired, the code may include relevant information such as department, level of job (management, clerical, etc.) and/or any other pertinent data you may wish to reference later.

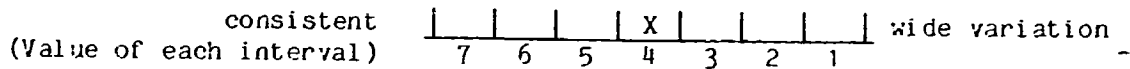
STEP 2: Assign a code number to each of the "Possible Activities" chosen by any of the individuals.

STEP 3: For each activity listed by the respondent, let X_i be the importance score taken directly from the importance column on the questionnaire.

STEP 4: For each activity listed by the respondent, let X_T be the time consumption factor taken directly from the Time-Consumption column on the questionnaire.

STEP 5: For each activity there is a "Semantic Differential" page. Code the 4 interval scales on each page as follows:

EXAMPLE:



The response in the above example would be assigned a value of 4.

B. Add the values of each of the four interval scales for an activity. There will be one total score per "Semantic Differential" page ranging from 4 to 28. This total is called X_v .

C. Normalize each X_v above by multiplying X_v by $\frac{100}{28}$. This will result in a value from 14.286 to 100. This normalized value is called NX_v .

STEP 6: For each activity, calculate X (the final score) according to the following:

$$X = X_I(X_T + NX_v)$$

which is the importance value multiplied by the sum of the time-consumption and the normalized interval scale value.

STEP 7: To examine the implications, develop the following two matrices:

MATRIX I: TOTAL ACTIVITY SCORES

A. List the activities by code number down the vertical axis on the far left side.

B. List the individual respondents across the top by code.

C. For each activity and individual combination, fill in the X score as computed in Step 6.

D. At the far right, add three columns. In the first, place the total amount (sum) of all scores for a given activity.

E. After the total score column place the average across all respondents for each activity. Average only those non-zero scores.

F. Next to the average column, place the number of non-zero scores for each activity.

G. Sort the activities in descending order by the number of non-zero scores. The effect of this is to place the activities shared by the greatest number of people at the top of the matrix.

MATRIX II: NORMALIZED SCORES

A. List the activities by code number down the vertical axis on the far left side.

B. List the individual respondents across the top by code.

C. For each activity, fill in the NX_v value computed in Step 5 corresponding to the individual respondent.

D. In the rightmost column place the average across all respondents for each activity. Average only those non-zero scores.

E. Develop and fill in values for the total and number of non-zeroes as in E and F of MATRIX I.

F. Sort the activities in descending order by the number of non-zero scores. This sort will be identical to that for Matrix I.

METHODOLOGY: KROBOCK QUESTIONNAIRE

The Krobock questionnaire addresses the utility of computer generated information and specific aspects related to that information. It also assesses the percentage of computer generated information the respondent presently uses and what additionally could be computerized. The questionnaire in its entirety is shown in APPENDIX A-2.

ADMINISTRATION

STEP 1: Identify the respondents and duplicate the requisite number of questionnaires.

STEP 2: Arrange a time and place (or set of possible times) for the administration of the questionnaire. Schedule the respondents as a group or several groups. Approximate time per group will be 30 minutes.

STEP 3: A few days before the scheduled administration of the questionnaire, send out a memo asking all of the respondents to list the exact title of all of their computer generated information on the bottom of the memo. To increase consistency, consider including a list of known reports to choose from. Ask them to bring the menu with them to the meeting.

STEP 4: At the meeting:

A. Read aloud the directions for "Data and Information for Job Responsibilities" (labeled 1 and 2). Allow a short time for the respondents to complete this.

B. Read aloud the directions for "Value of Current Information" (labeled 1 and 2). Allow time for completion.

C. After a few minutes when several respondents have finished, ask all respondents to listen to the directions for the next section. Assure those who haven't completed this section that they will have time to return to this section later.

D. Read aloud the directions in Parts I and V of the next page of the questionnaire. Those who have completed the previous page may now complete the questionnaire. Those who were not finished should go back to the preceding page, complete it, and then go on to complete the questionnaire.

E. Collect the questionnaires as they are completed.

STEP 5: Score the questionnaires and compile the data as instructed below.

COMPILATION OF DATA

STEP 1: Assign a code number to each respondent. If desired, the code may include relevant information such as department, level of job (management, clerical, etc.), and any other pertinent data you may wish to reference later.

STEP 2: Assign a code to every computer generated information Title. Transfer the codes to each title listed for all respondents.

NOTE: A computer program on diskette is available to ADGT/ISG to sort the data according to the following directions.

STEP 3: For each computer generated information title, create a report with the following headings.

TITLE# _____

<u>USER#</u>	<u>TOTAL COMPUTERIZED</u>	<u>SATISFIED BY THIS TITLE</u>	<u>UTILITY OF THIS TITLE</u>	<u>FACTORS</u>						
				<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>

A. The column labeled "Total Computerized" is taken directly from the EDP percentage divided by 100 (marked A on the questionnaire).

B. The column labeled "Satisfied by this Report" is the score given by the respondent to this title on the "Value of Current Information" page. This is the score corresponding to the Title of the Information. This number should also be converted to a decimal.

C. "Utility of this Title" can be obtained by multiplying the second column, "Total computerized", by the third column, "Satisfied by this Title".

D. Factors 1 through 7 are taken directly from the third page of the Krobok questionnaire and are labeled as items 1 through 7. These numbers, too, have been converted to decimal form by dividing each by 100.

E. Sum the column "Utility of this Title" and divide by the number of users of this report. Place the score under all entries of that column. Mathematically,

STEP 4: For objective 7 ONLY, create a report with the following columns.

<u>USER#</u>	<u>COMPUTERIZED</u>	<u>NOT COMPUTERIZED</u>	<u>COULD BE</u>	<u>CAN'T</u>	<u>NOT SATISFIED</u>	<u>SATISFIED</u>
--------------	---------------------	-------------------------	-----------------	--------------	----------------------	------------------

Respondents may be ordered randomly down the lefthand "User #" column. Their responses are placed under each appropriate heading in decimal form. These responses come from:

A. The "computerized" response comes from the first page next to EDP (marked A on the questionnaire).

B. "Not computerized" comes from the non-EDP response (marked B on the questionnaire).

C. "Could Be" score comes from the response "Percentage you believe could be computerized" (marked C on the questionnaire).

D. "Can't" scores come from the response "Percentage you believe cannot be computerized" (marked D on the questionnaire).

E. "Not Satisfied" scores are calculated by multiplying B times C. Not satisfied = B*C.

F. "Satisfied" is calculated as follows:

$$\text{Satisfied} = \frac{A}{A + (B*C)}$$

METHODOLOGY: IDEF₀

IDEF models are developed for a specific purpose and with a specific viewpoint. Examples of purposes might be to show relationships among departments in a hospital or among different aspects of a construction business. Examples of viewpoints might be from the viewpoint of a doctor or a construction foreman. Each viewpoint shows a different way of looking at a system. The viewpoint selected should give the desired results. When administering the IDEF methodology, it is necessary to obtain information and feedback from those persons who know the functions and information used in the environment being modeled in order to insure accuracy.

COLLECTION OF DATA

The steps involved in the collection of data are as follows:

STEP 1: Become familiar with the components of IDEF₀ as defined in the next section "Components of the Model".

STEP 2: Set the limits of scope of the model. Determine the viewpoint to be taken. Determine the desired level of specificity.

STEP 3: Identify those key individuals to interview which will encompass the scope to be modeled, the viewpoint to be taken, and the required level of specificity.

STEP 4: Schedule and conduct the interviews as follows. Approximate time per interview will be from 20 to 90 minutes.

A. Begin with the individual who can give the most general overview of the model's scope. (The modeler may want to identify one level above the scope.) Proceed by interviewing people with successively more confined views of the model scope.

B. Show each individual the previously developed portion of the model and ask him/her to identify where his/her functions would fit into the model.

C. Use the information from each interview to modify the model as it then exists.

STEP 5: Construct the model as the information is obtained from the interviews. It is best to sketch each segment of the model during the interview and obtain feedback from the interviewee at this time.

STEP 6: Complete a rough draft of the model including all elements explained in the section "Components of the Model".

STEP 7: Disseminate this information to each interviewee (and, perhaps, other interested parties). Ask for feedback within a given time frame.

STEP 8: Use the feedback from Step 7 to compile the final model.

COMPONENTS OF THE MODEL

The construction of the model is illustrated in Figure 1. A box is drawn for the major function of the organization being modeled. The box is labeled with the name of the function--using a verb, since a function is something that is performed (i.e., an activity). Inputs into that function (such as "request for information") are indicated with an arrow going into the left side of the box. Controls (influences on the function which do not themselves produce output, such as written procedures) are indicated with arrows coming into the top of the box. Outputs are indicated with arrows going out of the right side of the box. This first model is called the A-0 (A minus zero) diagram.

From the A-0 diagram, several major subfunctions are identified. Boxes representing these functions are drawn on a new diagram, called the A0 (A zero) diagram. The same procedure is applied to these functions as for the organization's major function but now relationships are identified among the functions. An output of one function may be an input to, or a control on, another function. Any of the functions on this diagram may be likewise broken down into further subfunctions. Only those functions the analyst is concerned with need be broken down. Figure 2 illustrates the identifying of relationships among functions.

Each diagram is given a number which identifies its place in the sequence of diagrams. The first diagram is the A-0 diagram. The next diagram is the A0 diagram. On the A0 diagram, the subfunctions of the major organizational function are drawn. Each of these boxes is given a number (1, 2, 3, etc.). Any of these boxes which are further broken down will carry its number into its new diagram. For example, if box 1 on diagram A0 is to be broken down, its new diagram will be A1. The boxes in this new diagram (A1) will be numbered (1, 2, 3, etc.). Should

any of these boxes be further broken down, their new diagrams will be numbered A11, A12, A13, etc., adding to the last diagram number the number of the box being broken down. In this way the diagrams can be traced back through all of its breakdowns to the original diagram. Because new diagrams are broken down from previous diagrams, the diagram being broken down is called the parent diagram and the new diagram is called the daughter diagram. The breaking down of functions into subfunctions and the numbering procedure is illustrated in Figure 3.

In order to show which loose-ended inputs, controls, and outputs on a parent diagram are the corresponding loose-ended inputs, controls, and outputs on its daughter diagram, codes may be used. The codes are numbered for the inputs I1, I2, etc., for the controls C1, C2, etc., and for the outputs O1, O2, etc. The same code number would be used on the corresponding loose-ended arrows in the parent and daughter diagrams. In a situation where the codes make the model easier to read, the codes should be used.

Besides the actual IDEF drawings, several other items are included in an IDEF model. The purpose and viewpoint should always be stated so that anyone reading the model will understand the perspective taken in modeling. Any terms used in modeling which need clarification can be defined in a glossary, preferably on the page on which the term was used. For explanations of functions which do not lend themselves to specific IDEF modeling techniques, an "FEO" or "For Exposition Only" diagram may be created. These diagrams may use any technique necessary to clarify the function and are simply attached to the IDEF drawings.

IDEF models may be general or specific. An entire organization may be modeled without consideration of who performs what function or a specific position in an organization may be modeled. The purpose for creating an IDEF model determines what kind of a model it will need to be. Information flows for an organization as a whole may be needed in some cases, and in other cases an analyst may wish to model a single position. For inputs, outputs, and controls in a general model, general terms such as "report" could be used and in a specific model, actual report titles could be used.

If more information about IDEF is desired, material explaining the methodology in great detail is available from the ICAM CM Library,

AFWAL/MLTC, Wright-Patterson Air Force Base, Ohio 45433. Also, a completed model of ADOT Right of Way Department may be found in Appendix A of the Final Report to ADOT.

APPENDIX A-1

Bailey-Federle Questionnaire

POSSIBLE ACTIVITIES

INTRODUCTION:

In the course of doing your job on a day to day basis, you assume many roles. Each role is composed of many activities. Some of these activities are more important to your success and some consume more of your time than others. The following is a list of examples of activities you might assume. Each activity has a brief explanation of its meaning. In completing the form titled "CRITICAL ACTIVITIES" (on p.4), attempt to select from the activities (whose names are underlined) which follow.

POSSIBLE ACTIVITIES

Forecasting: To predict future situations.

Organizational Planning: To assess, acquire, or alter organizational capabilities.

Conflict Management: To identify and resolve conflicts between subordinates.

Resource Crisis Resolution: To implement decisions caused by personnel or material shortfall.

Programming: To establish the sequence and priority for resource acquisition and use.

Staffing: To establish staffing needs.

Establish Operating Policies: To establish wage and operational policies and procedures.

Budgeting: To establish budgets for subordinates' activities.

Financial Analysis and Control: To manage cash flow and capital structure.

Scheduling: To establish and coordinate the occurrence of subordinates' activities.

Auditing and Inspecting: To monitor and evaluate the performance of subordinates.

Budget Negotiating: To negotiate budgetary needs with subordinates.

Committee Work: To attend meetings so as to gain and pass on information.

Monitor Operating Performance: To gain and pass on information as to subordinates' performance.

Mail and Report Analysis: To read received documents and gain general information.

Monitor Business Indicators: To gain information about internal, external, and political developments.

Communicating with Subordinates: To pass on oral or written information to subordinates.

Professional (Technical) Consulting: To gain or pass on specialized or technical information.

Responding to Information Requests from Outsiders: To pass on information to non-subordinates.

Performance Reporting: To pass on performance information.

Financial Reporting: To pass on financial information.

Public Relations: To represent the organization to the public.

Document Authentication: To validate organization documents.

Personal Interaction with Subordinates: To motivate and provide face to face leadership.

Coaching and Training: To train, council, and advise subordinates.

Personnel Development: To plan and prepare for subordinate promotion.

Performance Counseling: To review and then correct or praise subordinates for their performance.

Employee Relations: To develop good working attitudes in subordinates.

Committee Chairman: To lead non-subordinate groups.

Client/Customer Relations: To relate with customers.

Activities with Outsiders: To relate with the general public.

External Coordinating Activities: To work with others in the organization.

CRITICAL ACTIVITIES

DIRECTIONS:

1. Please list 10 or fewer activities which are most critical to your job success. Select from the preceeding list.

2. Now, divide 100 points of importance among the 11 or fewer items you've listed. Give more points to those activities which have the greatest impact on your job performance. Place your responses in the column marked "IMPORTANCE" corresponding to each item. Make sure the total equals 100 points.

3. Next, divide 100 points of time-consumption, meaning, in the long run, how your work time is divided. Show the relative amount of time spent on each item on your activity list. Place your responses in the column marked "TIME-CONSUMPTION" corresponding to each item. Make sure the total equals 100 points.

	IMPORTANCE	TIME-CCNSUMPTION
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____
11. ALL OTHER ACTIVITIES _____	_____	_____
	100	100

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 1 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistant". Rate activity 1 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
CONSISTENT														WIDE VARIATION
SIMILAR														FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
PROCEDURAL														INTUITIVE
CONSISTENT														CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 2 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistant". Rate activity 2 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
CONSISTENT														WIDE VARIATION
SIMILAR														FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
PROCEDURAL														INTUITIVE
CONSISTENT														CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 3 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistent". Rate activity 3 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
CONSISTENT														WIDE VARIATION
SIMILAR														FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
PROCEDURAL														INTUITIVE
CONSISTENT														CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 4 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistant". Rate activity 4 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
CONSISTENT								WIDE VARIATION

SIMILAR								FREQUENTLY NOVEL
---------	--	--	--	--	--	--	--	------------------

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
PROCEDURAL								INTUITIVE

CONSISTENT								CHANGING
------------	--	--	--	--	--	--	--	----------

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 5 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistant". Rate activity 5 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
CONSISTENT														WIDE VARIATION
SIMILAR														FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
PROCEDURAL														INTUITIVE
CONSISTENT														CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 6 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistant". Rate activity 6 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
CONSISTENT								WIDE VARIATION
SIMILAR								FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
PROCEDURAL								INTUITIVE
CONSISTENT								CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 7 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistent". Rate activity 7 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
CONSISTENT								WIDE VARIATION
SIMILAR								FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
PROCEDURAL								INTUITIVE
CONSISTENT								CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 8 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistant". Rate activity 8 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
CONSISTENT														WIDE VARIATION
SIMILAR														FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
PROCEDURAL														INTUITIVE
CONSISTENT														CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 9 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistent". Rate activity 9 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
CONSISTENT								WIDE VARIATION
SIMILAR								FREQUENTLY NOVEL

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
PROCEDURAL								INTUITIVE
CONSISTENT								CHANGING

SEMANTIC DIFFERENTIAL

DIRECTIONS: On the line below, write the activity 10 from your list on page 4.

Four pairs of adjectives are listed below with adverbial modifiers. Reading one adverb vertically and one adjective horizontally, pairs are formed such as "extremely consistant". Rate activity 10 on each adverbial scale by placing an X under the most correct adverb for each pair of adjectives. Make only one mark on each scale.

VARIETY OF CIRCUMSTANCES

(Variety indicates the frequency of unexpected and novel events that occur in the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
CONSISTENT														WIDE VARIATION

SIMILAR														FREQUENTLY NOVEL
---------	--	--	--	--	--	--	--	--	--	--	--	--	--	------------------

STRUCTURE OF RESPONSE

(Structure indicates the stability of the process followed in doing the activity.)

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
PROCEDURAL														INTUITIVE

CONSISTENT														CHANGING
------------	--	--	--	--	--	--	--	--	--	--	--	--	--	----------

APPENDIX A-2
KROBOCK QUESTIONNAIRE

DATA AND INFORMATION FOR JOB RESPONSIBILITIES

DIRECTIONS:

1) Please indicate the percentage of the information you use in your job which comes from the following sources (Please be sure the total adds up to 100):

	<u>Percentage</u>
ELECTRONIC DATA PROCESSING (EDP) (Computer-generated)	A. _____
NON-ELECTRONIC DATA PROCESSING Examples are meetings (formal or informal), telephone calls, non-computer reports.	B. _____
TOTAL	100

2) Of the information which is "NON-ELECTRONIC DATA PROCESSING", please estimate how much you think could be computerized if there were resources to do so. (Please be sure the total adds up to 100).

	<u>Percentage</u>
PERCENTAGE YOU BELIEVE <u>COULD</u> BE COMPUTERIZED.	C. _____
PERCENTAGE YOU BELIEVE <u>CANNOT</u> BE COMPUTERIZED.	D. _____
TOTAL	100

VALUE OF CURRENT INFORMATION

DIRECTIONS:

1) Please list the computer-generated information you are currently receiving. Use exact names of reports, etc. whenever possible.

2) These reports should constitute the total ELECTRONIC DATA PROCESSING information which you receive. Divide 100 points among the listed reports as to the relative contribution of each report to your total information needs. (Please make sure the total equals 100.)

<u>TITLE OF INFORMATION</u>	<u>SCORE</u>
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____
11. _____	_____
12. _____	_____
13. _____	_____
14. _____	_____
TOTAL	100

I. DIRECTIONS:

From the previous page, list one of the information titles below. List the remainder, one title per page, on the pages which follow. Complete parts III, IV and V with regard to the title you listed in part II.

II. TITLE OF INFORMATION:

III. HOW OFTEN DELIVERED:

IV. NUMBER OF TIMES USED IN A MONTH:

V. DIRECTIONS:

Please score the computed-generated information listed above from 0 to 100 with regard to the aspects below. Base your ratings on how these aspects affect the usefulness of the above listed item. Your score should reflect the relative usefulness of each aspect as compared to the others. Your total score should add up to 100 points.

TIMELINESS AFFECTS ON USEFULNESS

- | | |
|--|----------|
| 1. Item must be delivered on <u>time</u> | 1. _____ |
| 2. Data must be <u>current</u> | 2. _____ |

CONTENT AFFECT ON USEFULNESS

- | | |
|--|----------|
| 3. Data must be <u>accurate</u> | 3. _____ |
| 4. Item must be <u>relevant</u> to use | 4. _____ |
| 5. Data must be <u>adequate</u> | 5. _____ |

CONVENIENCE AFFECTS ON USEFULNESS

- | | |
|------------------------------------|----------|
| 6. Item must be <u>easy</u> to use | 6. _____ |
| 7. Item must be <u>handy</u> | 7. _____ |

TOTAL

100

VI. COMMENTS ABOUT THIS REPORT:

APPENDIX A-3

PEARSON QUESTIONNAIRE

USER SATISFACTION

Directions:

Each of the following questions has a set of four scales with pairs of words surrounding each scale. Rate each question by placing an X under the most correct adverb. Place only one X between each pair of adjectives (i.e. strong, weak).

1. Top management involvement: The positive or negative degree of interest, enthusiasm, support, or participation of any management level above the user's own level toward computer-based information systems or services or toward the computer staff which supports them.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
strong								weak
consistent								inconsistent
important								unimportant

2. Organizational competition with the ISG unit: The contention between the respondent's organizational unit and the ISG unit when vying for organizational resources or for responsibility for success or failure of computer-based information systems or services of interest to both parties.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
low								high
harmonious								dissonant
important								unimportant

3. Priorities determination: Policies and procedures which establish precedence for the allocation of ISG resources and services between different organizational units and their requests.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
fair								unfair
consistent								inconsistent
important								unimportant

4. Charge-back method of payment for services: The schedule of charges and the procedures for assessing users on a pro rata basis for the ISG resources and services that they utilize.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
reasonable								unreasonable
consistent								inconsistent
important								unimportant

5. Relationship with the ISG staff: The manner and methods of interaction, conduct, and association between the user and the ISG staff.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
good								bad
cooperative								uncooperative
important								unimportant

6. Communication with the ISG staff: The manner and methods of information exchange between the user and the ISG staff.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
precise														vague
meaningful														meaningless
important														unimportant

7. Technical competence of the ISG staff: The computer technology skills and expertise exhibited by the ISG staff.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
current														obsolete
sufficient														insufficient
important														unimportant

8. Attitude of the ISG staff: The willingness and commitment of the ISG staff to subjugate external, professional goals in favor of organizationally directed goals and tasks.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
cooperative														belligerent
courteous														discourteous
important														unimportant

9. Schedule of products and services: The ISG center timetable for production of information system outputs and for provision of computer-based services.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
regular								irregular
reasonable								unreasonable
important								unimportant

10. Time required for new development: The elapsed time between the user's request for new applications and the design, development, and/or implementation of the application systems by the ISG staff.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
short								long
acceptable								unacceptable
important								unimportant

11. Processing of change requests: The manner, method, and required time with which the ISG staff responds to user requests for changes in existing computer-based information systems or services.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
timely								untimely
flexible								rigid
important								unimportant

12. Vendor support: The type and quality of the service rendered by a vendor, either directly or indirectly, to the user to maintain the hardware or software required by that organizational status.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
sufficient														insufficient
eager														indifferent
important														unimportant

13. Response/turnaround time: The elapsed time between a user-initiated request for service or action and a reply to that request. Response time generally refers to the elapsed time for terminal type request or entry. Turnaround time generally refers to the elapsed time for execution of a program submitted or requested by a user and the return of the output to that user.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
good														bad
consistent														inconsistent
important														unimportant

14. Means of input/output with ISG center: The method and medium by which a user inputs data to and receives output from the ISG center.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
clear														hazy
efficient														inefficient
important														unimportant

15. Convenience of access: The ease or difficulty with which the user may act to utilize the capability of the computer system.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
convenient								inconvenient
efficient								inefficient
important								unimportant

16. Accuracy: The correctness of the output information.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
accurate								inaccurate
consistent								inconsistent
important								unimportant

17. Timeliness: The availability of the output information at a time suitable for its use.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
timely								untimely
consistent								inconsistent
important								unimportant

18. Precision: The variability of the output information from that which it purports to measure.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
sufficient														insufficient
consistent														inconsistent
important														unimportant

19. Reliability: The consistency and dependability of the output information.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
consistent														inconsistent
sufficient														insufficient
important														unimportant

20. Currency: The age of the output information.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
timely														untimely
adequate														inadequate
important														unimportant

21. Completeness: The comprehensiveness of the output information content.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
complete														incomplete
consistent														inconsistent
important														unimportant

22. Format of output: The material design of the layout and display of the output contents.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
simple														complex
useful														useless
important														unimportant

23. Language: The set of vocabulary, syntax, and grammatical rules used to interact with the computer systems.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
powerful														weak
easy-to-use														hard-to-use
important														unimportant

24. Volume of output: The amount of information conveyed to a user from computer-based systems. This is expressed not only by the number or reports or outputs but also by the voluminousness of the output contents.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
concise								redundant
reasonable								unreasonable
important								unimportant

25. Relevancy: The degree of congruence between what the user wants or requires and what is provided by the information products and services.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
relevant								irrelevant
clear								hazy
important								unimportant

26. Error recovery: The methods and policies governing correction and rerun of system outputs that are incorrect.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
superior								inferior
complete								incomplete
important								unimportant

27. Security of data: The safeguarding of data from misappropriation or unauthorized alteration or loss.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
good														bad
definite														uncertain
important														unimportant

28. Documentation: The recorded description or an information system. This includes formal instructions for the utilization of the system.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
clear														hazy
current														obsolete
important														unimportant

29. Expectations: The set of attributes or features of the computer-based information products or services that a user considers reasonable and due from the computer-based information support rendered within his organization.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
pleased														displeased
definite														uncertain
important														unimportant

30. Understanding of systems: The degree of comprehension that a user possesses about the computer-based information systems or services that are provided.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
sufficient								insufficient
complete								incomplete
important								unimportant

31. Perceived utility: The user's judgment about the relative balance between the cost and the considered usefulness of the computer-based information products or services that are provided. The costs include any costs related to providing the resource, including money, time, manpower, and opportunity. The usefulness includes any benefits that the user believes to be derived from the support.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
positive								negative
useful								useless
important								unimportant

32. Confidence in the systems: The user's feelings of assurance or certainty about the systems provided.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
definite								uncertain
good								bad
important								unimportant

33. Feeling of participation: The degree of involvement and commitment which the user shares with the ISG staff and others toward the functioning of the computer-based information systems and services.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
encouraged								repelled
sufficient								insufficient
important								unimportant

34. Feeling of control: The user's awareness of the personal power or lack of power to regulate, direct or dominate the development, alteration, and/or execution of the computer-based information systems or services which serve the user's perceived function.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
sufficient								insufficient
precise								vague
important								unimportant

35. Degree of training: The amount of specialized instruction and practice that is afforded to the user to increase the user's proficiency in utilizing the computer capability that is unavailable.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
complete								incomplete
sufficient								insufficient
important								unimportant

36. Job effects: The changes in job freedom and job performance that are ascertained by the user as resulting from modifications induced by the computer-based information systems and services.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
significant														insignificant
valuable														worthless
important														unimportant

37. Organizational Position of the ISG Function: The hierarchical relationship of the ISG function to the overall organizational structure.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
appropriate														inappropriate
strong														weak
important														unimportant

38. Flexibility of Systems: The capacity of the information system to change or to adjust in response to new conditions, demands, or circumstances.

	EXTREMELY		QUITE		SLIGHTLY		NEITHER		SLIGHTLY		QUITE		EXTREMELY	
flexible														rigid
sufficient														insufficient
important														unimportant

39. Integration of systems: The ability of systems to communicate/transmit data between systems servicing different functional areas.

	EXTREMELY	QUITE	SLIGHTLY	NEITHER	SLIGHTLY	QUITE	EXTREMELY	
complete								incomplete
successful								unsuccessful
important								unimportant

Guide for Creating the Analysis Data Base and Linking Analysis Programs to It.

INTRODUCTION

The ISG (ADOT) has been provided four identical diskettes which contain the eight data analysis programs developed and used for this project. The programs are specific for the data collected, and therefore will require some modification if used for newly collected data. This will be further explained in the following sections.

These programs were developed on an IBM PC/XT microcomputer and therefore must be run on the same, or highly compatible, equipment. Specific needs of the programs are the EDLIN line editor and the BASICA Basic-Language compiler.

PREPARATION OF DATA FOR ENTRYRespondent Identification Numbers

Each respondent should be assigned an identification number ranging from 100 to 199. This identification number must be used for each questionnaire completed by this respondent. Note that for a given analysis no more than 100 respondents can be identified by the programs (for later purposes of this report the respondent number is coded IDN).

Pearson Questionnaire Data

In the Pearson questionnaire, each respondent answers a series of 39 questionnaires by checking a set of three scales for each question.

The first two of these scales are identified as "Satisfaction" scale. Numeric values for these scales should be assigned according to Table 1.

TABLE 1 - Unweighted levels of satisfaction for individual participants for individual factors

<u>Value</u>	<u>Level of Satisfaction</u>
+3	Extremely Satisfied
+2	Quite Satisfied
+1	Slightly Satisfied
0	Neither Satisfied nor Dissatisfied or not applicable
-1	Slightly Dissatisfied
-2	Quite Dissatisfied
-3	Extremely Dissatisfied

The third scale is identified as the "Importance" scale. Numeric values of this scale should be assigned according to Table 2.

TABLE 2 - Levels of Importance

<u>Value</u>	<u>Level of Importance</u>
1.00	Extremely Important
.85	Quite Important
.70	Slightly Important
.55	Neither Important nor Unimportant or not applicable
.40	Slightly Unimportant
.25	Quite Unimportant
.10	Extremely Unimportant

These three specific data points are coded as a Satisfaction Trio ("ST").

Bailey-Federle Questionnaire Data

In the Bailey-Federle questionnaire each respondent is asked to consider an initial list of 32 activities he/she might perform. In addition, the respondent is urged to add activities to this list that are peculiar to his/her own job.

A master list of all possible activities must be compiled after administration of this questionnaire and identification numbers assigned. The identification numbers for the original 32 activities are 200 through 231, all additional activities should be numbered consecutively starting with 232. No activity may be numbered greater than 299. (A maximum of 100 activities). Activity number is coded as "AN."

The respondent lists as many activities as he/she wishes (with a limit of 10) and evaluates the importance (coded IM) and time-consumption (coded TC) of each. (This may be a one-to-three digit number).

The respondent then evaluates each activity with four scales. Each of these scales allows a check mark to be placed in one of 7 categories. These responses must be assigned numeric values, with a 1 assigned to a check in the far right category and ranging to a 7 for a check in the far left category. (These values are coded "VS").

The number of different activities each respondent lists must be identified and maintained for use in the data analysis program.

Krobock Questionnaire Data

The Krobock questionnaire data is divided into three distinct components: 1) Computerizability of information; 2) Relative value of use for each computer generated report; and 3) usefulness of each computer generated report.

The data is coded so that it can be entered into the data base in two modules. The first module contains data from components 1) and 2) identified in the preceding paragraph. The data for 1) computerizability of information are directly shown in one-to-three digit numeric values and are coded as "A", "B", "C" and "D." To properly code the data for, 2) relative value of use for report, all questionnaires must be collected and all reports identified by respondents must be tabulated. The report titles should be listed in order and identification numbers assigned ranging from 300 to 399 (a maximum of 100 reports). These numbers are coded "RN." For a given respondent, all reports listed must be assigned identification numbers and the total number of reports listed should be counted and kept for later use. The value score for each report is numeric (one-to-three digits) and is coded "VR." This concludes the data coding for the first module of the Krobock data.

The second module contains data for the 3) usefulness of each computer generated report. Each report the respondent lists is evaluated according to seven (7) aspects of usefulness. These evaluations (coded UE) are numeric (one-to-three digits).

DATA FILES AND DATA ENTRY

Three data files must be created using the EDLIN editor. There is one data file associated with each of the three sets of questionnaire data. Since the analysis programs are written in BASIC, each specific data point, or value, must be separated from the succeeding value by one or more blank spaces.

For convenience in explaining data entry format Table 3 presents a summary of the code names associated with the data collection questionnaires.

TABLE 3
Code Identification for Data Entry

<u>Code</u>	<u>Description</u>	<u>Questionnaire</u>
IDN	Respondent Number	All
ST	Satisfaction Trio (three data points for each question)	Pearson
AN	Activity Number	Bailey-Federle
IM	Importance of Activity	Bailey-Federle
TC	Time Consumption of Activity	Bailey-Federle
VS	Variety and Structure (four data points for each activity)	Bailey-Federle
A,B,C,D	Computerizability of Information Reports	Krobock
RN	Report Number	Krobock
VR	Value of Report	Krobock
UE	Usefulness Evaluations (seven data points for each report)	Krobock

DATAL - Data File for Pearson Questionnaire Data

Using the EDLIN line editor to create (or identify) the data file DATAL, the data from the Pearson questionnaire is entered as follows (the commas are

used to delimit the code identification, they are not required for actual data entry).

For each respondent the first data line is:

IDN, ST₁, ST₂, . . . , ST₇

The second through fifth data lines are;

ST_{i+1}, ST_{i+2}, . . . , ST_{i+7} (Satisfaction trios for each successive set of seven questions)

the sixth data line includes the satisfaction trios for the last four questions.

Example 1 shows a sample of how the data is stored in DATA 1

EXAMPLE 1

```

C>TYPE A: DATA1
100 1 2 .85 -2 2 .85 2 2 1.0 1 1 .85 2 2 1.0 2 3 1.0 2 2 1.0
    3 3 1.0 2 2 1.0 -1 2 1.0 2 2 1.0 2 2 1.0 2 2 1.0 2 2 1.0
    2 2 1.0 2 2 1.0 2 2 1.0 2 2 1.0 2 2 1.0 3 3 1.0 2 2 1.0
    2 3 1.0 3 -1 1.0 2 2 1.0 2 2 1.0 2 2 1.0 2 2 1.0 2 3 1.0 2 2 1.0
    2 2 1.0 2 2 1.0 2 3 1.0 2 2 1.0 2 2 1.0 2 2 .85 2 2 1.0 1 1 1.0
    1 2 1.0 2 3 1.0 2 2 1.0 2 2 1.0
101 2 2 .85 2 -2 .70 1 1 .55 1 1 .70 0 2 .85 -2 -1 .85 1 -1 .85
    1 2 .70 0 0 .55 -2 -1 .70 1 1 .55 -1 -1 .70 -1 -1 .70 1 0 .55
    1 -1 .70 2 2 .85 1 1 .70 2 2 .85 1 1 .70 1 1 .55 1 1 .70
    0 0 .55 0 -1 .85 -1 0 .55 1 1 .70 -1 0 .70 0 0 .55 0 0 .55
    -1 0 .70 -1 -1 .70 1 1 .70 0 1 .70 0 0 .55 -1 0 .70 -2 -2 .70
    1 -1 .55 0 0 .55 -1 0 .70 -1 -1 .70
103 0 0 .55 -2 0 .85 -2 0 .85 0 0 .55 0 -1 1.0 -2 1 1.0 -1 -1 1.0
    1 2 1.0 2 0 1.0 -2 0 1.0 -2 0 1.0 0 0 .35 0 2 .85 2 -2 1.0
    -2 -2 1.0 2 2 1.0 1 3 1.0 -2 0 1.0 2 1 1.0 -1 -1 1.0 -2 0 1.0
    -1 -1 1.0 -1 -1 .70 2 2 .85 2 2 .85 -1 0 1.0 0 0 .40 -2 -1 1.0
    -2 2 .85 -1 -1 .85 -1 -1 .85 -1 -1 .85 -1 -1 .85 -1 0 .85 -2 -2 .85
    0 0 .55 0 0 .55 -1 -1 .85 0 0 .35
105 3 3 1.0 -3 3 1.0 0 0 .55 0 0 .55 2 2 .85 2 2 .85 2 2 .85
    3 2 .85 0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55 1 1 .70
    0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55 -1 0 .55
    0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55
    0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55 0 0 .55
    0 0 .55 0 0 .55 0 0 .55 0 0 .55

```

DATA2 - Data File for Bailey-Federle Questionnaire Data

Using the EDLIN line editor to create (or identify) the data file DATA2, the data from the Bailey-Federle questionnaire is entered as follows.

For each respondent the first data line is:

IDN, AN, IM, TC, VS;

each succeeding data line is,

AN, IM, TC, VS.

Note that each activity identified by that respondent has its own data line and the total number of activities for each respondent must be tallied, in order of entry, and kept for later use.

Example 2 shows a sample of how the data is stored in DATA 2.

EXAMPLE 2

```
C:\TYPE A:DATA2
100 214 35 35 5 6 6 6
    216 25 25 2 6 6 6
    217 5 5 7 7 6 6
    228 10 10 2 2 2 2
    229 15 15 5 6 6 6
    230 10 10 3 6 5 3
101 217 10 10 6 3 5 3
    230 15 35 4 3 6 6
    231 75 55 2 3 5 3
103 200 5 10 6 3 3 2
    214 5 10 5 5 6 6
    217 5 10 2 6 2 3
    218 75 40 2 2 3 3
    230 5 5 6 6 6 6
    299 5 25 0 0 0 0
105 214 30 0 6 0 6 0
    216 30 0 6 0 6 0
    218 2.5 0 6 0 6 0
    220 2.5 0 6 0 6 0
    221 5 0 6 0 6 0
    228 10 0 6 6 6 6
    229 10 0 6 6 6 6
    230 10 0 6 6 6 6
106 204 20 20 6 6 6 6
    213 5 5 2 5 6 6
    216 20 20 6 3 2 5
    218 5 5 2 3 2 5
    221 40 40 6 6 6 6
    230 10 10 5 5 5 5
```


DATA3 - Data File for Krobock Questionnaire Data

As noted earlier, data from the Krobock questionnaire is stored in data file, DATA3, in two distinct modules. The first module contains data regarding: 1) computerizability of information; and 2) relative value of use for each computer generated report.

For this module, use the EDLIN line editor to create (or locate the appropriate line number in the existing file) the data file DATA3, and enter the data from the Krobock questionnaire as follows.

For each respondent the data line is;

IDN, A, B, C, D, RN, VR, RN, VR, . . . , RN, VR

if necessary additional data lines may be entered as;

RN, VR, RN, VR

The second module contains the seven factors concerning the 3) usefulness of each computer generated report. This data must be listed in exactly the same order as the reports listed in the first module.

For this module, use the EDLIN line editor to add data lines to the existing data file, DATA3.

For each respondent the first data line is:

IDN, UE

each succeeding line (one per information report) is;

UE.

Example 3 shows a sample of how the data is stored in DATA3.

EXAMPLE 3

```

C)TYPE A:DATA3
100 50 50 30 70 300 30 301 25 302 45
101 85 15 0 100 303 97 304 3
103 15 85 90 10 305 20 306 75 307 5
105 30 70 60 40 310 50 308 25 309 25
106 10 90 20 80 301 90 309 5 311 3
109 20 80 50 50 312 45 313 45 314 10
111 0 100 2 98
114 60 40 50 50 315 60 303 40
119 20 80 50 50 310 50 316 5 301 25 317 10 314 10
120 2 98 5 95 318 100
121 75 25 80 20 319 15 320 15 302 20 321 10 322 10 323 30
    126 40 40 30 70 324 13 325 5 326 20 327 10 328 20 329 10 330 10 304 2 331 5
        332 5
127 37 73 15 85 313 15 333 10 334 25 337 10 335 25 312 15
130 25 75 5 95 336 25 332 50 338 10 335 10 311 5
133 20 80 45 55 335 45 339 5 341 10 313 5 301 25 340 10
135 5 95 15 85 317 20 345 40 300 40
138 40 60 75 25 317 40 316 10 308 10 305 10 342 10 343 10 344 10
    146 40 60 20 80 345 50 336 10 346 10 343 5 347 5 311 5 305 5 344 5 301 5
147 0 100 0 100 348 100
153 10 90 35 65 301 70 309 30
155 10 90 40 60 312 36 301 37 349 5 353 5 348 1 350 1 351 1 352 1 313 5
324 : 333 1 335 1 354 5
156 65 35 0 100 348 100
157 10 90 10 90 355 50 356 50
159 50 50 90 10 303 100
161 50 50 75 25 313 85 334 5 357 10
100 0 30 30 20 10 0 10
    20 30 20 20 10 0 0
    20 20 20 10 10 10 10
101 5 5 50 10 15 10 5
    10 10 30 10 10 15 15
103 20 15 20 10 10 10 15
    20 15 20 10 10 10 15
    20 5 5 25 5 20 20
105 0 50 50 0 0 0 0
    75 0 12.5 12.5 0 0 0
    50 25 12.5 12.5 0 0 0
106 20 30 10 5 5 20 10
    10 20 30 5 5 20 10
    10 30 30 10 10 5 5
109 5 20 30 5 15 10 15
    5 20 20 10 15 15 15
    5 20 20 10 15 15 15
111
114 10 20 30 20 10 5 5
    20 10 50 10 5 6 0
119 15 15 20 10 15 15 10
    5 10 50 5 20 10 0
    5 5 50 10 20 10 0
    20 20 50 0 0 10 0
    25 20 40 0 5 10 0
120 10 45 45 0 0 0 0
121 25 20 20 10 5 10 10
    25 20 20 10 5 10 10
    20 20 20 10 10 10 10
    20 20 20 20 5 10 5
    20 20 20 10 15 5 10
    10 25 20 10 15 10 10
126 5 20 30 10 15 5 15
    5 30 25 10 10 5 15

```

PROGRAMS FOR DATA ANALYSIS

As noted earlier, eight data analysis programs were developed for this project. These programs use the data files (DATA1, DATA2 and DATA3) previously discussed. In addition, two of the programs create additional data files (DATA101 and DATA201) which are then stored. These two "new" data files will be explained in the next two sections of this report.

Since these programs were developed specifically for this project there are specific commands which must be altered when the questionnaires are used to develop additional data. Several of these commands apply to all eight programs and are presented in this section. Other commands are specific to specific programs and are presented with those programs.

The general commands, which must be changed in all programs, are:

1. NN=25. This study had 25 respondents, a different number of respondents will require NN=(new number). This command is line 10 or 20 in all programs.
2. All programs, in listing results, will stop after one page has been printed, to continue printing a Y key must be pressed.
3. A three digit number must be used to identify all respondents.

The specific programs and command changes are presented below.

Programs PLS-NS and PLS-NSAG

These programs work in conjunction to create a matrix based on the Person questionnaire data (DATA1). This matrix is "Normalized Satisfaction" sorted by average. Program PLS-NS calculates average values of normalized satisfaction, sorts them according to average, creates DATA101, and stores these values in DATA101. Program PLS-NSAG uses DATA101 and produces the final result.

The only specific command which might need to be changed is QN=39 (line 20) if fewer than 39 questions are used in the Pearson questionnaire.

Programs P1IMP2 and P1IMP3

These programs work in conjunction to create a matrix based on the Pearson questionnaire data (DATA1). This matrix is "Importance" sorted by average. Program P1IMP2 calculates average values of perceived importance, sorts them according to average, creates DATA201, and stores these values in DATA201. Program P1IMP3 uses DATA201 and produces the final result.

The only specific command which might need to be changed is QN=39 (line 20) if fewer than 39 questions are used in the Pearson questionnaire.

Program P2NXV

This program produces a matrix based on Bailey-Federle data (DATA2) which shows total scores for activity structure and consistency sorted by the number of non-zero entries.

Specific command changes which may be required are:

1. ACTN=58 (line 30). This project identified 58 different activities. A different use of the Bailey-Federle questionnaire will yield a different number.
2. The number of activities per respondent in the exact order in which respondent data is entered into DATA2 must be entered as DATA statements (lines 40, 50 and 60).

Program P2X

This program produces a matrix based on Bailey-Federle data (DATA2) which shows total computerizability scores sorted by the number of non-zero entries.

Specific command changes which may be required are:

1. ACTN=58 (line 30). This project identified 58 different activities. A different use of the Bailey-Federle questionnaire will yield a different number.
2. The number of activities per respondent in the exact order in which respondent data is entered into DATA2 must be entered as DATA statements (lines 40, 50 and 60).

Program P3SP

This program produces a set of matrices based on Krobok data (DATA3) which shows, by report number, the relative value individuals assign to that report.

Specific command changes which may be required are:

1. RN=61 (line 30). This project identified 61 different reports. A different use of the Krobok questionnaire will yield a different number.
2. The number of reports listed per respondent in the exact order in which respondent data is entered into DATA3 must be entered as DATA statements (lines 40, 50 and 60).

Program P3SI

This program produces a set of matrices based on Krobok data (DATA3) which shows, by individual respondent number, the relative value that individual assigns to all reports.

Specific command changes which may be required are:

1. RN=61 (line 30). This project identified 61 different reports. A different use of the Krobock questionnaire will yield a different number.

2. The number of reports listed per respondent in the exact order in which respondent data is entered into DATA3 must be entered as DATA statements (lines 40, 50 and 60).

APPENDIX A-5

Listing of Programs for Analysis of Bailey-Federle Questionnaire Data

Program P2NXV

Creates The Bailey-Federle NXV Matrix
Sorted By Non-Zero Entries

```

1 CLEAR:ACTN=58: AN=ACTN+1      'ESTIMATE 58 ACTIVITIES INVOLVED
2 NN=25      ' # OF QUESTIONNAIRES
3 PN=INT(NN/10)+1      ' EACH PAGE PRINT 10 PEOPLE, MAXIMUM PAGE NUMBER
4 REM NXV=(100/28)*(XV)      XV RANGE 4 TO 28
5 TIS='BAILEY AND FEDERLE STRUCTURE AND CONSISTENCY SORTED BY NON-ZERO'
10 DIM CODE(NN),ACTNUM(NN),POT(AN,NN+1),TOP%(NN),MC%(NN),B0%(NN),HSUM(AN)
11 DIM DOV(AN,NN+1),HDSUM(AN),KT(AN),CT(AN),RANK(AN)
20 FOR I=1 TO NN
30 READ ACTNUM(I): NEXT I      ' ACTNUM INDICATE HOW MANY ACTIVITIES INVOLVED
40 DATA 6,3,6,8,6,11,7,11,11,7
50 DATA 5,14,10,9,10,11,5,4,4
60 DATA 5,11,7,3,4,7
70 OPEN 'A:DATA2' FOR INPUT AS #1
80 FOR I=1 TO NN: INPUT #1, CODE(I):CODE%=STR$(CODE(I)):TOP%(I)=MID$(CODE%,2,1):
MC%(I)=MID$(CODE%,3,1):B0%(I)=RIGHT$(CODE%,1): FOR J=1 TO ACTNUM(I)
90 INPUT #1, A1,A2,A3,A4,A5,A6,A7: IF A1=299 THEN GOTO 120      '299 INDICATE REMA
INDER PERCENTAGE PORTIONS
91 REM** A2 IS *I(IMPORTANCE): A3 IS *I(TIME-CONSUMPTION)
100 POT(A1-199,I)=100*(A4+A5+A6+A7)/28
120 NEXT I: NEXT J      'BECAUSE ACTIVITY NUMBERED FROM #200
125 GOSUB 500
134 GOSUB 400      'SORTING PROCEDURE
125 GOSUB 500
170 END
200 REM *** CALCULATE BEFORE SORTING ***
310 FOR J=1 TO ACTN : KT(J)=0
320 FOR I=1 TO NN
330 IF POT(I,I)≠0 GOTO 350 ELSE KT(J)=KT(J)+1
350 NEXT I: NEXT J
399 RETURN
400 REM *** SORTING PROCESS ***
410 FOR J=1 TO AN: RANK(J)=J: NEXT J      'J IS THE RANKING BEFORE SORTING
420 FOR J=1 TO AN-1
430 MAX=KT(J)
440 FOR I=J+1 TO AN
450 IF KT(I)≠MAX THEN GOTO 480
460 MAX=KT(I): KT(I)=KT(J): KT(J)=MAX
470 TEMP=RANK(J): RANK(J)=RANK(I): RANK(I)=TEMP      'KEEP TRACK ON RANK
480 NEXT I: NEXT J
499 RETURN
500 S=1: SE=9
501 PRINT TIS
510 FOR PAGE=1 TO PN
520 PRINT TAB(17):FOR I=5 TO 5+SE: IF I=NN+1 THEN PRINT ' ' ELSE PRINT TOP%(I) S
PC(5): NEXT I:PRINT
530 PRINT TAB(17):FOR I=5 TO 5+SE:IF I=NN+1 THEN PRINT 'AVG%:' TOTAL%: ' * N
ON-ZERO' ELSE PRINT MC%(I) EPC(5): NEXT I:PRINT
540 PRINT TAB(17):FOR I=5 TO 5+SE:IF I=NN+1 THEN PRINT ' ' ELSE PRINT B0%(I) EPC
(5): NEXT I: PRINT
550 PRINT STRING$(30,45)
560 FOR J=1 TO ACTN      ' ACTIVITY 200-257
570 PRINT 'ACT':199+RANK(J):PRINT 'NXV' :
580 FOR I=5 TO 5+SE : IF I=NN+1 THEN GOSUB 651
590 PRINT USING '*****': POT,RANK(J),I):HSUM(J)=HSUM(J)+POT(RANK(J),I)
600 NEXT I
601 PRINT      ' HSUM FOR HORIZONTAL SUM OF NXV(POT HERE)
605 NEXT J
610 IF PAGE=PN GOTO 799      'LAST PAGE,
620 IF PAGE =PN-1 THEN S=5+10 ELSE GOTO 630
621 GOTO 649
630 S=21: SE=5
649 H=INKE%: IF H=11 GOTO 649
650 GOTO 700
651 IF KT(J)≠0 THEN PRINT : GOTO 652 ELSE PRINT USING '*****.***': HSUM(J)/KT(J)
:HSUM(J):KT(J)
652 RETURN      '606
700 NEXT PAGE
799 RETURN

```

Program P2NXVSA

Creates The Bailey-Federle NXV Matrix
Sorted By Average NXV

```

1 CLEAR:ACTN=58: AN=ACTN+1 'ESTIMATE 58 ACTIVITIES INVOLVED
2 NN=25 ' # OF QUESTIONNAIRES
3 PN=INT(NN/10)+1 ' EACH PAGE PRINT 10 PEOPLE. MAXIMUM PAGE NUMBER
4 REM NXV=(100/28)*(XV) XV RANGE 4 TO 28
5 TITL='BAILEY AND FEDEFLE STRUCTURE AND CONSISTENCY SORTED BY AVERAGE'
6 DIM CODE(NN),ACTNUM(NN),POT(AN,NN+1),TOP*(NN),MC*(NN),BO*(NN),HSUM(AN)
7 DIM CO*(AN,NN+1),HDSUM(AN),KT(AN),CT(AN),RANK(AN),AVG(AN)
8 FOR I=1 TO NN
9 READ ACTNUM(I): NEXT I ' ACTNUM INDICATE HOW MANY ACTIVITIES INVOLVED
10 DATA 6,2,6,9,6,11,7,11,11,7
11 DATA 5,14,10,9,10,11,5,4,4
12 DATA 5,11,7,2,4,7
13 OPEN 'A:DATA2' FOR INPUT AS #1
14 FOR I=1 TO NN: INPUT #1, CODE(I):CODE#=STR$(CODE(I)):TOP*(I)=MID$(CODE#,2,1):
15 MC*(I)=MID$(CODE#,3,1):BO*(I)=RIGHT$(CODE#,1): FOR J=1 TO ACTNUM(I)
16 INPUT #1, A1,A2,A3,A4,A5,A6,A7: IF A1=299 THEN GOTO 120 '299 INDICATE REMA
17 INER PERCENTAGE PORTICNS
18 REM** A2 IS I(IMPORTANCE): A3 IS K(TIME-CONSUMPTION)
19 POT(A1-199,I)=100*(A4+A5+A6+A7)/28
20 NEXT I: NEXT J 'BECAUSE ACTIVITY NUMBERED FROM #200
21 GOSUB 300
22 GOSUB 400 'SORTING PROCEDURE
23 GOSUB 500
24 END
25 REM *** CALCULATE BEFORE SORTING ***
26 FOR J=1 TO ACTN : KT(J)=0: HSUM(J)=0
27 FOR I=1 TO NN
28 IF POT(I,J)=0 THEN GOTO 350 ELSE KT(J)=KT(J)+1: HSUM(J)=HSUM(J)+POT(I,J)
29 NEXT I:IF KT(J)=0 GOTO 351 ELSE AVG(J)=HSUM(J)/KT(J)
30 NEXT J
31 RETURN
32 REM *** SORTING PROCESS ***
33 FOR J=1 TO AN: RANK(J)=J: NEXT J 'J IS THE RANKING BEFORE SORTING
34 FOR I=1 TO AN-1
35 MAX=AVG(I)
36 FOR J=I+1 TO AN
37 IF AVG(J)<MAX THEN GOTO 380
38 MAX=AVG(J): AVG(I)=AVG(J): AVG(J)=MAX 'VALUE SORTED
39 TEMP=RANK(J): RANK(J)=RANK(I): RANK(I)=TEMP 'KEEP TRACK ON RANK
40 NEXT J: NEXT I 'AVG(RANK(J)) STORE THE ORIGINAL VALUE
41 RETURN 'AVG(I) IS THE LARGEST VALUE NOW
42 B=1: SE=9
43 PRINT TITL
44 FOR PAGE=1 TO PN
45 PRINT TAB(17):FOR I=5 TO 5+SE: IF I=NN+1 THEN PRINT ' ' ELSE PRINT TOP*(I) S
46 P(I): NEXT I:PRINT
47 PRINT TAB(17):FOR I=5 TO 5+SE:IF I=NN+1 THEN PRINT 'AVG: ' TOTAL: ' # N
48 ON-CERO* ELSE PRINT MC*(I) SPC(5): NEXT I:PRINT
49 PRINT TAB(17):FOR I=5 TO 5+SE:IF I=NN+1 THEN PRINT ' ' ELSE PRINT BO*(I) SPC
50 (5): NEXT I: PRINT
51 PRINT STRING$(80,45)
52 FOR J=1 TO ACTN ' ACTIVITY 200-257
53 PRINT 'ACT:':199+RANK(J):PRINT 'NXV' :
54 FOR I=5 TO 5+SE : IF I=NN+1 THEN GOSUB 651
55 PRINT USING '*****': POT(RANK(J),I):
56 NEXT I:PRINT ' HSUM FOR HORIZONTAL SUM OF NXV(POT HERE)
57 NEXT J
58 IF PAGE=PN: GOTO 799 'LAST PAGE.
59 IF PAGE=PN-1 THEN B=5+10 ELSE GOTO 630
60 GOTO 649
61 B=1: SE=5
62 A$=INKEY$: IF A$="" GOTO 649
63 GOTO 700
64 IF -(RANK(J))=0 THEN PRINT : GOTO 652 ELSE PRINT USING '*****.###':AVG(J):A
65 V(J):KT(RANK(J)):KT(RANK(J))
66 RETURN 606
67 NEXT PAGE
68 RETURN
69
70

```

Program P2XSA

Creates The Bailey-Federle Matrix Sorted By Average X

```

1 CLEAR:ACTN=50: AN=ACTN+1 ESTIMATE 50 ACTIVITIES INVOLVED
2 NN=25 # OF QUESTIONNAIRES
3 S=INT(NN/10)+1 EACH PAGE PRINT 10 PEOPLE, MAXIMUM PAGE NUMBER
4 REM # OF PRINTINGS
5 Y1$='BAILEY AND FEDERLE COMPUTERIZABILITY SORTED BY AVERAGE'
10 DIM CODE(NN),ACTNUM(NN),POT(A1,NN+1),TOP$(NN),MCS$(NN),BOS$(NN),MSUM(A1:
11 DIM DOV(A1,NN+1),HDSUM(A1),KT(A1),CT(A1),RANK(A1),AVG(A1)
20 FOR I=1 TO NN
30 READ ACTNUM(I): NEXT I ACTNUM INDICATE HOW MANY ACTIVITIES INVOLVED
40 DATA 6,2,6,3,6,11,7,11,11,7
50 DATA 5,14,10,9,10,11,5,4,4
60 DATA 5,11,7,3,4,7
70 OPEN 'A:DATA2' FOR INPUT AS #1
80 FOR I=1 TO NN: INPUT #1, CODE(I):CODE$=STR$(CODE(I)):TOP$(I)=MID$(CODE$,2,1):
MCS$(I)=MID$(CODE$,3,1):BOS$(I)=RIGHT$(CODE$,1): FOR J=1 TO ACTNUM(I):
90 INPUT #1, A1,A2,A3,A4,A5,A6,A7: IF A1=299 THEN GOTO 130 '299 INDICATE SEMA
INCE PERCENTAGE PORTIONS
91 REM# A2 IS # IMPORTANCE: A3 IS # TIME-CONSUMPTION
100 #1 A1=199, I=100*(A2+A5+A6+A7)/B1:DOV(A1-199, I)=A2*(A3+POT(A1-199, I))
110 NEXT J: NEXT I 'BECAUSE ACTIVITY NUMBERED FROM #200
120 GOSUB 200
130 GOSUB 400 'SORTING PROCEDURE
140 GOSUB 500
150 END
160 REM *** CALCULATE BEFORE SORTING ***
170 FOR I=1 TO ACTN: KT(I)=POT: HSUM(I)=0
180 FOR J=1 TO NN
190 IF DOV(I)=0 GOTO 250 ELSE KT(I)=KT(I)+1: HSUM(J)=HSUM(J)+DOV(I, I)
200 NEXT J
210 IF KT(I)=0 GOTO 252 ELSE AVG(I)=HSUM(I)/KT(I)
220 NEXT I
230 RETURN
240 REM *** SORTING PROCESS ***
250 FOR I=1 TO AN: RANK(I)=I: NEXT I 'J IS THE RANKING BEFORE SORTING
260 FOR J=1 TO AN-1
270 MAY=AVG(I)
280 FOR I=J+1 TO AN
290 IF AVG(I) < MAY THEN GOTO 460
300 MAY=AVG(I): AVG(I)=AVG(I): AVG(J)=MAY 'VALUE SORTED
310 TEMP=RANK(I): RANK(I)=RANK(J): RANK(J)=TEMP 'KEEP TRACK ON RANK
320 NEXT I: NEXT J
330 RETURN
340 #1: G=0
350 PRINT #1
360 FOR PAGE=1 TO PN
370 PRINT TAB(17):FOR I=3 TO 3+SE: IF I=NN+1 THEN PRINT ' ' ELSE PRINT TOP$(I): S
380 #1: NEXT I:PRINT
390 PRINT TAB(17):FOR I=3 TO 3+SE:IF I=NN+1 THEN PRINT 'AVG:' ' TOTAL:' ' # N
ON=CEPO' ELSE PRINT MCS$(I): SPC(5): NEXT I:PRINT
400 PRINT TAB(17):FOR I=3 TO 3+SE:IF I=NN+1 THEN PRINT ' ' ELSE PRINT BOS$(I): SPC
410 #1: NEXT I: PRINT
420 PRINT STRING$(90,45)
430 FOR J=1 TO ACTN: ACTIVITY 200-257
440 PRINT 'ACT:'199+RANK(J):PRINT ' X=':
450 FOR I=3 TO 3+SE: IF I=NN+1 THEN GOSUB 651
460 PRINT USING '*****': DOV(RANK(J), I)
470 NEXT I:PRINT ' HSUM FOR HORIZONTAL SUM OF X (DOV HERE)
480 NEXT J
490 IF PAGE=PN GOTO 799 'LAST PAGE.
500 IF PAGE < PN-1 THEN S=5+10 ELSE GOTO 630
510 GOTO 649
520 S=21: SE=5
530 AS=INT(NN/5): IF AS=0 GOTO 649
540 GOTO 700
550 IF KT(RANK(J))=0 THEN PRINT ': GOTO 652 ELSE PRINT USING '*****.M': AVG(J):
AVG(J)+KT(RANK(J)):KT(RANK(J))
560 RETURN 606
700 NEXT PAGE
799 RETURN
9

```


APPENDIX A-6
 LISTING OF PROGRAMS FOR ANALYSIS OF KROBOCK DATA
 Program P3TL
 Creates the Krobock Data Reduction Matrix

```

1 CLEAR:NN=25: RN=61      ' NN= # OF PEOPLE; RN= # OF REPORT ESTIMATED
5 TI$="KROBOCK DATA"
10 DIM CODE(NN),ACTNUM(NN)
11 DIM UNIT(NN,7)
20 FOR I=1 TO NN
30 READ ACTNUM(I): NEXT I
40 DATA 3,2,3,3,3, 3,0.2 ,5 .1
50 DATA 5,10,6 ,5,5 ,3 ,7.9,1
60 DATA 2,13,1,2,1,3
70 OPEN "A:DATA3" FOR INPUT AS #1
80 FOR I=1 TO NN: INPUT #1, KODE,A,B,C,D:CODE(I)=KODE
81 A=A*.01: B=B*.01: C=C*.01: D=D*.01
85 UNIT(I,1)=A
86 UNIT(I,2)=B
87 UNIT(I,3)=C
88 UNIT(I,4)=D
89 UNIT(I,5)=B*C
90 IF (A+(B*C))=0 THEN UNIT(I,6)=0' ELSE UNIT(I,6)=A/(A+(B*C))
91 UNIT(I,7)=A2*.01      'VALUE OF CURRENT INFORMATION
118 FOR J= 1 TO ACTNUM(I)
119 INPUT #1, A1,A2
120 NEXT J
121 NEXT I
122 FOR I=1 TO NN:INPUT #1,CUMKBD: FOR J=1 TO ACTNUM(I): INPUT #1,V1,V2,V3,V4,V5,
V6,V7:NEXT J: NEXT I
125 GOSUB 500
126 END
500 PEM *** DRAW TABLES *****
501 PRINT TI$
502 PRINT SPC(15): "A" SPC(8) "B" SPC(7) "C" SPC(6) "D" SPC(6) "B*C" SPC(3) "A/(A
+ B*C):"
540 PRINT STRING$(75,45)      'HEADING
550 FOR I=1 TO NN
570 PRINT CODE(I): SPC(6):: FOR M=1 TO 6: PRINT USING"####.###"; UNIT(I,M):: NEXT
M
590 PRINT
700 NEXT I
900 RETURN
0

```

Program P3SP

Creates The Krobock Data Matrices Sorted By Specific Reports

```

1 CLEAR:NN=25: RN=61      * NN= # OF PEOPLE: RN= # OF REPORT ESTIMATED
5 TIS="KROBOCK SORTED REPORT NUMBER"
10 DIM CODE$(NN),ACTNUM$(NN),A$(NN,20)      * A MATRIX TRACK THE ACT NUMBER
11 DIM UNIT$(NN,RN,10)
20 FOR I=1 TO NN
30 READ ACTNUM%(I): NEXT I
40 DATA 1,2,3,3,3, 3,0,2 ,5 ,1
50 DATA 6,10,6 ,5,6 ,3 ,7,9,1
60 DATA 2,13,1,2,1,0
70 OPEN "A:DATA3" FOR INPUT AS #1
80 FOR I=1 TO NN: INPUT #1, KODE,A,B,C,D:CODE$(I)=KODE
92 FOR J= 1 TO ACTNUM%(I)
94 INPUT #1, A$(I,J),A2 : A1=A$(I,J)
95 UNIT$(I,A1-299,1)=A      *VALUE A
96 UNIT$(I,A1-299,2)=A2      *VALUE OF CURRENT INFORMATION
97 UNIT$(I,A1-299,3)=A*A2
100 NEXT J: NEXT I
102 FOR I=1 TO NN: INPUT #1, IDK
103 FOR J=1 TO ACTNUM%(I):INPUT #1, V1,V2,V3,V4,V5,V6,V7
104 UNIT$(I,A$(I,J)-299,4)=V1      : UNIT$(I,A$(I,J)-299,5)=V2
106 UNIT$(I,A$(I,J)-299,6)=V3      : UNIT$(I,A$(I,J)-299,7)=V4
108 UNIT$(I,A$(I,J)-299,8)=V5      : UNIT$(I,A$(I,J)-299,9)=V6
110 UNIT$(I,A$(I,J)-299,10)=V7
112 NEXT J: NEXT I
114 CLOSE #1
125 GOSUB 500
130 END
500 REM **** DPAW TABLES *****
501 PRINT TIS
510 FOR J=1 TO RN
511 TNN=0
520 PRINT "(REPORT # ";299+J;")"
530 PRINT SPC(15) "A" SPC(4) "SCORE" SPC(2) "A*SCORE" SPC(3) "1" SPC(5) "2" SPC(
5) "3" SPC(5) "4" SPC(5) "5" SPC(5) "6" SPC(5) "7"
540 PRINT STRING$(75,45)
541 FOR K=1 TO 10: SUBT(K)=0: NEXT K
550 FOR I=1 TO NN
560 IF UNIT$(I,J,1)=0 GOTO 700      *IF NO VALUE STORED, SKIP
561 TNN=TNN+1
570 PRINT CODE$(I) SPC(6):: FOR M=1 TO 2: PRINT USING"###.###": UNIT$(I,J,M)*.01
: SUBT(M)=SUBT(M)+UNIT$(I,J,M)*.01
571 NEXT M
572 PRINT USING "###.###":UNIT$(I,J,3)*.0001;
573 SUBT(3)=SUBT(3)+UNIT$(I,J,3)*.0001
574 FOR M=4 TO 10: PRINT USING"###.##": UNIT$(I,J,M)*.01::SUBT(M)=SUBT(M)+UNIT$(
I,J,M)*.01: NEXT M
580 PRINT
600 NEXT I
701 IF TNN=0 GOTO 780
750 PRINT STRING$(75,45): PRINT "TOTAL" SPC(6);
751 PRINT USING "###.###": SUBT(1)::AG(1)=SUBT(1)/TNN: PRINT USING "###.###": SU
BT(2)::AG(2)=SUBT(2)/TNN
753 PRINT USING "###.###": SUBT(3)::AG(3)=SUBT(3)/TNN
755 FOR I=4 TO 10: PRINT USING "###.##":SUBT(I)::AG(I)=SUBT(I)/TNN: NEXT I
760 PRINT "AVERAGE" SPC(4)
771 PRINT USING "###.###": AG(1)::PRINT USING "###.###": AG(2);
773 PRINT USING "###.###": AG(3);
775 FOR I=4 TO 10: PRINT USING "###.##":AG(I):: NEXT I
780 PRINT:PRINT:PRINT:NEXT J
900 RETURN
9

```

Program P3SI

Creates The Krobock Data Matrices
Sorted By Individual Respondents

```

1 CLEAR:NN=25: RN=61      ' NN= # OF PEOPLE; RN= # OF REPORT ESTIMATED
5 TIS="KROBOCK SORTED BY INDIVIDUAL"
10 DIM CODE%(NN),ACTNUM%(NN),A%(NN,20)  ' A MATRIX TRACK THE ACT NUMBER
11 DIM UNIT%(NN,RN,10),AG(10),SUBT(10)
20 FOR I=1 TO NN
30 READ ACTNUM%(I): NEXT I
40 DATA 3,2,3,3,3, 3,0,2 ,5 ,1
50 DATA 6,10,6 ,5,6 ,3 ,7,9,1
60 DATA 2,13,1,2,1,3
70 OPEN "A:DATA3" FOR INPUT AS #1
90 FOR I=1 TO NN: INPUT #1, KODE,A,B,C,D:CODE%(I)=KODE
92 FOR J= 1 TO ACTNUM%(I)
93 INPUT #1, A%(I,J),A2 : A1=A%(I,J)
95 UNIT%(I,A1-299,1)=A      'VALUE A
96 UNIT%(I,A1-299,2)=A2    'VALUE OF CURRENT INFORMATION
97 UNIT%(I,A1-299,3)=A*A2
100 NEXT J: NEXT I
102 FOR I=: TO NN: INPUT #1, IDK
103 FOR J=1 TO ACTNUM%(I):INPUT #1, V1,V2,V3,V4,V5,V6,V7
104 UNIT%(I,A%(I,J)-299,4)=V1 : UNIT%(I,A%(I,J)-299,5)=V2
106 UNIT%(I,A%(I,J)-299,6)=V3 : UNIT%(I,A%(I,J)-299,7)=V4
109 UNIT%(I,A%(I,J)-299,8)=V5 : UNIT%(I,A%(I,J)-299,9)=V6
110 UNIT%(I,A%(I,J)-299,10)=V7
112 NEXT J: NEXT I
114 CLOSE #1
125 GOSUB 500
130 END
500 REM **** DRAW TABLES ****
501 PRINT TIS
510 FOR K=1 TO NN
511 TNN=0
520 PRINT "(INDIVIDUAL # ";CODE%(K);")"
530 PRINT SPC(15) "A" SPC(4) "SCORE" SPC(2) "A*SCORE" SPC(3) "1" SPC(5) "2" SPC(
5) "3" SPC(5) "4" SPC(5) "5" SPC(5) "6" SPC(5) "7"
540 PRINT STRING$(75,45)
541 FOR M=1 TO 10: SUBT(M)=0: NEXT M
550 FOR J=1 TO RN
560 IF UNIT%(K,J,1)=0 GOTO 700 'IF NO VALUE STORED, SKIP
561 TNN=TNN+1
570 PRINT 299+J SPC(6):: FOR M=1 TO 2: PRINT USING"###.###"; UNIT%(K,J,M)*.01::
SUBT(M)=SUBT(M)+UNIT%(K,J,M)*.01
571 NEXT M
572 PRINT USING "###.####";UNIT%(K,J,3)*.0001:
573 SUBT(3)=SUBT(3)+UNIT%(K,J,3)*.0001
574 FOR M=4 TO 10: PRINT USING"###.##"; UNIT%(K,J,M)*.01::SUBT(M)=SUBT(M)+UNIT%(
K,J,M)*.01: NEXT M
580 PRINT
700 NEXT J
701 IF TNN=0 GOTO 780
750 PRINT STRING$(75,45): PRINT "TOTAL" SPC(6);
751 PRINT USING "###.###"; SUBT(1)::AG(1)=SUBT(1)/TNN: PRINT USING "###.###"; SU
BT(2)::AG(2)=SUBT(2)/TNN
753 PRINT USING "###.####"; SUBT(3)::AG(3)=SUBT(3)/TNN
755 FOR I=4 TO 10: PRINT USING "###.##";SUBT(I)::AG(I)=SUBT(I)/TNN: NEXT I
760 PRINT "AVERAGE" SPC(4)
771 PRINT USING "###.###"; AG(1)::PRINT USING "###.###"; AG(2);
773 PRINT USING "###.####"; AG(3);
775 FOR I=4 TO 10: PRINT USING "###.##";AG(I):: NEXT I
780 PRINT:PRINT:PRINT:NEXT K
800 RETURN
3

```

APPENDIX A-7
 LISTING OF PROGRAMS FOR ANALYSIS OF PEARSON DATA
 Programs P1S-NS and P1S-NSAG
 Creates The Pearson NSI Matrix

```

LIST
10 REM *****
20 REM ADOT PROJECT DATA ANALYSIS ARIZONA STATE UNIVERSITY 1984
30 REM ***** FORMULA *****
40 REM VSUMI=WEIGHTED CALCULATION ON EACH QUESTION OF EACH USER SATISFACTION
50 REM QUESTIONNAIRE(3 TO -3; 1.00,0.85,0.70,0.55,0.40,0.25,0.10)
60 REM SUM OF VSUMI=S1 DEFINED IN THE PAPER
70 REM DELTA = 0 OR 1 DEPENDING THE THE FIRST TWO RESPONSES ON EACH QUESTION
80 REM SUM OF DELTA=F1 DEFINED IN THE PAPER
90 REM NORMAL SCORE(NORSCR)=S1/(F1*3.0)
100 REM *****
120 CLEAR: QN=39: NN=25 'TOTAL QUESTIONS ; # OF PEOPLE
121 TI$="GENERATE BY SORTING NORMAL SCORE"
120 DIM MEASURE(QN,3,NN), CODE(NN), TOP$(NN), MC$(NN), BO$(NN), NCZERO(NN), NSCR(NN)
140 DIM VSUMI(NN,QN), DELTA(QN,NN), FSUM(NN) 'WEIGHTED: 1 OR 0; F1=SUM OF DELTA
150 DIM CSUM(NN), RANK(NN), RSUM(QN), RAVG(QN) 'NORMAL SCORE=CSUM/FSUM*3.0
152 GOSUB 1000
160 END

1000 OPEN "A:DATA1" FOR INPUT AS #1 'READ DATA INTO WORKING AREA
1010 FOR I=1 TO NN: INPUT #1, CODE(I)
1020 FOR J=1 TO QN: FOR K=1 TO 3
1030 INPUT #1, MEASURE(J,K,I)
1040 NEXT K
1041 VSUMI(I,J)=MEASURE(J,3,I)*((MEASURE(J,1,I)+MEASURE(J,2,I))/2)
1050 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=
1
1052 NEXT J: NEXT I
1060 CLOSE #1
1070 FOR J=1 TO QN: FOR I=1 TO NN 'CALCULATE SOME BASIC VALUES
1080 RSUM(J)=RSUM(J)+VSUMI(I,J)
1090 NEXT I: RAVG(J)=RSUM(J)/NN: NEXT J
1100 FOR I=1 TO NN :CSUM(I)=0:DEL=0: FOR J=1 TO QN
1110 DEL=DEL+DELTA(J,I)
1120 CSUM(I)=CSUM(I)+VSUMI(I,J)
1130 NEXT J: NSCR(I)=CSUM(I)/(DEL*3!): NEXT I
2000 REM SORTING PROCEDURES
2010 FOR I=1 TO NN: RANK(I)=I: NEXT I 'RANK(I) REFLECT THE ORIGINAL ORDER
2020 FOR I=1 TO NN-1
2030 MAX=NSCR(I)
2040 FOR J=I+1 TO NN
2050 IF NSCR(J)<=MAX THEN GOTO 2200
2060 MAX=NSCR(J): NSCR(J)=NSCR(I): NSCR(I)=MAX
2070 TEMP=RANK(I):RANK(I)=RANK(J):RANK(J)=TEMP
2200 NEXT J: NEXT I
2210 OPEN "A:DATA101" FOR OUTPUT AS #1 'WRITE THE SORTING ORDER BACK
2220 FOR I=1 TO NN: PRINT #1, CODE(RANK(I));
2230 FOR J=1 TO QN: FOR K=1 TO 3
2240 PRINT #1, MEASURE(J,K, RANK(I));
2250 NEXT K: NEXT J: PRINT #1, " ": NEXT I
2260 CLOSE #1
2500 RETURN

```

```

LIST
10 REM *****
20 REM ADOT PROJECT DATA ANALYSIS ARIZONA STATE UNIVERSITY 1984
30 REM ***** FORMULA *****
40 REM VSUMI=WEIGHTED CALCULATION ON EACH QUESTION OF EACH USER SATISFACTION
50 REM QUESTIONNAIRE(3 TO -3; 1.00,0.25,0.70,0.55,0.40,0.25,0.10)
60 REM SUM OF VSUMI=S1 DEFINED IN THE PAPER
70 REM DELTA = 0 OR 1 DEPENDING THE THE FIRST TWO RESPONSES ON EACH QUESTION
80 REM SUM OF DELTA=F1 DEFINED IN THE PAPER
90 REM NORMAL SCORE=(NORSCR)=S1/(F1*3.0)
100 REM *****
110 CLEAR: ON=39: NN=25 'TOTAL QUESTIONS ; # OF PEOPLE
120 T1$='PEARSON SORTED BY NORMALIZED SATISFACTION AND AVERAGE'
130 DIM MEASURE(ON,3,NN),CODE(NN),TOP*(NN),MC*(NN),BO*(NN),NCCZERO(NN),NSCR(NN)
140 DIM VSUMI(NN,NN),DELTA(NN,NN),FSUM(NN) 'WEIGHTED: 1 OR 0; F1=SUM OF DELTA
150 DIM CSUM(NN),FAVG(NN),RSUM(ON),FAVG(ON) 'NORMAL SCORE=CSUM/FSUM*3.0
160 GOSUB 1000
170 OPEN "A:DATA100" FOR INPUT AS #1
180 FOR I=1 TO NN: FSUM(I)=0 'FSUM IS FOR COLUMN SUM-UP USE
190 REM SEPERATE CODE INTO TOP, MIDDLE AND BOTTOM PARTS FOR PRINT HEADING
200 INPUT #1, CODE I: CODE$=STR$(CODE I) 'BEWARE CODE$ CONTAIN A SPACE AHEAD
210 TOP$(I)=MID$(CODE$,2,1)
220 MC$(I)=MID$(CODE$,3,1)
230 BO$(I)=RIGHT$(CODE$,1)
240 REM READ OR 0 DATA FOR EACH QUESTIONNAIRE
250 FOR J=1 TO ON
260 FOR K=1 TO 3: INPUT #1, MEASURE(J,K,I): NEXT K
270 REM VSUMI=WEIGHT * ONE HALF OF THE SUM OF TWO DATA
280 VSUMI(I,J)=MEASURE(J,2,I)+((MEASURE(J,1,I)+MEASURE(J,2,I))/2)
290 REM DELTA COMPARE THE RESPONSE VALUES; IF SAME, =0, ELSE =1
300 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=1
310 IF VSUMI(I,J)=0 THEN NCCZERO(I)=NCCZERO(I)+1
320 NEXT J: NEXT I
330 CLOSE #1
340 GOSUB 100
350 END
360 REM *****
370 REM PRINT THE MATRIX OUT
380 PRINT T1$: FLAG=0
390 S=1: SE=9 'S & SE DEFINE HOW MANY COLUMNS TO BE SHOWN IN A SINGLE PRINTOUT
400 SETAIL=NN-INT(NN/S+SE)+1: FOR PAGE=1 TO PGN 'DEFINE # OF PAGES PRINTOUT
410 PRINT TAB(13):
420 FOR I=S TO S+SE:PRINT TOP$(I) SPC(6):NEXT I: PRINT
430 PRINT TAB(13):
440 FOR I=S TO S+SE:IF I=NN THEN GOTO 460 ELSE PRINT MC$(I) SPC(6):NEXT I
450 PRINT:GOTO 470
460 PRINT MC$(I) SPC(6) 'AVERAGE':
470 PRINT TAB(13):
480 FOR I=S TO S+SE: PRINT BO$(I) SPC(6):NEXT I: PRINT
490 PRINT STRING$(20,45)
500 FOR J=1 TO NN: IF RANK(J)=10 THEN GAPS=" " ELSE GAPS=" "
510 PRINT"QUES":RANK(J):GAPS:FOR I=S TO S+SE:PRINT USING "###.###":VSUMI(I,J):
520 NEXT I:IF FLAG=1 THEN GOSUB 510 'CALCULATE HORIZONTAL AVERAGE VALUES
530 PRINT: NEXT J
540 GOSUB 500 'CALCULATE NORMAL SCORE
550 IF PAGE=PGN THEN GOTO 560
560 AS=INHEX$: IF AS="" THEN GOTO 570 ELSE 560
570 IF PAGE+1=PGN THEN S=S+10: GOTO 590
580 IF PAGE+1=PGN THEN S=S+10: SE=SETAIL-1: FLAG=1: GOTO 590
590 NEXT PAGE
600 RETURN
610 RSUM(I)=0: FOR I=1 TO NN
620 RSUM(I)=RSUM(I)+VSUMI(I,J): NEXT I

```

```

630 RAVG(J)=RSUM(J)/N
640 PRINT USING "####.####"; RAVG(J);
650 RETURN
660 PRINT STRING$(80,45)
670 PRINT "NOR SCORE":FOR I=S TO S+SE:DEL=0:CSUM(I)=0: FOR J=1 TO GN
680 DEL=DEL+DELTA(J,I):CSUM(I)=CSUM(I)+VSUM(I,J): NEXT J
690 NSCR(I)=CSUM(I)/(DEL*3)
700 PRINT USING "###.###";NSCR(I);
710 NEXT I
711 PRINT:PRINT "S) VALUE ":FOR I=S TO S+SE
712 PRINT USING "###.###";CSUM(I);
713 NEXT I
720 IF FLAG=1 THEN GOSUB 800 "FORMAT LAST PAGE USE
730 PRINT "OF ZERO":FOR I=S TO S+SE
740 PRINT USING "#####";NCZERO(I): NEXT I
750 IF FLAG=1 THEN GOTO 770
760 GOTO 790
770 FOR J=1 TO GN:RAVG=RAVG(J)+RAVG: NEXT J "TOTAL AVG OF RAVG
780 PRINT USING "###.###";RAVG/GN:PRINT "COL AVG";
790 RETURN
800 FOR I=1 TO NN: TNSCR=TNSCR+NSCR(I): NEXT I
810 PRINT USING "###.###";TNSCR/NN: PRINT "NSR AVG";
820 RETURN
1000 OPEN "A:DATA101" FOR INPUT AS #1 "READ DATA INTO WORKING AREA
1010 FOR I=1 TO NN: INPUT #1, CODE(I)
1020 FOR J=1 TO GN: FOR K=1 TO 3
1030 INPUT #1, MEASURE(J,K,I)
1040 NEXT K
1041 VSUM(I,J)=MEASURE(J,3,I)+(MEASURE(J,1,I)+MEASURE(J,2,I))/2)
1050 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=
1
1052 NEXT J: NEXT I
1060 CLOSE #1
1070 FOR J=1 TO GN: FOR I=1 TO NN "CALCULATE SOME BASIC VALUES
1080 RSUM(J)=RSUM(J)+VSUM(I,J)
1090 NEXT I: RAVG(J)=RSUM(J)/NN: NEXT J
1100 FOR I=1 TO NN :CSUM(I)=0:DEL=0: FOR J=1 TO GN
1110 DEL=DEL+DELTA(J,I)
1120 CSUM(I)=CSUM(I)+VSUM(I,J)
1130 NEXT J: NSCR(I)=CSUM(I)/(DEL*3): NEXT I
2000 REM SORTING PROCEDURES
2010 FOR J=1 TO GN: RANK(J)=J: NEXT J "RANK(I) REFLECT THE ORIGINAL ORDER
2020 FOR J=1 TO GN-1
2030 MAX=RAVG(J)
2040 FOR I=J+1 TO GN
2050 IF RAVG(I)<MAX THEN GOTO 2200
2060 MAX=RAVG(I): RAVG(I)=RAVG(J): RAVG(J)=MAX
2070 TEMP=RANK(J):RANK(J)=RANK(I):RANK(I)=TEMP
2080 NEXT I: NEXT J
2210 OPEN "A:DATA102" FOR OUTPUT AS #1 "WRITE THE SORTING ORDER BACK
2220 FOR I=1 TO NN: PRINT #1, CODE(I);
2230 FOR J=1 TO GN: FOR K=1 TO 3
2240 PRINT #1, MEASURE(RANK(J),K,I);
2250 NEXT K: NEXT J: PRINT #1, " ": NEXT I
2260 CLOSE #1
2500 RETURN

```

Programs P1IMP2 and P1IMP3
Creates Pearson Importance Matrix

```

10 REM *****
20 REM ADOT PROJECT DATA ANALYSIS ARIZONA STATE UNIVERSITY 1984
30 REM ***** FORMULA *****
40 REM VSUMI=WEIGHTED CALCULATION ON EACH QUESTION OF EACH USER SATISFACTION
50 REM QUESTIONNAIRE(3 TO -3; 1.00,0.85,0.70,0.55,0.40,0.25,0.10)
60 REM SUM OF VSUMI=Si DEFINED IN THE PAPER
70 REM DELTA = 0 OR 1 DEPENDING THE THE FIRST TWO RESPONSES ON EACH QUESTION
80 REM SUM OF DELTA=Fi DEFINED IN THE PAPER
90 REM NORMAL SCORE(NORSCR)=Si/(Fi*3.0)
100 REM *****
110 CLEAR: GN=39: NN=25 'TOTAL QUESTIONS ; # OF PEOPLE
120 TIS="GENERATE BY IMPORTANT VALUES AND SORTED BY ROW FIRST"
140 DIM MEASURE(GN,3,NN),CODE(NN),TOP*(NN),MC*(NN),BO*(NN),NCZERO(NN),NSCR(NN)
150 DIM VSUMI(NN,GN), DELTA(GN,NN), FSUM(NN) 'WEIGHTED; 1 OR 0; Fi=SUM OF DELTA
160 DIM CSUM(NN),RANK(NN), RSUM(GN),RAVG(GN) 'NORMAL SCORE=CSUM/FSUM*3.0
161 GOSUB 930
170 END
230 OPEN "A:DATA1" FOR INPUT AS #1 'READ DATA INTO WORKING AREA
240 FOR I=1 TO NN: INPUT #1, CODE(I)
250 FOR J=1 TO GN: FOR K=1 TO 3
260 INPUT #1, MEASURE(J,K,I)
270 NEXT K
280 VSUMI(I,J)=MEASURE(J,3,I)
290 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=1
300 NEXT J: NEXT I
310 CLOSE #1
320 FOR J=1 TO GN: FOR I=1 TO NN 'CALCULATE SOME BASIC VALUES
330 RSUM(J)=RSUM(J)+VSUMI(I,J)
340 NEXT I: RAVG(J)=RSUM(J)/NN: NEXT J
350 FOR I=1 TO NN :CSUM(I)=0:DEL=0: FOR J=1 TO GN
360 DEL=DEL+DELTA(J,I)
370 CSUM(I)=CSUM(I)+VSUMI(I,J)
380 NEXT J: NSCR(I)=CSUM(I)/GN : NEXT I
390 REM SORTING PROCEDURES
400 FOR I=1 TO NN: RANK(I)=I: NEXT I 'RANK(I) REFLECT THE ORIGINAL ORDER
410 FOR I=1 TO NN-1
420 MAX=NSCR(I)
430 FOR J=I+1 TO NN
440 IF NSCR(J)<=MAX THEN GOTO 470
450 MAX=NSCR(J): NSCR(J)=NSCR(I): NSCR(I)=MAX
460 TEMP=RANK(I):RANK(I)=RANK(J):RANK(J)=TEMP
470 NEXT J: NEXT I
480 OPEN "A:DATA201" FOR OUTPUT AS #1 ' WRITE THE SORTING ORDER BACK
490 FOR I=1 TO NN: PRINT #1, CODE(RANK(I)); ' SORT BY AVERAGE
500 FOR J=1 TO GN: FOR K=1 TO 3
510 PRINT #1, MEASURE(J,K,RANK(I));
520 NEXT K: NEXT J: PRINT #1," ": NEXT I
530 CLOSE #1
540 RETURN
550

```

```

10 REM *****
20 REM ADOT PROJECT DATA ANALYSIS ARIZONA STATE UNIVERSITY 1984
30 REM ***** FORMULA *****
40 REM VSUMI=WEIGHTED CALCULATION ON EACH QUESTION OF EACH USER SATISFACTION
50 REM QUESTIONNAIRE(3 TO -3; 1.00,0.85,0.70,0.55,0.40,0.25,0.10)
60 REM SUM OF VSUMI=S1 DEFINED IN THE PAPER
70 REM DELTA = 0 OR 1 DEPENDING THE THE FIRST TWO RESPONSES ON EACH QUESTION
80 REM SUM OF DELTA=F1 DEFINED IN THE PAPER
90 REM NORMAL SCORE(NORSOR)=S1/(F1*3.0)
100 REM *****
110 CLEAR: QN=39: NN=25 'TOTAL QUESTIONS : # OF PEOPLE
120 TIB='PEARSON SORTED BY IMPORTANCE AND AVERAGE'
130 DIM MEASURE(39,3,NN),CODE(39),TOP*(NN),MC*(NN),BO*(NN),NCZERO(NN),NSOR(NN)
140 DIM VSUMI(NN,39), DELTA(39,NN), FSUM(NN) 'WEIGHTED: 1 OR 0; F1=SUM OF DELTA
150 DIM DSUM(NN),RANK(39), FSUM(39),RAVG(39) 'NORMAL SCORE=DSUM/FSUM*3.0
160 GOSUB 300
170 OPEN 'A:DATA202' FOR INPUT AS #1
180 FOR I=1 TO NN : FSUM(I)=0 'FSUM IS FOR COLUMN SUM-UP USE
190 REM SEPERATE CODE INTO TOP, MIDDLE AND BOTTOM PARTS FOR PRINT HEADING
200 INPUT #1, CODE(I): CODE=STR$(CODE:I) 'BEWARE CODE* CONTAIN A SPACE AHEAD
210 TCF*(I)=MID$(CODE$,2,1)
220 MC*(I)=MID$(CODE$,3,1)
230 BC*(I)=RIGHT$(CODE$,1)
240 REM READ 39 : 3 DATA FOR EACH QUESTIONNAIRE
250 FOR J=1 TO QN
260 FOR K=1 TO 3: INPUT #1, MEASURE(J,K,I): NEXT K
270 REM VSUMI=IMPORTANT FACTOR ONLY
280 VSUMI(I,J)=MEASURE(J,3,I) 'JUST WANT IMPORTANT VALUE
290 REM DELTA COMPARE THE RESPONSE VALUES; IF SAME , =0, ELSE =1
300 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=1
310 IF VSUMI(I,J)=0 THEN NCZERO(I)=NCZERO(I)+1
320 NEXT J: NEXT I
330 CLOSE #1
340 GOSUB 350
350 END
360 REM *****
370 REM PRINT THE MATRIX OUT
380 PRINT TIB : FLAG=0
390 S=1: SE=9 'S & SE DEFINE HOW MANY COLUMNS TO BE SHOWN IN A SINGLE PRINTOUT
400 SETAIL=NN-INT(NN/(S+SE))*(S+SE)
410 PGN=INT(NN/(S+SE))+1: FOR PAGE=1 TO PGN 'DEFINE # OF PAGES PRINTOUT
420 PRINT TAB(13);
430 FOR I=S TO S+SE:PRINT TOP*(I) SPC(6):NEXT I: PRINT
440 PRINT TAB(13);
450 FOR I=S TO S+SE:IF I=NN THEN GOTO 460 ELSE PRINT MC*(I) SPC(6):NEXT I
460 PRINT:GOTO 470
470 PRINT MC*(I) SPC(6) 'AVERAGE'
480 PRINT TAB(13);
490 FOR I=S TO S+SE: PRINT BO*(I) SPC(6):NEXT I: PRINT
500 PRINT STRING$(80,45)
510 FOR J=1 TO QN: IF RANK(J)<10 THEN GAP*=" " ELSE GAP*=" "
520 PRINT 'QUES':RANK(J);GAP*:FOR I=S TO S+SE:PRINT USING "###.###":VSUMI(I,J);
530 NEXT I:IF FLAG=1 THEN GOSUB 510 'CALCULATE HORIZONTAL AVERAGE VALUES
540 PRINT: NEXT J
550 GOSUB 560 'CALCULATE AVG OF IMPORTANT VALUES
560 IF PAGE=PGN THEN GOTO 600
570 A*=INHE*: IF A*="%" OR A*="/" THEN GOTO 570 ELSE 560
580 IF PAGE<1+PGN THEN S=S+10: GOTO 390
590 IF PAGE=1+PGN THEN S=S+10 : SE=SETAIL-1: FLAG=1 : GOTO 390
600 NEXT PAGE

```



```

600 RETURN
610 RSUM(J)=0: FOR I=1 TO NN
620 RSUM(J)=RSUM(J)+VSUMI(I,J): NEXT I
630 RAVG(J)=RSUM(J)/NN
640 PRINT USING "####.####": RAVG(J):
650 RETURN
660 PRINT STRING$(80,45)
670 PRINT "AVERAGE":FOR I=5 TO 5+SE:DEL=0:CSUM(I)=0: FOR J=1 TO GN
680 CSUM(I)=CSUM(I)+VSUMI(I,J): NEXT J
690 NSCR(I)=CSUM(I)/GN
700 PRINT USING "###.###":NSCR(I):
710 NEXT I
720 IF FLAG=1 THEN GOSUB 800 'FORMAT LAST PAGE USE
730 PRINT "":FOR I=5 TO 5+SE
740 PRINT "": NEXT I
750 IF FLAG=1 THEN GOTO 770
760 GOTO 790
770 FOR J=1 TO GN: AAVG=RAVG(J)+AAVG: NEXT J 'TOTAL AVG OF RAVG
780 PRINT USING "###.###":AAVG/GN:PRINT "(COL AVG)":
790 RETURN
800 FOR I=1 TO NN: TNSCR=TNSCR+NSCR(I): NEXT I
810 PRINT USING "###.###":TNSCR/NN: PRINT "(HOR AVG)":
820 RETURN
830 OPEN "A:DATA201" FOR INPUT AS #1 'READ DATA INTO WORKING AREA
840 FOR I=1 TO NN: INPUT #1, CODE(I)
850 FOR J=1 TO GN: FOR K=1 TO 3
860 INPUT #1, MEASURE(J,K,I)
870 NEXT K
880 VSUMI(I,J)=MEASURE(J,3,I)
890 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=1
900 NEXT J: NEXT I
910 CLOSE #1
920 FOR J=1 TO GN: FOR I=1 TO NN 'CALCULATE SOME BASIC VALUES
930 RSUM(J)=RSUM(J)+VSUMI(I,J)
940 NEXT I: RAVG(J)=RSUM(J)/NN: NEXT J
950 FOR I=1 TO NN: CSUM(I)=0:DEL=0: FOR J=1 TO GN
960 DEL=DEL+DELTA(J,I)
970 CSUM(I)=CSUM(I)+VSUMI(I,J)
980 NEXT J: NSCR(I)=CSUM(I)/GN: NEXT I
990 REM SORTING PROCEDURES
1000 FOR J=1 TO GN: RANK(J)=J: NEXT J 'RANK(I) REFLECT THE ORIGINAL ORDER
1010 FOR J=1 TO GN-1
1020 MAX=RAVG(J)
1030 FOR I=J+1 TO GN
1040 IF RAVG(I)<MAX THEN GOTO 1070
1050 MAX=RAVG(I): RAVG(I)=RAVG(J): RAVG(J)=MAX
1060 TEMP=RANK(J):RANK(J)=RANK(I):RANK(I)=TEMP
1070 NEXT I: NEXT J
1080 OPEN "A:DATA202" FOR OUTPUT AS #1 'WRITE THE SORTING ORDER BACK
1090 FOR I=1 TO NN: PRINT #1, CODE(I): 'SORT BY AVERAGE
1100 FOR J=1 TO GN: FOR K=1 TO 3
1110 PRINT #1, MEASURE(RANK(J),K,I):
1120 NEXT K: NEXT J: PRINT #1, " ": NEXT I
1130 CLOSE #1
1140 RETURN
C

```