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

Prepared by:
Dr. William C. Moor
College of Engineering
Arizona State University
Tempe, Arizona
and
Dr. James E. Bailey
College of Engineering
Arizona State University
Tempe, Arizona

March 1985

Prepared for
Arizona Department of Transportation
206 South 17th Avenue
Phoenix, Arizona 85007
in cooperation with
U.S. Department of Transportation
Federal Highway Administration

The contents of the report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Arizona Department of Transportation or the Federal Highways Administration. This report does not constitute a standard, specification, or regulation. Trade or manufacturer's names which may appear herein are cited only because they are considered essential to the objectives of the report. The U.S. Government and the State of Arizona do not endorse products or manufacturers.

Technical Report Documentation Page

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
		6. Performing Organization Code
7. Author(s) W. C. Moor, J.E. Bailey, P.A. Evans, and A. Roberts		8. Performing Organization Report No.
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		10. Work Unit No. (TRAIS)
		11. Contract or Grant No. HPR-PL-1(27) ITEM 205
12. Sponsoring Agency Name and Address Arizona Department of Transportation 206 South 17th Avenue Phoenix, Arizona 85007		13. Type of Report and Period Covered FINAL MARCH, 1985
		14. Sponsoring Agency Code

15. Supplementary Notes

In cooperation with the U. S. Department of Transportation Federal Highway Administration

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.

17. Key Words IDEF, User Needs, Information Systems, System Analysis and Design, User Satisfaction, Information System Utility		18. Distribution Statement No Restrictions. Available to the public through the NTIS, Springfield, Virginia 22161	
19. Security Classif. (of this report) UNCLASSIFIED	20. Security Classif. (of this page) UNCLASSIFIED	21. No. of Pages 86	22. Price

Form DOT F 1700.7 (8-72). Reproduction of completed page authorized

TABLE OF CONTENTS

VOLUME I
PROJECT REPORT

Section	Page
LIST OF TABLES	iv
LIST OF FIGURES	v
INTRODUCTION	1
BACKGROUND OF THE STUDY	5
Function Modeling	5
Needs Analysis	6
Utility of Information	8
User Satisfaction	10
APPLICATION OF THE RESEARCH METHODOLOGIES FOR ADOT	12
Background	12
Methodologies As Applied	12
IDEF Methodology	12
Bailey and Federle Methodology	17
Krobock Methodology	18
Pearson Methodology	20
Data Collection	21
DATA ANALYSIS PROCEDURES	24
Application of IDEF	24
Bailey and Federle Methodology	24
Krobock Methodology	28
Pearson Methodology	32
Combinations of Methodologies	37

TABLE OF CONTENTS (cont'd)

Section	Page
ANALYSIS OF COLLECTED DATA IN THE RIGHT-OF-WAY SECTION	40
IDEF Methodology	40
Federie Methodology	40
Krobock Methodology	41
Pearson Methodology	44
Combinations of Methodologies	46
Users Manual	48
RESULTS	50
Summary	50
Conclusions	51
BIBLIOGRAPHY	53

LIST OF TABLES

Table 1 Pearson Satisfaction Weights 33

Table 2 Pearson Importance Weights 33

Table 3 Normalized Levels of Satisfaction 35

LIST OF FIGURES

Figure 1 $IDEF_{\emptyset}$ Model 13

Figure 2 $IDEF_{\emptyset}$ Interrelations 14

Figure 3 $IDEF_{\emptyset}$ Break Down 15

Figure 4 $IDEF_{\emptyset}$ Parent-daughter 16

Figure 5 Federle Semantic Differential 19

Figure 6 Krobock Relevance Tree 20

Figure 7 Pearson Scale 21

VOLUME II
MANUAL FOR EVALUATION OF NEEDS AND ATTITUDES OF EDP USERS

		Page
APPENDIX A	The ISG Users Manual	1
APPENDIX A-1	The Bailey-Federle Questionnaire	34
APPENDIX A-2	The Krobock Questionnaire	48
APPENDIX A-3	The Pearson Questionnaire	51
APPENDIX A-4	Guide for Creating the Data Base and Linking Analysis Programs	65
APPENDIX A-5	Listing of Programs for Analysis of Bailey-Federle Questionnaire Data	75
APPENDIX A-6	Listing of Programs for Analysis of Krobock Data	78
APPENDIX A-7	Listing of Programs for Pearson Data	81

VOLUME III
APPENDICES

		Page
APPENDIX B	Informed Consent Form	1
APPENDIX C	Complete $IDEF_0$ Analysis for the Right of Way Section, ADOT	2
APPENDIX D	Questionnaire 1 As Used In This Study	38
APPENDIX E	Questionnaire 2 As Used In This Study	53
APPENDIX F	Activities Performed by ADOI Personnel In the Right of Way Section.	68
APPENDIX G	EDP Information Reports Generated for ADOT Right of Way Section Personnel.	71
APPENDIX H	Bailey-Federle MX_V Matrix Sorted By Non-Zero Entries.	74
APPENDIX H-1	Guide for Creating the Analysis Data Base and Linking Analysis Programs To It.	77
APPENDIX H-2	Bailey-Federle Questionnaire Data As Stored In the Data Base (DATA2).	87

		Page
APPENDIX H-3	Listing of the Program ($P2NX_V$) To Create the Bailey-Federle NX_V Matrix Sorted by Non-Zero Entries.	90
APPENDIX H-4	Bailey-Federle NX_V Matrix Sorted By Average NX_V	91
APPENDIX H-5	Listing of the Program (P2NXVSA) To Create the Bailey-Federle NX_V Matrix Sorted By Average NX_V.	
APPENDIX I	Bailey-Federle X Matrix Sorted By Non-Zero Entries.	95
APPENDIX I-1	Listing of Program (P2X) to Create Bailey-Federle X Matrix Sorted By Non-Zero Entries.	98
APPENDIX J	Bailey-Federle X Matrix Sorted By Average X.	99
APPENDIX J-1	Listing of Program (P2XSA) To Create Bailey-Federle Matrix Sorted By Average X.	102
APPENDIX K	Krobock Data Reduction Matrix	103
APPENDIX K-1	Krobock Questionnaire Data As Stored In the Data Base (DATA3).	104

		Page
APPENDIX K-2	Listing of Program (P3TL) To Create Krobock Data Reduction Matrix.	106
APPENDIX L	Krobock Data Matrice Sorted By Specific Reports.	107
APPENDIX L-1	LISTING OF PROGRAM (P3SP) To Create Krobock Data Matrices Sorted By Specific Reports	116
APPENDIX M	Krobock Data Matrices Sorted Respondents.	117
APPENDIX M-1	Listing of Program (P3SI) To Create Krobock Data Matrices Sorted by Individual Respondents.	122
APPENDIX N	Pearson NS_i Matrix	123
APPENDIX N-1	Pearson Questionnaire Data As Stored In The Data Base (DATA1)	126
APPENDIX N-2	Listing of Programs (P1S-NS and P12-NSAG) To Create Pearson NS_i Matrix.	129
APPENDIX O	Pearson Importance Matrix	132
APPENDIX O-1	Listing of Programs (P1TMP2 and P1TMP3) to Create Pearson Importance Matrix.	135

APPENDIX A

MANUAL FOR EVALUATION OF NEEDS AND ATTITUDES OFEDP 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 acscertain 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

NS	Level of Satisfaction
+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 apsects 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 greately 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.

CATEGORY	SCORE	POTENTIAL
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 Krobock scores for each individual who scored the given activity. The higher the Krobock 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 $IDEF_0$ 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 $IDEF_0$, 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 preceeding 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.

Strong		X						Weak
Score assigned	3	2	1	0	-1	-2	-3	

Consistent					X			Inconsistent
Score assigned	3	2	1	0	-1	-2	-3	

Important			X					Unimportant
Score assigned	1.00	0.85	0.70	0.55	0.40	0.25	0.10	

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 <u>each</u> 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 <u>each</u> 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 normalize 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 respondant 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 <u>each</u> activity listed by the respondent, let X_I be the importance score taken directly from the importance column on the questionnaire.

STEP 4: For <u>each</u> 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:

consistent				X				wide variation
(Value of each interval)	7	6	5	4	3	2	1	

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 ADOT/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#_____

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

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 Krobock 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.

USER#	COMPUTERIZED	NOT COMPUTERIZED	COULD BE	CAN'T	NOT SATISFIED	SATISFIED

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: $IDEF_0$

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 $IDEF_0$ 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 <u>during</u> 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-CONSUMPTION
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 consistant". 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 consistant". 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 consistant". 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):

		Percentage
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).

		Percentage
PERCENTAGE YOU BELIEVE COULD BE COMPUTERIZED.	C.	_____
PERCENTAGE YOU BELIEVE CANNOT 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.)

	TITLE OF INFORMATION	SCORE
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 USEFULLNESS

1. Item must be delivered on time 1._____

2. Data must be current 2._____

CONTENT AFFECT ON USEFULNESS

3. Data must be accurate 3._____

4. Item must be relevant to use 4._____

5. Data must be adequate 5._____

CONVENIENCE AFFECTS ON USEFULNESS

6. Item must be easy to use 6._____

7. Item must be handy 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 or 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. <u>Precision</u>: 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. <u>Reliability</u>: The consistency and dependability of the output information.

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

20. <u>Currency</u>: The age of the output information.

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

21. <u>Completeness</u>: The comprehensiveness of the output information content.

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

22. <u>Format of output</u>: 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. <u>Language</u>: 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. <u>Integration of systems</u>: 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

APPENDIX A-4

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 ENTRY

Repondent 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

Value	Level of Satisfaction
+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

Value	Level of Importance
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 preceeding 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

Code	Description	Questionnaire
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

DATA1 - Data File for Pearson Questionnaire Data

Using the EDLIN line editor to create (or identify) the data file DATA1, the data from the Pearson questionnaire is entered as follows (the commas are

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

For each respondent the <u>first</u> data line is:

IDN, ST_1, ST_2, . . ., ST_7

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  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 .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 .55  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 .55
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  5
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 60 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 25 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
334  : 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 10 302 100
161 50 50 75 25 313 85 334  5 357 10
100 0 20 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 P1S-NS and P1S-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 P1S-NS calculates average values of normalized satisfaction, sorts them according to average, creates DATA101, and stores these values in DATA101. Program P1S-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 P2NXY

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 Krobock 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 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).

Program P3SI

This program produces a set of matrices based on Krobock 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 TI$="BAILEY AND FEDERLE STRUCTURE AND CONSISTENCY SORTED BY NON-ZERO"
10 DIM CODE(NN),ACTNUM(NN),POT(AN,NN+1),TOP$(NN),MC$(NN),BO$(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):BO$(I)=RIGHT$(CODE$,1): FOR J=1 TO ACTNUM(I)
90 INPUT #1, A1,A2,A3,A4,A5,A6,A7: IF A1=299 THEN GOTO 120     '299 INDICATE REMA
INDER PERCENTAGE PORTIONS
91 REM** A2 IS XI(IMPORTANCE): A3 IS XT(TIME-CONSUMPTION)
100 POT(A1-199,I)=100*(A4+A5+A6+A7)/28
120 NEXT J: NEXT I    'BECAUSE ACTIVITY NUMBERED FROM #200
123 GOSUB 300
124 GOSUB 400          'SORTING PROCEDURE
125 GOSUB 500
170 END
300 REM *** CALCULATE BEFORE SORTING ***
310 FOR J=1 TO ACTN  : KT(J)=0
320 FOR I=1 TO NN
330 IF POT(J,I)=0 GOTO 350 ELSE KT(J)=KT(J)+1
350 NEXT I: NEXT J
399 RETURN
400 REM *** SORTING PROCESS ***
410 FOR J=1 TO AN: RANK(J)=J: NEXT J      'J IS THE RANKING BEFORE SORTING
420 FOR J=1 TO AN-1
430 MAX=KT(J)
440 FOR I=J+1 TO AN
450 IF KT(I)<=MAX THEN GOTO 480
460 MAX=KT(I): KT(I)=KT(J): KT(J)=MAX                'VALUE SORTED
470 TEMP=RANK(J): RANK(J)=RANK(I): RANK(I)=TEMP     'KEEP TRACK ON RANK
480 NEXT I: NEXT J
499 RETURN
500 S=1: SE=9
501 PRINT TI$
510 FOR PAGE=1 TO PN
520 PRINT TAB(17);:FOR I=S TO S+SE: IF I=NN+1 THEN PRINT " " ELSE PRINT TOP$(I) S
PC(5);: NEXT I:PRINT
530 PRINT TAB(17);:FOR I=S TO S+SE:IF I=NN+1 THEN PRINT "AVG";"   TOTAL";"    # N
ON-ZERO" ELSE PRINT MC$(I) SPC(5);: NEXT I:PRINT
540 PRINT TAB(17);:FOR I=S TO S+SE:IF I=NN+1 THEN PRINT " " ELSE PRINT BO$(I) SPC
(5);: NEXT I: PRINT
550 PRINT STRING$(80,45)
560 FOR J=1 TO ACTN    ' ACTIVITY 200-257
570 PRINT "ACT";199+RANK(J);:PRINT "NXV" ;
580 FOR I=S TO S+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                        ' HSUM FOR HORIZONTAL SUM OF NXV(POT HERE)
601 PRINT
606 NEXT J
610 IF PAGE=PN GOTO 700  'LAST PAGE.
620 IF PAGE   PN-1 THEN S=S+10 ELSE GOTO 630
621 GOTO 649
630 S=21: SE=5
649 A$=INKEY$: IF A$="" 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
9
```

Program P2NXVSA

Creates The Bailey-Federle NXV Matrix Sorted By Average NXV

```
1
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 TI$="BAILEY AND FEDERLE STRUCTURE AND CONSISTENCY SORTED BY AVERAGE"
10 DIM CODE(NN),ACTNUM(NN),POT(AN,NN+1),TOP$(NN),MC$(NN),BO$(NN),HSUM(AN)
11 DIM DOV(AN,NN+1),HDSUM(AN),KT(AN),CT(AN),RANK(AN),AVG(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):BO$(I)=RIGHT$(CODE$,1): FOR J=1 TO ACTNUM(I)
90 INPUT #1, A1,A2,A3,A4,A5,A6,A7: IF A1=299 THEN GOTO 120    '299 INDICATE REMA
INDER PERCENTAGE PORTIONS
91 REM** A2 IS <I>(IMPORTANCE): A3 IS <T>(TIME-CONSUMPTION)
100 POT(A1-199,I)=100*(A4+A5+A6+A7)/28
120 NEXT J: NEXT I    'BECAUSE ACTIVITY NUMBERED FROM #200
123 GOSUB 200
124 GOSUB 400          'SORTING PROCEDURE
125 GOSUB 500
199 END
200 REM *** CALCULATE BEFORE SORTING ***
210 FOR J=1 TO ACTN  : KT(J)=0: HSUM(J)=0
220 FOR I=1 TO NN
230 IF POT(J,I)=0 THEN GOTO 250 ELSE KT(J)=KT(J)+1: HSUM(J)=HSUM(J)+POT(J,I)
250 NEXT I:IF KT(J)=0 GOTO 251 ELSE AVG(J)=HSUM(J)/KT(J)
251 NEXT J
299 RETURN
400 REM *** SORTING PROCESS ***
410 FOR J=1 TO AN: RANK(J)=J: NEXT J      'J IS THE RANKING BEFORE SORTING
420 FOR I=1 TO AN-1
430 MAX=AVG(I)
440 FOR J=I+1 TO AN
450 IF AVG(J)<=MAX THEN GOTO 480
460 MAX=AVG(J): AVG(I)=AVG(J): AVG(J)=MAX                'VALUE SORTED
470 TEMP=RANK(J): RANK(J)=RANK(I): RANK(I)=TEMP     'KEEP TRACK ON RANK
480 NEXT J: NEXT I      'AVG(RANK(J)) STORE THE ORIGINAL VALUE
490 RETURN              'AVG(I) IS THE LARGEST VALUE NOW
500 S=1: SE=9
501 PRINT TI$
510 FOR PAGE=1 TO PN
520 PRINT TAB(17);:FOR I=S TO S+SE: IF I=NN+1 THEN PRINT " " ELSE PRINT TOP$(I) S
PC(5);: NEXT I:PRINT
530 PRINT TAB(17);:FOR I=S TO S+SE:IF I=NN+1 THEN PRINT "AVG";"   TOTAL";"    # N
ON-ZERO" ELSE PRINT MC$(I) SPC(5);: NEXT I:PRINT
540 PRINT TAB(17);:FOR I=S TO S+SE:IF I=NN+1 THEN PRINT " " ELSE PRINT BO$(I) SPC
(5);: NEXT I: PRINT
550 PRINT STRING$(80,45)
560 FOR J=1 TO ACTN   ' ACTIVITY 200-257
570 PRINT "ACT";199+RANK(J);:PRINT "NXV" ;
580 FOR I=S TO S+SE : IF I=NN+1 THEN GOSUB 651
590 PRINT USING "######"; POT(RANK(J),I);
600 NEXT I:PRINT     ' HSUM FOR HORIZONTAL SUM OF NXV(POT HERE)
610 NEXT J
611 IF PAGE=PN GOTO 799  'LAST PAGE.
620 IF PAGE   PN-1 THEN S=S+10 ELSE GOTO 630
621 GOTO 649
630 S=S+10: SE=5
649 A$=INKEY$: IF A$="" GOTO 649
650 GOTO 700
651 IF KT(RANK(J))=0 THEN PRINT : GOTO 652 ELSE PRINT USING "#####.###";AVG(J);A
VG(J)*KT(RANK(J));KT(RANK(J))
652 RETURN   606
700 NEXT PAGE
799 RETURN
9
```

Program P2XSA

Creates The Bailey-Federle Matrix Sorted By Average X

```
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    ' =XI(XT+NXV)
5 TI$='BAILEY AND FEDERLE COMPUTERIZABILITY SORTED BY AVERAGE'
10 DIM CODE(NN),ACTNUM(NN),POT(AN,NN+1),TOP$(NN),MC$(NN),BO$(NN),HSUM(AN)
11 DIM DOV(AN,NN+1),HDSUM(AN),KT(AN),CT(AN),RANK(AN),AVG(AN)
20 FOR I=1 TO NN
30 READ ACTNUM(I): NEXT I          ' ACTNUM INDICATE HOW MANY ACTIVITIES INVOLVED
40 DATA 6,3,6,3,6,11,7,11,11,7
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$,2,1):
MC$(I)=MID$(CODE$,3,1):BO$(I)=RIGHT$(CODE$,1): FOR J=1 TO ACTNUM(I)
90 INPUT #1, A1,A2,A3,A4,A5,A6,A7: IF A1=299 THEN GOTO 120    '299 INDICATE REMA
INDER PERCENTAGE PORTIONS
91 REM** A2 IS  I(IMPORTANCE): A3 IS KT(TIME-CONSUMPTION)
100 POT(A1-199,I)=100*(A4+A5+A6+A7)/28:DOV(A1-199,I)=A2*(A3+POT(A1-199,I))
110 NEXT J: NEXT I    'BECAUSE ACTIVITY NUMBERED FROM #200
120 GOSUB 300
124 GOSUB 400          'SORTING PROCEDURE
125 GOSUB 500
130 END
300 REM *** CALCULATE BEFORE SORTING ***
310 FOR J=1 TO ACTN  : KT(J)=0: HSUM(J)=0
320 FOR I=1 TO NN
330 IF DOV(J,I)=0 GOTO 350 ELSE KT(J)=KT(J)+1: HSUM(J)=HSUM(J)+DOV(J,I)
350 NEXT I
351 IF KT(J)=0 GOTO 352 ELSE AVG(J)=HSUM(J)/KT(J)
352 NEXT J
399 RETURN
400 REM *** SORTING PROCESS ***
410 FOR J=1 TO AN: RANK(J)=J: NEXT J      'J IS THE RANKING BEFORE SORTING
420 FOR J=1 TO AN-1
430 MAX=AVG(J)
440 FOR I=J+1 TO AN
450 IF AVG(I)<=MAX THEN GOTO 480
460 MAX=AVG(I): AVG(I)=AVG(J): AVG(J)=MAX                'VALUE SORTED
470 TEMP=RANK(J): RANK(J)=RANK(I): RANK(I)=TEMP     'KEEP TRACK ON RANK
480 NEXT I: NEXT J
490 RETURN
500 S=1: SE=9
501 PRINT TI$
510 FOR PAGE=1 TO PN
520 PRINT TAB(17):FOR I=S TO S+SE: IF I=NN+1 THEN PRINT ' ' ELSE PRINT TOP$(I) S
PC(5);: NEXT I:PRINT
530 PRINT TAB(17):FOR I=S TO S+SE:IF I=NN+1 THEN PRINT 'AVG';'   TOTAL';'    # N
ON-ZERO' ELSE PRINT MC$(I) SPC(5);: NEXT I:PRINT
540 PRINT TAB(17):FOR I=S TO S+SE:IF I=NN+1 THEN PRINT ' ' ELSE PRINT BO$(I) SPC
(5);: NEXT I: PRINT
550 PRINT STRING$(80,45)
560 FOR J=1 TO ACTN    ' ACTIVITY 200-257
570 PRINT 'ACT';199+RANK(J);:PRINT ' X=' ;
580 FOR I=S TO S+SE : IF I=NN+1 THEN GOSUB 651
590 PRINT USING '######'; DOV(RANK(J),I);
600 NEXT I:PRINT     ' HSUM FOR HORIZONTAL SUM OF  X (DOV HERE)
606 NEXT J
610 IF PAGE=PN GOTO 799  'LAST PAGE.
620 IF PAGE   PN-1 THEN S=S+10 ELSE GOTO 630
621 GOTO 649
630 S=21: SE=5
649 A$=INKEY$: IF A$='' GOTO 649
650 GOTO 700
651 IF KT(RANK(J))=0 THEN PRINT : GOTO 652 ELSE PRINT USING '#######.#'; AVG(J);
AVG(J)*KT(RANK(J));KT(RANK(J))
652 RETURN   606
700 NEXT PAGE
799 RETURN
0
```

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$="KROBOCK DATA"
10 DIM CODE(NN),ACTNUM(NN)
11 DIM UNIT(NN,7)
20 FOR I=1 TO NN
30 READ ACTNUM(I): NEXT I
40 DATA 2,2,3,3,3, 3,0,2 ,5 ,1
50 DATA 5,10,6 ,5,6 ,3 ,7,9,1
60 DATA 3,13,1,2,1,3
70 OPEN "A:DATA3" FOR INPUT AS #1
80 FOR I=1 TO NN: INPUT #1, KODE,A,B,C,D:CODE(I)=KODE
81 A=A*.01: B=B*.01: C=C*.01: D=D*.01
85 UNIT(I,1)=A
86 UNIT(I,2)=B
87 UNIT(I,3)=C
88 UNIT(I,4)=D
89 UNIT(I,5)=B*C
100 IF (A+(B*C))=0 THEN UNIT(I,6)=0' ELSE UNIT(I,6)=A/(A+(B*C))
101 UNIT(I,7)=A2*.01        'VALUE OF CURRENT INFORMATION
118 FOR J= 1 TO ACTNUM(I)
119 INPUT #1, A1,A2
120 NEXT J
121 NEXT I
122 FOR I=1 TO NN:INPUT #1,DUMKD: FOR J=1 TO ACTNUM(I): INPUT #1,V1,V2,V3,V4,V5,
V6,V7:NEXT J: NEXT I
125 GOSUB 500
130 END
500 REM **** DRAW TABLES *********
501 PRINT TI$
520 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
800 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 TI$="KROBOCK SORTED REPORT NUMBER"
10 DIM CODE%(NN),ACTNUM%(NN),A%(NN,20)     ' A MATRIX TRACK THE ACT NUMBER
11 DIM UNIT%(NN,RN,10)
20 FOR I=1 TO NN
30 READ ACTNUM%(I): NEXT I
40 DATA 7,2,3,3,3, 3,0,2 ,5 ,1
50 DATA 6,10,6 ,5,6 ,3 ,7,9,1
60 DATA 2,13,1,2,1,3
70 OPEN "A:DATA3" FOR INPUT AS #1
80 FOR I=1 TO NN: INPUT #1, KODE,A,B,C,D:CODE%(I)=KODE
82 FOR J= 1 TO ACTNUM%(I)
90 INPUT #1, A%(I,J),A2 : A1=A%(I,J)
95 UNIT%(I,A1-299,1)=A          'VALUE A
96 UNIT%(I,A1-299,2)=A2         'VALUE OF CURRENT INFORMATION
97 UNIT%(I,A1-299,3)=A*A2
100 NEXT J: NEXT I
102 FOR I=1 TO NN: INPUT #1, IDK
103 FOR J=1 TO ACTNUM%(I):INPUT #1, V1,V2,V3,V4,V5,V6,V7
104 UNIT%(I,A%(I,J)-299,4)=V1     : UNIT%(I,A%(I,J)-299,5)=V2
106 UNIT%(I,A%(I,J)-299,6)=V3     : UNIT%(I,A%(I,J)-299,7)=V4
108 UNIT%(I,A%(I,J)-299,8)=V5     : UNIT%(I,A%(I,J)-299,9)=V6
110 UNIT%(I,A%(I,J)-299,10)=V7
112 NEXT J: NEXT I
114 CLOSE #1
125 GOSUB 500
130 END
500 REM **** DRAW TABLES *********
501 PRINT TI$
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$(75,45)
541 FOR K=1 TO 10: SUBT(K)=0: NEXT K
550 FOR I=1 TO NN
560 IF UNIT%(I,J,1)=0 GOTO 700   'IF NO VALUE STORED, SKIP
561 TNN=TNN+1
570 PRINT CODE%(I) SPC(6);: FOR M=1 TO 2: PRINT USING"###.###"; UNIT%(I,J,M)*.01
;: SUBT(M)=SUBT(M)+UNIT%(I,J,M)*.01
571 NEXT M
572 PRINT USING "###.####";UNIT%(I,J,3)*.0001;
573 SUBT(3)=SUBT(3)+UNIT%(I,J,3)*.0001
574 FOR M=4 TO 10: PRINT USING"###.##"; UNIT%(I,J,M)*.01;:SUBT(M)=SUBT(M)+UNIT%(
I,J,M)*.01: NEXT M
580 PRINT
700 NEXT I
701 IF TNN=0 GOTO 780
750 PRINT STRING$(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
800 RETURN
0
```

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 TI$="KROBOCK SORTED BY INDIVIDUAL"
10 DIM CODE%(NN),ACTNUM%(NN),A%(NN,20)    ' A MATRIX TRACK THE ACT NUMBER
11 DIM UNIT%(NN,RN,10),AG(10),SUBT(10)
20 FOR I=1 TO NN
30 READ ACTNUM%(I): NEXT I
40 DATA 3,2,3,3,3, 3,0,2 ,5 ,1
50 DATA 6,10,6 ,5,6 ,3 ,7,9,1
60 DATA 2,13,1,2,1,3
70 OPEN "A:DATA3" FOR INPUT AS #1
80 FOR I=1 TO NN: INPUT #1, KODE,A,B,C,D:CODE%(I)=KODE
82 FOR J= 1 TO ACTNUM%(I)
90 INPUT #1, A%(I,J),A2 : A1=A%(I,J)
95 UNIT%(I,A1-299,1)=A          'VALUE A
96 UNIT%(I,A1-299,2)=A2         'VALUE OF CURRENT INFORMATION
97 UNIT%(I,A1-299,3)=A*A2
100 NEXT J: NEXT I
102 FOR I=1 TO NN: INPUT #1, IDK
103 FOR J=1 TO ACTNUM%(I):INPUT #1, V1,V2,V3,V4,V5,V6,V7
104 UNIT%(I,A%(I,J)-299,4)=V1     : UNIT%(I,A%(I,J)-299,5)=V2
106 UNIT%(I,A%(I,J)-299,6)=V3     : UNIT%(I,A%(I,J)-299,7)=V4
108 UNIT%(I,A%(I,J)-299,8)=V5     : UNIT%(I,A%(I,J)-299,9)=V6
110 UNIT%(I,A%(I,J)-299,10)=V7
112 NEXT J: NEXT I
114 CLOSE #1
125 GOSUB 500
130 END
500 REM **** DRAW TABLES *********
501 PRINT TI$
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
```

APPENDIX A-7

LISTING OF PROGRAMS FOR ANALYSIS OF PEARSON DATA

Programs P1S-NS and PIS-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$="GENERATE BY SORTING NORMAL SCORE"
130 DIM MEASURE(QN,3,NN),CODE(NN),TOP$(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
340 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; 1.00,0.85,0.70,0.55,0.40,0.25,0.10)
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$="PEARSON SORTED BY NORMALIZED SATISFACTION AND AVERAGE"
130 DIM MEASURE(QN,3,NN),CODE(NN),TOP$(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(QN), RSUM(QN),RAVG(QN)    'NORMAL SCORE=CSUM/FSUM*3.0
152 GOSUB 1000
160 OPEN "A:DATA102" FOR INPUT AS #1
170 FOR I=1 TO NN : FSUM(I)=0                    'FSUM IS FOR COLUMN SUM-UP USE
180 REM SEPERATE CODE INTO TOP, MIDDLE AND BOTTOM PARTS FOR PRINT HEADING
190 INPUT #1, CODE(I): CODE$=STR$(CODE(I)) 'BEWARE CODE$ CONTAIN A SPACE AHEAD
200 TOP$(I)=MID$(CODE$,2,1)
210 MC$(I)=MID$(CODE$,3,1)
220 BO$(I)=RIGHT$(CODE$,1)
230 REM READ 39 * 3 DATA FOR EACH QUESTIONNAIRE
240 FOR J=1 TO QN
250 FOR K=1 TO 3: INPUT #1, MEASURE(J,K,I): NEXT K
260 REM VSUMI=WEIGHT * ONE HALF OF THE SUM OF TWO DATA
270 VSUMI(I,J)=MEASURE(J,3,I)*((MEASURE(J,1,I)+MEASURE(J,2,I))/2)
280 REM DELTA COMPARE THE RESPONSE VALUES; IF SAME , =0, ELSE =1
290 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=1
300 IF VSUMI(I,J)=0 THEN NCZERO(I)=NCZERO(I)+1
310 NEXT J: NEXT I
320 CLOSE #1
330 GOSUB 350
340 END
350 REM ***********************************************************************
360 REM PRINT THE MATRIX OUT
370 PRINT TI$  : FLAG=0
380 S=1: SE=9  'S & SE DEFINE HOW MANY COLUMNS TO BE SHOWN IN A SINGLE PRINTOUT
390 SETAIL=NN-INT(NN/(S+SE))*(S+SE)
400 PGN=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$(80,45)
500 FOR J=1 TO QN: IF RANK(J)<10 THEN GAP$="  " ELSE GAP$=" "
 510 PRINT"QUES";RANK(J);GAP$;:FOR I=S TO S+SE:PRINT USING "###.###";VSUMI(I,J);
520 NEXT I:IF FLAG=1 THEN GOSUB 610  'CALCULATE HORIZONTAL AVERAGE VALUES
530 PRINT: NEXT J
540 GOSUB 660  'CLACULATE NORMAL SCORE
550 IF PAGE=PGN THEN GOTO 600
560 A$=INKEY$: IF A$="/" 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(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"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)+VSUMI(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: 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"(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 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 GN: 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 GN
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 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
2200 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: QN=39: NN=25 'TOTAL QUESTIONS ; # OF PEOPLE
120 TI$="GENERATE BY IMPORTANT VALUES AND SORTED BY ROW FIRST"
140 DIM MEASURE(QN,3,NN),CODE(NN),TOP$(NN),MC$(NN),BO$(NN),NCZERO(NN),NSCR(NN)
150 DIM VSUMI(NN,QN), DELTA(QN,NN), FSUM(NN) 'WEIGHTED; 1 OR 0; Fi=SUM OF DELTA
160 DIM CSUM(NN),RANK(NN), RSUM(QN),RAVG(QN)    'NORMAL SCORE=CSUM/FSUM*3.0
161 GOSUB 830
240 END
830 OPEN "A:DATA1" FOR INPUT AS #1        'READ DATA INTO WORKING AREA
840 FOR I=1 TO NN: INPUT #1, CODE(I)
850 FOR J=1 TO QN: 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 QN: 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 QN
960 DEL=DEL+DELTA(J,I)
970 CSUM(I)=CSUM(I)+VSUMI(I,J)
980 NEXT J: NSCR(I)=CSUM(I)/QN : NEXT I
990 REM  SORTING PROCEDURES
1000 FOR I=1 TO NN: RANK(I)=I: NEXT I       'RANK(I) REFLECT THE ORIGINAL ORDER
1010 FOR I=1 TO NN-1
1020 MAX=NSCR(I)
1030 FOR J=I+1 TO NN
1040 IF NSCR(J)<=MAX THEN GOTO 1070
1050 MAX=NSCR(J): NSCR(J)=NSCR(I): NSCR(I)=MAX
1060 TEMP=RANK(I):RANK(I)=RANK(J):RANK(J)=TEMP
1070 NEXT J: NEXT I
1080 OPEN "A:DATA201" FOR OUTPUT AS #1        ' WRITE THE SORTING ORDER BACK
1090 FOR I=1 TO NN: PRINT #1, CODE(RANK(I));        ' SORT BY AVERAGE
1100 FOR J=1 TO QN: FOR K=1 TO 3
1110 PRINT #1, MEASURE(J,K,RANK(I));
1120 NEXT K: NEXT J: PRINT #1," ": NEXT I
1130 CLOSE #1
1140 RETURN
0
```

```
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 ***********************************************************************
110 CLEAR: QN=39: NN=25 'TOTAL QUESTIONS : # OF PEOPLE
120 TI$="PEARSON SORTED BY IMPORTANCE AND AVERAGE"
140 DIM MEASURE(QN,3,NN),CODE(QN),TOP$(NN),MC$(NN),BO$(NN),NCZERO(NN),NSCR(NN)
150 DIM VSUMI(NN,QN), DELTA(QN,NN), FSUM(NN) 'WEIGHTED: 1 OR 0: F1=SUM OF DELTA
160 DIM CSUM(NN),RANK(QN), PSUM(QN),PAVG(QN)    'NORMAL SCORE=CSUM/FSUM*3.0
161 GOSUB 320
162 OPEN "A:DATA2U2" FOR INPUT AS #1
170 FOR I=1 TO NN : FSUM(I)=0                    'FSUM IS FOR COLUMN SUM-UP USE
180 REM SEPERATE CODE INTO TOP, MIDDLE AND BOTTOM PARTS FOR PRINT HEADING
190 INPUT #1, CODE(I): CODE$=STR$(CODE(I)) 'BEWARE CODE$ CONTAIN A SPACE AHEAD
200 TOP$(I)=MID$(CODE$,2,1)
210 MC$(I)=MID$(CODE$,3,1)
220 BO$(I)=RIGHT$(CODE$,1)
230 REM READ 39 * 3 DATA FOR EACH QUESTIONNAIRE
240 FOR J=1 TO QN
250 FOR K=1 TO 3: INPUT #1, MEASURE(J,K,I): NEXT K
260 REM VSUMI=IMPORTANT FACTOR ONLY
270 VSUMI(I,J)=MEASURE(J,3,I)  'JUST WANT IMPORTANT VALUE
280 REM DELTA COMPARE THE RESPONSE VALUES; IF SAME , =0, ELSE =1
290 IF MEASURE(J,1,I)=0 AND MEASURE(J,2,I)=0 THEN DELTA(J,I)=0 ELSE DELTA(J,I)=1
300 IF VSUMI(I,J)=0 THEN NCZERO(I)=NCZERO(I)+1
310 NEXT J: NEXT I
320 CLOSE #1
330 GOSUB 350
340 END
350 REM ***********************************************************************
360 REM PRINT THE MATRIX OUT
370 PRINT TI$  : FLAG=0
380 S=1: SE=9  'S & SE DEFINE HOW MANY COLUMNS TO BE SHOWN IN A SINGLE PRINTOUT
390 SETAIL=NN-INT(NN/(S+SE))*(S+SE)
400 PGN=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$(80,45)
500 FOR J=1 TO QN: IF RANK(J)<10 THEN GAP$="  " ELSE GAP$=" "
510 PRINT "QUES";RANK(J);GAP$;:FOR I=S TO S+SE:PRINT USING "###.###";VSUMI(I,J);
520 NEXT I:IF FLAG=1 THEN GOSUB 610  'CALCULATE HORIZONTAL AVERAGE VALUES
530 PRINT: NEXT J
540 GOSUB 660   CLACULATE AVG OF IMPORTANT VALUES
550 IF PAGE=PGN THEN GOTO 600
560 A$=INKEY$: IF A$="Y" OR A$="y" 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(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=S TO S+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=S TO S+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
```