Behavior Research Methods & Instrumentation
1974, Vol. 6 (6), 567-568

ORGAN and ORGY: Programs for the analysis of organization structures

PETER R. LANSLEY and TERRY D. WEBB
Ashridge Management Research Unit
Berkhamsted, Hertfordshire HP4 1NS, England

Description. ORGAN and ORGY are programs for the comparison and analysis of networks of relationships which exist within an organization. The basic units of information are the pairwise relationships which exist between individuals in the organization; these are represented by incidence matrices, one matrix for each network. For a communications network, the rows can be considered as senders and the columns as receivers of information. The essential feature of the program is the comparison of the entries in the matrices with configurations of relationships specified by the investigator. For example, we may wish to compare the formal relationships between individuals in a company as defined on the organization chart (or family tree) with the perceptions furnished by the individuals of their relationships to others with whom they work. Denoting the defined relationship between the ith and jth individuals in the organization by Dij and Dji and the perceived relationships by Pij and Pji, such that ij indicates a relationship of the ith individual to the jth individual and ji indicates a relationship of the jth individual to the ith individual, and denoting the possible values which the Ds and Ps can take by M (manager), P (peer), S (subordinate), and 0 (no relationship), simple configurations may be defined as shown in Examples 1, 2, and 3. As organization analysts we are interested in certain configurations of the Dij, Pij, Dji, and Pji relationships, such as:

Example 1
Agreement Between Defined and Perceived Relationships

Possibility	Dij	Dji	Pij	Pji	
1	S	M	S	M	The perceived relationships are "correct" between Person i and Person j.
2	P	P	P	P	
3	M	S	M	S	

Example 2
Errors of Omission: Reciprocated

Possibility	Dij	Dji	Pij	Pji	
1	S	M	O	O	The defined relationships are not perceived by either Person i or Person j.
2	P	P	O	O	
3	M	S	O	O	

Example 3
Errors of Perception: Not Reciprocated (Without Omission)

Possibility	Dij	Dji	Pij	Pji	
1	S	M	M	M	The defined relationships are incorrectly perceived by Person i.
2	S	M	P	M	
3	P	P	S	P	
4	P	P	M	P	
5	M	S	S	S	
6	M	S	P	S	

For some situations the number of configurations is large, the specification and enumeration of individual categories is complicated, and they are often of little interest. To help overcome this difficulty, "abbreviators" have been developed for the purpose of specifying the set of configurations to be compared using the ORGAN program. The following indicators are used to form the abbreviated specification: *all*, all possible defined relationships; *same*, perceived relationships which take the same form as the defined relationships; *not same*, perceived relationships which do not take the same form as the defined relationship; and *ignore*, relationships which are to be ignored.

Examples 1, 2, and 3 in abbreviated form would thus appear as:

Example 1
Agreement Between Defined and Perceived Relationships

Possibility	Dij	Dji	Pij	Pji
1	All	All	Same	Same

Considering all of the possible defined relationships, those defined for Person i and Person j are perceived as the same (correct).

Example 2
Errors of Omissions: Reciprocated

Possibility	Dij	Dji	Pij	Pji
1	All	All	0	0

No relationships are perceived where relationships are defined.

Example 3
Errors of Perception: Not Reciprocated (Without Omission)

Possibility	Dij	Dji	Pij	Pji
1	All	All	Not Same	Same

Considering all of the possible defined relationships, those defined for Person i and Person j are incorrectly perceived by Person i (not same) but are correctly perceived by Person j (same).

Program Input and Output. Input to the program ORGAN takes the form of the incidence matrices for the networks, the configuration specifications, and certain ancillary information.

Output from the program takes the form of frequency counts of the incidence of the configurations defined by the specification (1) for each individual paired with all other individuals in the organization and (2) for certain specified groups of individuals compared with other groups of individuals.

The program ORGY provides a means for "cleaning" and formatting data prior to its submission to program ORGAN. Information concerning the relationships between individuals may be input to ORGY, which for an authority network could take the following form:

JOHN MARY S TONY M MARK M

indicating that John is Mary's subordinate and that he is the manager of both Tony and Mark. The program checks the information for inconsistencies and permits the user to correct certain errors during run time. After the correction of all detectable errors, the program outputs information in a form suitable for analysis by ORGAN. Although the uses of the programs have been discussed with respect to the problem of analyzing organization structures, they may be used to analyze any two suitably specified sets of relationships arising from the same group of individuals.

Computer and Language. The programs are written in FORTRAN IV for use on a Honeywell time-sharing system (1648). The program ORGY is, for ease of data correction, written for interactive use via an on-line terminal.

Availability. Further information concerning the programs and listings are available from the authors.

Behavior Research Methods & Instrumentation
1974, Vol. 6 (6), 568

Subroutine for multiple logistic discriminant function analysis

EDWARD F. GOCKA, HOJAT J. ROSTAMI,
and LOREN R. GROSSMAN
Predictive and Evaluative Models Research Laboratory
Veterans Administration Hospital
Sepulveda, California 91343
and
California State University
Northridge, California 91324

A number of nonlinear least-squares computer programs obtain a weighted fit to a user-specified function through the use of the Taylor theorem expansion and an iterative procedure. Practically all of the general-purpose versions of these nonlinear programs require user-supplied FORTRAN statements for the evaluation of the function and additional statements for an evaluation of the partial derivatives with respect to the parameters being estimated. These are usually placed into a subroutine format and submitted with the run.

Recently, a multiple logistic discriminant model has been used on large sets of data which have a dichotomous outcome. This model may be run conveniently on such general-purpose computer programs as mentioned above.

Observing computer conventions of the nonlinear regression program of the popular BMD series (Dixon, 1973) the multiple logistic function F for five independent variables X(1) to X(5) is written as

$$F = (1 + EXP(-(P(1) + P(2)X(1) + \cdots + P(6)X(5))))^{-1},$$

where P(1) is the origin value in the argument and P(2) to P(6) are the coefficients for. the independent variables. If DF(I) denotes the value of the i^{th} partial derivative, the user-required subroutine FUN, written in FORTRAN, is as follows:

```
0001      SUBROUTINE FUN(F,DF,P,X,N)
0002      DIMENSION DF(1),P(1),X(1)
0003      A=P(1)
0004      DO 1 I=2,6
0005      A=A + P(I)*X(I)
0006   1  CONTINUE
0007      F=1./(1. + EXP(-A))
0008      DF(1)=EXP(-A)/(1. + EXP(-A))
0009      DF(1)=F*DF(1)
0010      DO 2 I=2,6
0011      DF(I)=DF(1)*X(I)
0012   2  CONTINUE
0013      RETURN
0014      END
```

Statement Numbers 0004 and 0010 can be changed if there are different numbers of independent variables. For example, with seven independent variables, the Statement 0004 would be written as

```
0004      DO 1 I=2,8
```

and Statement 0010 as

```
0010      DO 2 I=2,8
```

REFERENCES

Dixon, W. J. (Ed.) BMD07R: Nonlinear least squares. *BMD Biomedical Computer Programs*. Berkeley: University of California Press, 1973. Pp. 387-396.

Gocka, E. F., Rostami, H. J., & Grossman, L. R. Multiple logistic discriminant function analysis. Technical Report: Predictive and Evaluative Models Research Laboratory, V. A. Hospital, Sepulveda, California, 1973.

Grossman, L. R. Multiple linear versus multiple logistic regression. M. S. thesis, California State University, Northridge, 1974.