

Programs for producing questionnaires with randomized ordering and sampling of components

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Two FORTRAN programs implement a method for producing copies or "forms" of a questionnaire on a computer line printer; they provide for the forms to vary individually and flexibly, according to a prespecified scheme. Each form may embody fixed, randomly ordered, or randomly selected subsets of items, response alternatives, entire sections, or other components of the questionnaire, as required.

When questionnaires are used in experimental or survey research, it is often desirable to vary the order of presentation of items or sets of items across subjects, or to sample them from a larger pool. Ideally, a different form would be administered to each subject or respondent, but expense and practical constraints ordinarily permit the use of only a few, at best, different forms of a questionnaire. The method described here provides a convenient means for providing a finished set of individually varying forms that meet most possible requirements.

All but the most rudimentary questionnaires contain a variety of types of elements, such as section headings, instructions, items, and response alternatives of various kinds. The relative order of certain of these elements must be maintained whenever a unit of the questionnaire is rearranged internally or repositioned within the questionnaire; for example, the instructions for a set of items must precede those items, whatever their order or their place in a given form. The same considerations apply when each form is to contain a selection from a set of elements or components, such as response alternatives, questions, or entire sections, which may be combined with fixed elements. To accomplish this conveniently and flexibly, the form-generating program therefore provides the capacity to specify a complex organization of fixed and random orderings and samplings for elements and combinations of elements of the questionnaire.

For the coding and entry of data from completed forms to be practical, responses must be entered in the order in which they appear on the form. Responses from each form must then be "unscrambled" into a common order. The form-generating program makes this possible by recording the identity and order of items on each form as it is produced, and this information

is used by a companion program to reorder the unsorted "raw" data. The result is a set of data as it might have been coded directly from a set of identical forms (possibly with "missing data" for unsampled items).

A subsidiary benefit of this approach is that some of the routine clerical and physical steps in questionnaire production are bypassed. Another advantage for some applications is that collaborative responding in a group-administration situation is inhibited with the use of such forms.

This method is implemented by two programs: PQUEST, which produces the forms for a given questionnaire, and PQSORT, which reorders the responses from each form into a common ordering.

Description of the Programs. PQUEST applies an Order Specification String (OSS; expressed in a straightforward command notation described in the user's manual) to the set of texts of all elements of the questionnaire. The program produces a set of forms on the line printer, each of which incorporates these elements in a sequence whose properties are specified by the OSS. A given OSS defines a general form structure that is hierarchically organized so that components at any level (e.g., response alternatives for a given question, sets of items, subsets within sets, entire sections, or composites of other components) may be specified to appear on each form in a randomized or fixed order or to be randomly sampled from a designated subset of elements or larger components. Features of form layout and formatting, such as spacing, page length, page and item numbering, and splitting of components between pages, may also be specified. The program also records the identity and order of the elements as they appear on each form.

PQSORT sorts the responses, which have been coded or entered in the order in which they appear on each form, into a consistent ordering, using the order information recorded by PQUEST. The program may also organize the reordered data into a more convenient format if desired.

Input and Output. PQUEST requires three input files. The first contains the texts of all elements of the questionnaire. The second provides necessary identifications and parameters, including an identification code for the set of forms to be produced, the range of form numbers, and form layout and formatting parameters; it also contains the OSS. The third file contains a random seed and starting permutation sequence, which may be the starting or finishing values from another run. This permits a run to be duplicated or continued.

PQUEST produces four files. The first contains the set of generated forms, preceded by a cover page providing descriptions and specifications for this set of

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forms. The second contains the element orders for all generated forms, and the third contains the final random seed and sequence. Error messages are written to the fourth file, or to the terminal in interactive use.

PQSORT expects three input files. One contains the unsorted data along with input and output format specifications; there may be any number of responses for an item, each coded as 1-4 characters. The second is the file produced by PQUEST containing the order information for all forms. The third is the questionnaire text file used by PQUEST, which provides PQSORT with the number of items and the number of responses expected for each. PQSORT produces the set of reordered and reformatted responses for each form. Error messages are written to another file or to the terminal.

Limitations. At present, the programs provide for a maximum of 500 80-character lines of text (excluding blank lines that may be provided by formatting specifications), 150 components, and 1,000 responses. These specifications are conveniently modifiable.

Computer and Language. The programs are written in FORTRAN designed for maximum portability and should require little modification for most common systems. They have been developed on a DEC-10 computer

with the TOPS-10 operating system. They may be used either interactively or in batch operation.

Availability. A technical report (Peay, Note 1) incorporating documentation, listings, and user's manuals for PQUEST and PQSORT is available for \$3.50 (draft or money order in U.S. or Australian funds payable to "Flinders University"; no personal checks) from the author at the School of Social Sciences, Flinders University, Bedford Park, South Australia 5042, Australia. The listing for the two programs contains approximately 600 lines, including extensive comments. Alternatively, the technical report and a new nine-track magnetic tape containing the programs and test data may be obtained for a total of \$25. Please do not send a tape.

REFERENCE NOTE

1. Peay, E. R. *Constructing questionnaires with randomized ordering and sampling of items: A computer implemented approach* (CASSR Technical Paper Series No. 4). Bedford Park, South Australia: Flinders University, Centre for Applied Social and Survey Research, 1982.

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