8-15-1997

Constructing Survey and Decision Support Systems:Sociocultural, Methodological, and User Oriented Perspectives

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Keywords: Survey, Decision Support Systems, CATI, CASIC

Abstract

This paper proposes the new idea of 'Survey and Decision Support Systems(SDSS).' SDSS will improve the existing systems of Computer-Assisted Telephone Interviewing (CATI) and Computer-Assisted Survey Information Collection(CASIC).

In constructing SDSS, three perspectives are considered: Sociocultural, Methodological, and User Oriented. These Perspectives will provide a reference framework to run cross-cultural surveys.
The SDSS consists of 4 systems:

1. Sampling Decision Support System.
2. Measurement and Questionnaire Design Support System.
3. Group Interviewing Management Information System.
4. Data analysis and Decision Support System.

Introduction

The specific objectives of this paper are the following:

- Introducing the new idea of 'Survey and Decision Support Systems(SDSS).'
- Investigating and developing the system functions of SDSS.

SDSS will satisfy the continuously growing demand of public policy as well as marketing survey researches. It will improve the existing systems of Computer-Assisted Telephone Interviewing (CATI) and Computer-Assisted Survey Information Collection (CASIC).

The idea of CATI can be attributed to the telephone interview and information and communication technologies two decades ago. (Groves et al., 1984, Shanks, 1983) CATI was a questionnaire editing tool and an on line interviewing data gathering procedure. Later on, CASIC enhanced it by adding the new functions of Prepared Data Entry(PDE), Touch-Tone Data Entry(TDE) and Voice Recognition Entry(VRE) (Weeks, 1992).

However, after a few years some critical problems beyond the capability of CATI and CASIC were found. Furthermore, the user interface seemed unfriendly to commercial survey project leaders and even to the academic researchers who do not have the technical expertise in methodology.
To solve these problems, I propose to construct a better survey setting that renders all the difficulties into

an invisible decision making environment, taking into considerations of three comprehensive perspectives for the SDSS.

Sociocultural Perspective

My experience from conducting CATI in Taiwan indicated definite cultural differences among different countries. Some problems and possible solutions are summarized as the following:

Respondent's Potential Decision

The direct self-report has been the most common method for election polling in USA. However, Wu(1994) pointed out that this method might cause 2 problems in Taiwan. The first is low response rate or nonresponse (Dunkelberg et al., 1973, Francis et al., 1975). The second is respondent's inconsistency between attitude and behavior.

Sometimes, the undecided respondents were not necessarily lying. They might not be ready to think about the answer seriously, though they did have some potential decision preference.
Wu(1996) found that the voter's decision was determined by the candidates' popularity and their image. This function could be formulated as a series of models in the information system to predict respondent's choice.

Bias of who always answers the phone

In Taiwan, persons who answer family phones are not random. Wu(1996) explained that there are lots of large families in Taiwan, and their members do not share an equal chance of responding to the ring. Any survey that interviews the first person on the line will reach many more housewives, youngsters than males and senior members. Thus, a revised 'household selection method' seemed to be quite necessary in Taiwan. The traditional way of household selection was to ask two questions, such as the numbers of adults and women in the family, then to decide which one to interview. A better way would be to select the proper respondent by randomize function with an on line interface.

Sociocultural Ecology

Some Taiwan researchers argued that local public opinions were divided and manipulated by 'local factions' in some rural counties. Because the faction's existence doses not necessarily coincide with the boundaries of the official district, it is difficult to estimate the faction's influence by aggregate data. It would be easier to check if the special sociocultural ecology exists by connecting a geographic data base with the information system.

Methodological Perspective

The heuristic work on scientific paradigm of Kuhn(1977) is just as valuable to social scientists in defining the proper process of survey. The challenge is how to implement and organize scientific processes into information systems.
Some examples are discussed as follows.

Sample Size

The sample size design is usually determined by arbitrary experience because the theoretical relation between sample size and its precision is too complicated to cope with quickly.

A parameter database will be prepared based on former surveys. The database includes variances of different types of surveys. The user can choose desired parameter and feasible cost to decide the most efficient sample size.

Sampling Management

How to integrate directory method, random digits dialing (RDD) method and plus 1 method (Hauck et al., 1974, Klecka et al., 1978, Landon et al., 1977) is another problem. A sampling database is provided which incorporates all sampling methods. However, random last 1 to 4 digit method is recommended. A filtering procedure of 5 attempts to reduce empty phone numbers and cost is also employed.
This database can further manage the sampling frame by specific groups as well as by area.

Data Quality

The data quality is an inevitable issue. Researcher will need an on line control and evaluation function in addition to an easy decision suggestion for interpreting the meaning of data.
At the end of each interview, the system will assist the interviewer to evaluate the sample. Four rates are used to measure the data quality or cost efficiency:

1. Access rate: respondent is found.
2. Response rate: respondent answered the questions.
3. Eligible rate: respondent passed the filtering questions, if there were any.
4. Valid sample rate: sample did not have empty numbers, etc.

User Oriented Perspective

The innovation of personal computing accelerated a key research issue that was summarized as 'End-User Computing (EUC) Management' by Brancheau and Brown (1993). An earlier idea of 'Human Aspects of Computing' was also presented as a distinctive field both in computer and management science. (Card et al., 1983, Moran, 1981)
Moran et al.(1996) who organized a number of broad case studies suggested that the essential requirement of user oriented design is to make it simple and easy to use. Some considerations are discussed below.

Project Wizard

The recent trend to provide friendly interfaces are represented by wizard and template library. This wizard would lead user to design a complete survey. Tips to decide proper parameters will be automatically suggested. System default value would be suitable for general situation. Flexible choice would be provided easily.

The template library would provide structured questionnaire and psychometrics measurement tools such as summated scale, scalogram, semantic differential scale.

Group and Distributed Operation

The emerging requirement of networking is intranet system design.
The SDSS is organized by three divisions:
File Server that supports the different databases and model base.
Master Workstations that are for the project director and associate directors to design a survey.
Client Workstations that are for interviewer to collect data.

Structures and Functions

The current structures and functions of SDSS are:

Sampling Decision Support System.

- Sample size decision support
- Sampling database management
- On line households selection interfaces

Measurement and Questionnaire Design Support System.

- Structural designing support
- Questionnaire editing tool
- Psychometrics measurement support
- Modeling support
- On line data gathering and database management

Group Interviewing Management Information System.

- Intranet management
- Autoexecution
- Auditing and supervising devices

Data Analysis and Decision Support System.

- Variable processing
- Analysis and prediction
- Sample representativeness test
- Reliability and validity test

Conclusion

Applications

There were 4 voting studies conducted by the author while developing the SDSS from 1992 to 1996. (Wu et al. 1996, Wu 1995, 1994) Voters' decisions of five constituencies were predicted. The precision of predictions was 0.99, 0.99, 0.98, 0.96, 0.75.
This finding implied a promising future for SDSS to replace CATI and CASIC.
SDSS could be used by commercial organizations, survey organizations, and government for various applications such as: voting prediction, public campaign, marketing analysis, and other surveys on different social problems.

The system perspectives discussed above also provided behavioral insights for running cross-cultural surveys.

Reproducibility

Is survey scientific research? This is a persistent question.

My purpose for constructing SDSS is to provide a scientific research tool that will have the capability of reproducibility as well as prediction.

Hardware and equipment are the most important in reproducing physics research while humans are always directly responsible for the research reproducibility in social and behavioral studies. The latter can be hardly reproducible, if different researchers do not have the same research perspectives.

SDSS will organize and hide all complicated issues and concerns behind friendly user interface. It will control research procedure and minimize errors and initiate a promising future for survey reproducibility.

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