

# INTERACTIVE QUESTIONNAIRES

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**Abstract:** The use of online interactive questionnaires is an interesting example of human-computer interactions mediatizing human interactions to support the emergence of collective intelligence. To better understand these interactions and their various effects, we propose to investigate the operating mode of interactive questionnaires. First, we recall what the questionnaires are made of in order to know their anatomy. Then we give two examples of interactive questionnaires: e-Brainstorming from the Orange Labs and the Real-Time Delphi, one computerization of the Delphi method.

## 1 INTRODUCTION

Questionnaires are mainly used in surveys that address many issues in a wide range of areas. They have spread with computerization and the development of the Web, which makes data collection easy. Unlike traditional questionnaires, where questions and answers are frozen at the beginning of the survey, interactive questionnaires are dynamic or tailorable, malleable: new questions may arise, with new possible answers that modify the initial questionnaire. Through several iterations, the interaction leads to an adaptation via the feedback loop of the socio-technical system. The result of this adaptation can be the achievement of consensus or an aid to problem resolution or the discovery of multiple tracks.

This paper is organized as follows. First, we present a state of the art of traditional surveys just before discussing the changes involved by online interactive questionnaires. Then, we develop the underlying concept and method and we present some related products. Finally, we discuss the advantages and drawbacks of such techniques.

## 2 STATIC SURVEYS

Questionnaires are frequently used for surveys. The following figure represents an overview of survey concerns: the main issues of sampling, the classical "errors", and the different means to contact the

participants depending on their management.

In her "Fundamentals of Survey Research Methodology", Glasow (2005) begins with a quote about the objectives of a survey: [Survey research is used] "to answer questions that have been raised, to solve problems that have been posed or observed, to assess needs and set goals, to determine whether or not specific objectives have been met, to establish baselines against which future comparisons can be made, to analyze trends across time, and generally, to describe what exists, in what amount, and in what context." (Isaac and Michael, 1997, p. 136).

Errors generally arise for four reasons, Fricker (2008) quotes Groves (1989): coverage, sampling, non-response and measurement. The coverage error occurs if the sample doesn't include all needed units of the population. The sampling error occurs because only a limited sample of the population is invited to participate in a survey instead of the total population, and some people in the sample tend to make a measurement deviation. The measurement error occurs when the answers given are not accurate and the given answers difficult or impossible to use. This happens, for instance, when the influence during an interview is too much significant (Fricker, 2008). An important point to determine when designing a survey is the mode (the channel of communication). Roughly speaking, surveys are classified into two categories: interviewer-administered surveys and self-administered surveys. De Leeuw (2005) explains mixed modes are a way to reduce costs, errors and to get more data.

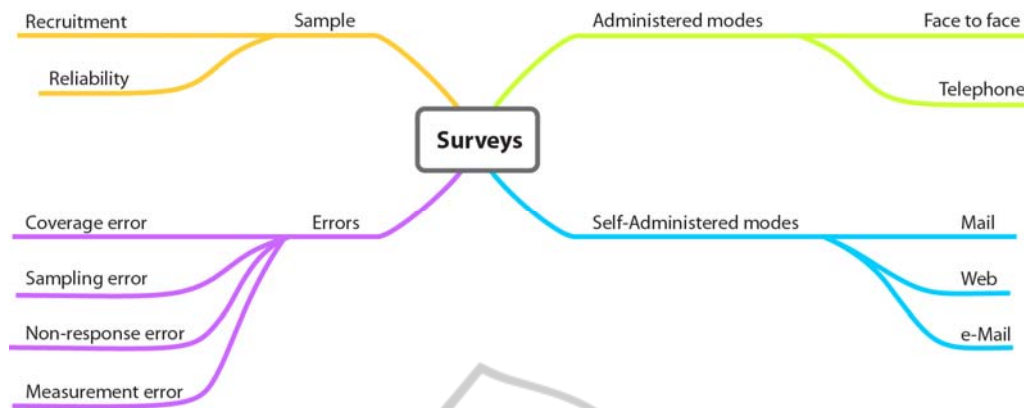


Figure 1: Overview of survey concerns.

An evolution came with computerization; the e-mail mode and the web mode are new internet-based modes. The web mode gives lot of capabilities and advantages: shorter transmitting time, lower delivery cost, more design options, and less data entry time. However, it has several flaws: sampling remains difficult, “Coverage is the most widely recognized shortcoming of internet-based surveys” (Fricker, 2002), the response rate is estimated approximately 11% lower than the traditional modes (Manfreda et al., 2008) quoted by (Fan and Yan, 2010). The web mode allows designing a large amount of possible surveys, the interactive questionnaires fit well with the online modes such as web mode.

### 3 INTERACTIVE SURVEYS

One interesting point with internet based technologies relates to open-ended questions, Yun (2000) quotes Bachmann and Elfrink (1996): open-ended questions by e-mail collect longer answers, more information than a paper survey. Keyboarding can be easier than handwriting. This was also observed at Murdoch University (Australia), where students are surveyed to evaluate teaching. Collings and Ballantyne (2004) made a comparison between online and paper regarding the 2003 survey. The students write more comments online than on paper, when they do comment, the number of words is higher. Collings and Ballantyne conclude saying that the response rate focuses first the attention, but the value of qualitative data, richness in responses is in comment length.

This points out limitations of traditional static surveys. Such surveys are conducted to gather information about a population, but they are very regulated, framed, constrained: participants can only make a choice by a yes/no system, a check boxes

system, a scales system or respond in textboxes. We can see that a better quality of information comes from open-ended questions and interactivity because respondents have things to say and they respond willingly when they are given the opportunity. The web mode lends itself to this form of questioning. A questionnaire that allows people express themselves, as in a real dialogue, or a debate, could collect lots of valuable information. This would be another kind of questionnaires, dynamic and interactive, with another design, other goals and objectives. Now let’s review two initiatives in the field of interactive questionnaires: the e-Brainstorming and the Real-Time Delphi. Roughly speaking, the e-Brainstorming relies on multiple-choice questions as first interaction mode and the Real-Time Delphi (RT Delphi) is a web-based variant of the Delphi method that we will remind.

#### 3.1 e-Brainstorming

The e-Brainstorming, an initiative from the Orange Labs of Caen in France (Lancieri et al., 2005), is a computerized system of closed questions, a multiple choice questionnaire system (MCQ), intended to simplify and synthesize the opinions of a group. The system uses the good will of the participants to respond to open-ended questions as we have just seen. Inside a question, respondents can leave a comment: each question provides a free comments zone, and the system allows them to add questions and possible answers that are forwarded to all respondent for a new questionnaire round. This is a way to get rid of some limitations (lack of cooperation, not enough choice) introduced by the MCQ. The success rate of certain questions and the amount of left comments on certain questions are fuelling debates. The idea relies on human intelligence: to solve a problem, half of the solution

is in formulation. The e-Brainstorming provides a structuring frame to express, formalize and reformulate ideas. There is no moderator, the group has to be self-moderated.

The questionnaire is scripted with an easy tagged language, writable in a form, in a mobile phone application for instance, then sent to a web server. After generation on a server, a return mail is sent to the author with the URL of the web questionnaire, to be distributed to the chosen participants. e-Brainstorming can be applied in three modes: without free comments, with free comments, with free comments and capacity for adding new questions. Among the features: new questions are highlighted, participants can check a box “Does not interest me”, they can access statistics and graphics; the system uses traces to evaluate the collective intelligence phenomenon. Data can be exported: it is possible to exploit it in information processing systems (semantic web, etc.). Cheap, easy and quick to implement, it can be used with distributed participants. This is another example demonstrating that technology can change spatiotemporal interactions between individuals (Lancieri et al., 2005).

### 3.2 Delphi, Real-time Delphi

“The primary strength of Delphi is its ability to explore, coolly and objectively, issues that requires judgment” (Gordon, 2003). In the 1950s, on demand of the US Army, RAND (Research AND Development - a thinktank) was in charge of creating a method to make forecasts from the opinion of experts about the possibility (etc.) of an enemy attack during the Cold War. RAND achieved the Delphi method. A sample of experts on the topic of the study enters an iterative process of questionnaires, administered by researchers, which stops when a pre-defined criterion has been reached. Iterative process: the questionnaire has to be prepared, the questions refined. In a first questionnaire, the experts are asked to provide their judgment. Data collected is analyzed, synthesized. The next round begins with the sending of a new questionnaire. The experts have to be more accurate, some extreme positions have to be reassessed, justified (Gordon, 2003). There are multiple rounds until a defined criterion is reached, then the administrator stops the questionnaires. Gordon says that at the end, more often than not, group of experts move toward a consensus. If not, the reasons are known. The reasons and arguments for the consensus as well as for disagreements can be highly valuable and useful: with this material, it becomes possible for planners to make judgments. Synthesis

is done to reduce the force of oratory of some people, by this way every participant is equal; the Delphi method was designed to encourage a true debate.

Okoli and Pawlowski (2004) have compared a traditional survey approach with the Delphi method in order to investigate what would be the critical success factors for e-commerce in Sub Saharan Africa. In a traditional survey, a questionnaire is designed, the participants respond, data collected is analyzed. In the Delphi method, a questionnaire is designed, submitted to a group of experts, responses are analyzed, then the questionnaire is re-designed and re-submitted and this process is repeated. The sample of the Delphi method is made of some experts on the topic (literature recommends 10 to 18 experts). In a traditional survey, a large sample is preferred, for generalization. Individuals responses are averaged in a traditional survey while in the Delphi method, “Studies have consistently shown that for questions requiring expert judgment, the average of individual responses is inferior to the averages produced by group decision processes; research has explicitly shown that the Delphi method bears this out”. For a traditional survey, reliability is an important concern, assured by multiple tests, while in a Delphi study, the experts have to revise their responses, the importance degree is different. In a traditional survey, the construct validity is assured in the design phase and participants only respond. In the Delphi method, the experts are asked to validate the design (researchers' interpretation and categorization of the variables). Participants are always anonymous in a traditional survey. In the Delphi method, respondents are anonymous to each other but not to researchers, then, if a participant drops-out, researchers are able to discover the reason by asking directly. Non-response is an error to be reduced in traditional survey while in the Delphi method, experts have been selected and solicited to give their opinion. In a traditional survey, the quality depends on the question, design, the follow-up, the respondents... while in the Delphi method, multiple iterations provide rich data, furthermore there may be follow-up interviews: interviewers can come with open-ended questions to learn more.

In 2004, the Defense Advanced Research Project Agency (DARPA) asked for the development of a Delphi-based method for improving the speed of the Delphi method. A company, Articulate Software, made the “Real-Time Delphi”. This computerized method is quick and there can be more participants. They introduced Artificial Intelligence and Natural Language during the analysis phase of non-numerical answers. It works “roundless”: every

participant can come, at anytime to update his or her inputs. Each presented question comes with some information (the average/median response of the group, the number of responses, the reasons). Respondents have got spaces to respond and justify it. Real-Time Delphi has got a large range of applications (Gordon and Pease, 2006).

## 4 DISCUSSION

There are elements that lead us to say e-Brainstorming and the Real Time Delphi seem to have some convergence points as interactive questionnaires systems: they are well suited for small groups of carefully selected experts. A second point of convergence is the exploitation of what we saw with open-ended questions: people are willing to express themselves, in writing. e-Brainstorming allows participants to add questions and to leave comments. The Real Time Delphi tries to get the opinion, the judgment and a justification of the participants. They both take advantage of the ease of keyboarding. A third point of convergence is: e-brainstorming and RT Delphi solved the problem of availability of a moderator thanks to computerization but each in a different way: the first uses multiple-choice questionnaire, the second uses of Natural Language and Artificial Intelligence to do the sort and classification tasks and to send back a synthesis. e-Brainstorming relies on a self-regulation from the participants because it is assumed that multiple-choice questionnaire simplifies the opinions (implicit management), RT Delphi uses a sophisticated and instrumented device. Where they differ is in the goal: the Delphi method seeks a consensus with a predefined set of questions carefully prepared and refined during the iteration process. e-Brainstorming encourages participants to formalize the subjects of interest in a structured frame but participants can create new questions and comment it, this can give an open direction to the discussion; we might call such a questionnaire a malleable questionnaire. The RT Delphi uses an impressive computerization, e-Brainstorming uses a cheaper, more creative and human method.

In this paper, we have seen that surveys have evolved. Technologies such as web have allowed the rise of different forms of interactive questionnaires. We should continue to study interactive questionnaires because they are group-meeting methods that develop creativity, allow people to share and pool together ideas, uses the good will and where everyone is equal. They could be useful tools for research purposes.

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