

# The Technological Revolution in Survey Data Collection

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## INTRODUCTION

Surveys—data collection based on standardized questionnaires—started with censuses thousands of years ago. However, it was only in the 1930s, following some breakthrough developments in applied statistics, that the sample survey data collection approach was widely acknowledged. The possibility of inferring about the total population from samples of 300 or 1,000 units radically expanded the potential of survey data collection. In addition to sampling, survey data collection procedures also rely on a proper measurement instrument (i.e., a survey questionnaire) as well as effective administrative and managerial activities.

Since the 1930s, opinion polling has become a major tool of democratic development (Gallup & Rae, 1968). Official statistics have recognized the enormous potential of survey data collection for the fast estimation of crops, industry outputs, unemployment, and so forth. Further, the marketing and media industries obtained a tool to effectively measure the characteristics of their target groups. The survey industry has therefore become an established activity with its own associations (e.g., ESOMAR, AAPOR), codes of conduct, publications, conferences, professional profiles, and large multinational companies generating annual revenues worth billions of dollars (e.g., A.C. Nielsen).

Surveys were traditionally performed as personal interviews, over the telephone or in the form of self-administered questionnaires. Information-communication technology (ICT) developments introduced radical changes to the survey data collection processes,

particularly because the core of this activity is manipulation with the information itself.

The early implementations of ICT in survey data collection are linked to computer developments. Mass computerization started with the emerging PC in the 1980s and enabled *computer-assisted survey information collection* (CASIC), firstly with the introduction of *computer-assisted telephone interviewing* (CATI). In the late 1980s, portable computers started to be used with face-to-face interview data collection, leading to *computer-assisted personal interviewing* (CAPI). When personal computers started to become the mainstream, *computerized self-administered questionnaires* (CSAQ) were implemented in various forms. The last crucial milestone came in the 1990s with the rise of the Internet, which enabled e-mail and Web-based types of CSAQ. This started a new stream of ICT development which is radically transforming the entire survey industry.

Internet-based data collection will soon become the mainstream survey mode. Studies for 2005 projected that market research organizations worldwide would generate over a billion dollars in revenue on the basis of Internet surveys (Terhanian & Bremer, 2005). In addition, about 40% of research work in the USA in 2003-2004 was conducted on the Internet (E-consultancy, 2004).

In this article, we first overview specific ICT developments as the driving forces of the transformation of survey data collection procedures. The subsequent part addresses the status of ICT-supported data collection. In the conclusion, we summarize the findings and outline some potential future trends.

## BACKGROUND

Several key technological factors have generated major changes in the transformation of the survey data collection industry.

**Computer developments** were the starting point of other ICT-related changes. They allowed the entering of data into a computer already in the interviewing stage (e.g., CATI, CAPI). This eliminated the need for a manual data input, thereby also avoiding errors in this phase. In addition, they enabled the enrichment of questionnaire design with computerized features. These include interactive questions that automatically adapt to respondents' answers (e.g., automated skips over irrelevant questions), the real-time control of answers, extensive multimedia support, and several others. These features are especially prominent within the CSAQ modes.

**Internet development.** Technological advancements in transmission procedures, the evolution of standardized Web browsers, the development of e-mail clients, and integrated technologies have enabled and fostered use of the Internet for survey research (Lozar Manfreda, 2001). Internet surveys are computerized, self-administered questionnaires that are delivered, submitted, and usually managed using the Internet. The most widespread are Web surveys, which started in the early 1990s (Pitkow & Recker, 1994), and revolutionized self-administered surveys. More recent software developments (e.g., Ajax) are also importantly improving Web survey developments. Further, Internet access is available on an increasing number of various devices, including mobile phones. The survey questionnaire, implemented using specific Internet services, enables all the benefits of CSAQ.

**Telecommunications & Broadband.** Broadband is the main precondition for effective Internet surveys. Low bandwidth produced an important bottleneck in Internet data collection up until a few years ago. People using a modem needed extra patience, incurred extra costs, and were limited to plain textual questionnaires. Broadband developments have thus determined the speed and nature of the transformation of Internet data collection. With a wider availability of broadband, the advanced features of CSAQ can be implemented more effectively.

**Mobile phone developments** currently have a limited role in data collection, partly due to delays in full

3<sup>rd</sup> generation developments. Modern features of CSAQ cannot be adequately implemented on mobile phones without suitable bandwidth and multimedia support. Technological standardization is an obstacle as well (Tjøstheim, Thalberg, Nordlund, & Vestgård, 2005). In the future, mobile devices are likely to become much more powerful and offer more operational screens.

**Interactive TV** also has huge potential but is experiencing relatively slow development. This technology integrates "traditional TV" and access to Internet services (e.g., WebTV). It is currently rarely used for the distribution of survey questionnaires. However, as people intensively interact with TV devices (on average more than 2 hours per day in developed countries), we can expect that the full implementation of interactive TV will dramatically stimulate its use in survey data collection.

**Information security management** already enables a respondents' identification to be securely managed through the response process. This is essential in all Internet surveys where user identification is needed (e.g., census data collection or official statistical surveys). Mobile certificate authorization will offer another promising opportunity in the future. Respondents will obtain a simple identification option on mobile without the need to install a certificate on a disk or use special equipment for smart cards. Every time identification is required, the user will provide a mobile phone number and receive an SMS with a PIN code for survey access. This procedure will further simplify and extend the potential of survey data collection, as it is legally equal to other forms of digital signatures.

**Open Source** software developments are extremely important in this area. Although it is not difficult to program a survey questionnaire on the Web, the development of sophisticated solutions is relatively complicated. A large number of software tools for Web surveys can be found in various online databases (e.g., WebSM, 2006). Open source applications (e.g., phpSurveyor) substantially contribute to the expansion of surveys, particularly for small companies, organizations, and the nonprofit sector.

## ICT IN COMPONENTS OF THE SURVEY PROCESS

Survey modes can be classified according to various criteria. If we focus on the interviewer's involvement

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