

e-census
The 2000 Census on the Internet – Concept and Stock-taking

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Contribution to the 2nd Swiss eGovernment Symposium, 22 August 2001, Zurich

e-census – A ground-breaking achievement by Switzerland

Under the title "e-census", the Swiss Federal Statistical Office developed an Internet application for the 2000 Census which enabled a large proportion of the population to submit their Census questionnaires electronically, via the Internet, instead of using the conventional written method. After Singapore and part of the USA, Switzerland was only the third country worldwide – and the first in Europe – to use the Internet for its Population Census. Moreover, the e-census was Switzerland's first nationwide transaction-oriented eGovernment application.

Using the Internet for surveys has been widely discussed for years now, and some initial electronic survey tools already exist in (market) research. The use of electronic survey techniques was also considered very early on with a view to the 2000 Census, but the first concepts were frustrated by Switzerland's decentralized structure which appeared to make efficient data management and survey control impossible. So ultimately, it was the establishment of a Service Centre (SC) for routine tasks such as address management, data entry and checking that tipped the balance in favour of the idea of an Internet solution.

When the decision about the e-census was taken, it was however clear that, for organizational reasons and due to current Internet coverage, this electronic entry option could not replace the written postal questionnaire but merely complement it. Nevertheless, some 90 percent of the population living in communes which had delegated their routine tasks to the SC were to be given at least the alternative of submitting their questionnaires by post or via the Internet.

Despite this limitation, the e-census was a promising project for several reasons:

- *Image promotion and public relations:* the rather conservative image of the Census was to be upgraded by the use of state-of-the-art communication technologies. In addition, it seemed likely that the PR and advertising impact of an Internet solution would be highly beneficial for the Census. And then there was the possibility of improving Switzerland's international image.
- *Demand and expectations of the general public:* even though only a minority of the Swiss population currently have Internet access, electronic communication options are increasingly expected by potential users. Acceptance of the data survey among the groups concerned increases, depending on the extent to which account is taken of

these expectations. And in the final analysis, this too could well have a positive influence on the return rate.

- *Gleaning of experience:* the aim of the e-census pilot project was to acquire experience of using new technologies with a view to conducting other statistical surveys and eGovernment projects. In particular, the purpose was to see how far using the Internet could boost the efficiency of data entry and data quality while possibly cutting costs.

This report begins by outlining the background to the e-census concept and goes on to provide a brief overview of experiences with operating the e-census.

Promises and challenges: the e-census concept

Advantages

The use of modern communication technologies for survey purposes not only offers considerable potential advantages but also raises a variety of new problems.

In addition to the positive effects referred to earlier, the advantages include:

- Fast availability of results through simplification of the time-consuming data entry and checking stages.
- Better data quality and more reliable information thanks to interactive control of the survey (online checking of completeness, plausibility and validity, flashing up of warnings and correction prompts, automatic data transfer).
- More user-friendly than the written questionnaire:
 - no need to confine questions to a double A3 page
 - possibility of choosing individual languages (German, French, Italian)
 - greater transparency thanks to the use of graphic elements
 - incorporation of interactive aids and explanations
 - interactive user guidance and automatic filtering of irrelevant questions (eg. gainful employment, which is not applicable to children).

Using the example of the question about the respondent's previous place of residence, Fig. 1 illustrates various points: the questionnaire was divided into a series of sub-questions, each with its own screen and standard layout. Each question contains a title and indicates the person to whom the question refers. The question text proper and the possible replies are given in darker writing, while additional explanations are shown in a lighter (green) colour. Depending on the question, the answers can be provided by ticking an answer box, looking for the reply in a pull-down menu or by entering text in a blank area. There are grey navigation buttons at the bottom of each screen. If the "Weiter" (Next) button is pressed, the screen content is checked and, if necessary, a warning prompt flashes up.

Fig. 1: Illustration of the e-census user interface (question about place of residence)

The screenshot shows a web-based form for the Swiss census. The title is 'Wohnort von Rahel Experimenta (Jg. 1918) vor 5 Jahren'. The question is 'Wo wohnte Rahel Experimenta am 5. Dezember 1995?'. There are four radio button options: 'an der gleichen Adresse wie heute (Adr A Stras 98, P2 AdrA Ort)', 'in der gleichen Gemeinde (P2 AdrA Ort)', 'in einer anderen Gemeinde, nämlich', and 'im Ausland'. The 'in einer anderen Gemeinde' option is selected. Below it are input fields for 'PLZ und Ort', 'Kanton', 'Staat', and 'Anderer Staat'. A note says 'Falls Sie den Staat nicht in der Liste finden, wählen Sie "ANDERER STAAT" und tragen den Staat im leeren Feld ein.' The footer includes 'Bundesamt für Statistik, Volkszählung 2000, 2010 Neuchâtel' and navigation buttons: '< Zurück', 'Hilfe', 'Abbrechen', and 'Weiter >'. The page number 'P5' is also visible.

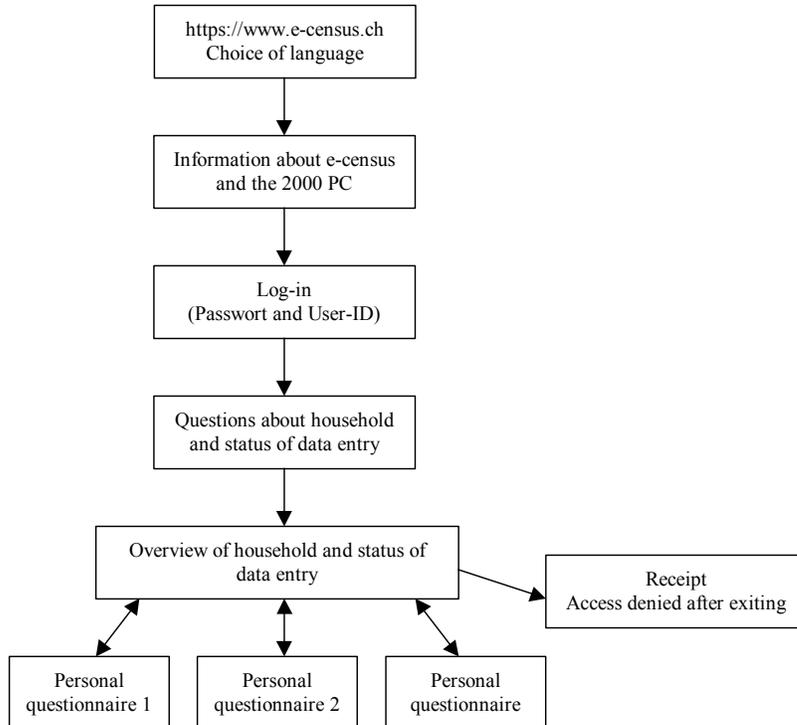
Challenges

Besides these obvious advantages, the e-census also raised new challenges and problems that had to be solved within the context of the project, in particular:

- Survey sequence: for methodological reasons, care had to be taken not to deviate too much from the written questionnaire. However, as working on computers is subject to other conventions than filling out questionnaires by hand, a compromise between "replication" and "innovation" had to be found. By way of a solution, the structure of the original questionnaire and the distinction between the household and the personal level were retained, as was the wording of the questions. In this general survey sequence, which is illustrated in Fig. 2, the specific resources of electronic communication were, however, used as comprehensively as possible (filter structures, plausibility checks, automatic data transfer, etc.).
- Identification of questionnaires, response checks and coordination: coordination with the written survey involved various problems which resulted in some considerable limitations:
 - use of the e-census was confined to communes which had opted to use SC services (approx. 90% of the population) in order to ensure efficient password assignment and monitoring of returns.
 - all questionnaires for a single household had to be submitted either by post or via the Internet. Nevertheless, checking mechanisms had to be developed to identify "duplicates" (ie questionnaires submitted electronically and in writing).

- disabling of access on completion of data entry (see Fig. 2)

Fig. 2: e-census survey sequence



- Rights of privacy and data security:
 - Issue of User IDs and passwords specific to each household
 - Use of an independent, firewall-protected system
 - 128bit encryption
- Requirements and limitations of the Internet: the Internet is still a comparatively unstable working environment, so arrangements had to be made to ensure that, if the session was interrupted, the data were reliably and automatically stored and made available to the user again later.
- Deciding the dimensions of the system: in contrast to many other surveys, the Population Census has a precise reference day. Because considerable interest was expected from the general public, the system therefore had to be designed to cope with peak user frequencies over a brief period (30 000 users accessing it simultaneously).
- Software: the e-census had to run on different systems (PC/Mac) and support different browser programs (Internet Explorer/Netscape).

e-census in practice: intensity of use and experiences

Key data

The e-census was launched on the Net on 27 November 2000, approximately one week before the 2000 Population Census reference day (5 December 2000), and operated continuously until 25 March 2001.

Apart from two minor down-times during the first few days of operations, due to high visitor numbers and a server configuration which had not yet been optimized, the e-census ran smoothly, with no security problems throughout the four-month operating period.

As was expected, the e-census triggered considerable interest among the general public. While in operation, it registered just under 300 000 visitors who spent an average of roughly 18 minutes on the site and consulted/worked through an average of 46 pages.

In the majority of cases (93%), Windows operating systems were used, while other e-census visitors accessed the site using the Apple Macintosh system. In over three quarters of cases (77%), Internet Explorer software was used, and 23% of visitors used a Netscape browser.

Utilization

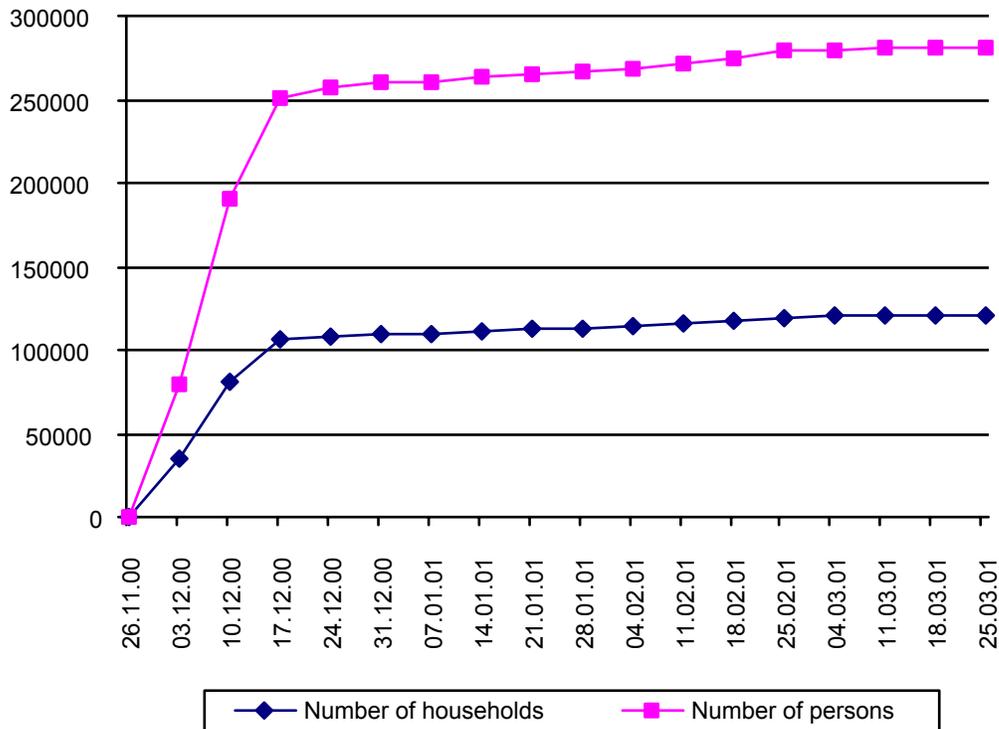
Not everybody visited the site with the intention of completing his/her questionnaire via the Internet. About 20 percent of the visitors could be described as "tourists" who just wanted to have a quick look at the e-census without attempting to enter their data. Roughly 10% of visitors did not master the log-in procedure hurdle, either because they had no password or because they had problems with logging in (see below). The other 70% progressed as far as data entry, but not all visitors managed to successfully complete this step.

By the end of March 2001, information about 281 000 persons from 121 000 households had been fully submitted via the Internet. About 10 percent of the data entries (14 000 households with roughly 30 000 people) were not completed. As Fig. 3 shows, use of the e-census was unevenly distributed over time. By the 2000 Population Census reference date, about one third of all questionnaires had already been completed, and after a mere three weeks in operation, just under 90 percent of all the questionnaires that were ultimately submitted had been sent off.

On the whole, user feedback was gratifying. Naturally, there were criticisms but also a surprisingly high percentage of praise. The large number of calls to the Hotline was striking. Apart from a few "bugs" in the application that were eliminated within the first few days, it transpired that the users often had very basic problems with operating their computers and using the Internet that had little to do with the e-census. A substantial

number of users failed to get past the log-in procedure which, while it guaranteed maximum security, was also fairly complicated. As a general rule, the comments about the user guidance tools and the built-in on-line plausibility checks were positive.

Fig 3: Utilization of the e-census over time (completed household and personal questionnaires)



User characteristics

The approximately 281 000 personal questionnaires submitted correspond to a return rate of 4.2% of the population who had the possibility of using the e-census. In more than 98% of all communes where the e-census could be deployed, at least one household used it for data entry.¹

¹ Ten or more percent of the population participated in Les Pommerats (JU), Brütten (ZH), Dorf (ZH), Villars-sous-Yens (VD), Rossens (FR), Villarod (FR) and Präz (GR).

Closer analysis revealed only slight differences between urban (4.4%) and rural areas (3.8%) and between the language regions (German-speaking Switzerland: 4.2%, French-speaking Switzerland: 4.3%).

However, compared with the population as a whole, there were substantial differences in the socio-demographic and socio-economic profiles of responding households and persons:

- Size of households: with an average of 2 persons, the households covered by the e-census are much smaller than the average Swiss household nationwide (approximately 3 persons). Single-person households accounted for a particularly high percentage (37%) in the e-census, although 36% of all households covered using the e-census consisted of three or more persons.
- Nationality and language: at 15%, foreigners are slightly under-represented (total population: 19%). Compared information from the 1990 Population Census, people whose main language was not one of the languages in which the e-census was offered were slightly over-represented. Thus the flexible choice of language seems to have lowered the entry barriers even for people with another main language.
- Gender distribution: men (55%) were clearly over-represented in the e-census compared with women (45%). At the level of single-person households, the ratio of men to women is 2:1.
- Age distribution: the average age of the people covered by the e-census is 33. At 41%, the age group of 20 – 39 year-olds is clearly over-represented (average for the population as a whole: 30%).
- Socio-economic characteristics: better-educated groups are over-represented in the e-census (approximately 35% have a higher-education qualification, compared with 23% of the overall population). The economically active, and especially people in middle-grade management, also account for above-average percentages.

Although the e-census was used particularly frequently by "younger middle-class males", the differences tend to be smaller than expected. A large number of women and older people also participated in the e-census, so it cannot be said that there is a major "digital divide" in Swiss society.

Conclusions and prospects

The e-census can be termed a success. It provided the proof that major surveys can be carried out securely and reliably. Despite working under considerable time pressure, it was possible to introduce the system punctually and ensure that it operated reliably.

The e-census attracted a lot of extra attention to the Population Census (PR, enhanced image) and was used to the extent originally expected. On the whole, acceptance of the e-

census among the general public can be described as good. Moreover, analysis of data so far has revealed an actual improvement in data quality as a result of use of the Internet.

Nevertheless, mention should be made of a few critical points which also need to be taken into account when planning future eGovernment applications.

- **Cost:** the investment and operating cost of Internet applications are high, especially when – as for the e-census – a great deal of time and effort has to be devoted to security and data protection. On the basis of the specific characteristics of electronic communication, it is not enough to merely transpose existing procedures into an electronic format. Successful Internet applications call for new ideas, but it is important to be aware that they quickly become dated, given the fast-changing electronic communication environment.
- **Dimensions:** the generous dimensioning of the system was a fundamental factor in costs, even though it kicked in for only a fraction of the total operating time. Internet applications are likely to be particularly promising in situations where there is a fairly constant flow of data over a longer period of time. Surveys with a reference date (such as elections and votes, for instance) always raise the problem of coping with a large volume over a short period. Such applications will probably not be cost-effective until a permanent infrastructure can be created for use by various providers.
- **Utilization:** compared with Internet coverage in Switzerland, an e-census return rate of slightly over four percent seems fairly low. However, it should be remembered that the use of the Internet for "official purposes" still involves numerous obstacles. Widespread reservations about the security and stability of Internet communication are compounded by the general public's existing comparative lack of expertise when it comes to dealing with computer applications. Internet applications must be as user-friendly as possible and provide maximum support – if necessary in the form of written comments or hotlines.
- **Incentives:** in comparison with traditional communication channels, this method has only slight (or even fewer) additional advantages for users. Because people received a written questionnaire in any event, there was little incentive for them to boot the computer and incur telephone charges in order to enter their data on-line. For future applications, it should be considered whether and to what extent additional incentives for using the Internet should be created. However, care should be taken to ensure that such incentives do not help to accentuate existing differences.²

In any event, traditional communication channels will remain indispensable for some time to come. In the immediate future, multi-modal systems that use various channels (direct communication, post, telephone, Internet, use of administrative registers) will probably prevail.

² This is also why the idea of a competition to create an additional incentive for e-census use was rejected.

- Participants: despite fast progress, the circle of Internet application users still shows a typical bias, so within the context of surveys in particular, representativeness cannot (yet) be guaranteed.