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**STATISTICS CANADA – CENSUS ON THE NET**

Invited paper submitted by Statistics Canada\*

**INTRODUCTION**

1. Statistics Canada, like several other statistical agencies around the globe, is providing a secure online Internet based application so that everyone who lives in Canada can complete their 2006 Census questionnaire online. This short document will highlight some of what we have learned following the decision to offer an online option for 2006 and testing it in a sizeable dress rehearsal in May, 2004. Though not yet implemented on a national scale, the introduction of this added response channel is one of the major changes to census methodology in Canada in more than 30 years. Specifically, this paper examines basic pre-conditions that should exist prior to the consideration of offering a census online option, strategic and business case considerations, main risks, challenges and benefits, and long-term opportunities.

**BACKGROUND**

2. The 2006 Census provides the capacity for respondents in all private households and agricultural operations in Canada to complete either the long (53 questions) or short (8 questions) questionnaire by Internet. It is anticipated that 20% of respondents will use the online application, which will be available 24 hours a day, 7 days a week. A comprehensive public communications strategy is planned to encourage respondents to complete their census form online. Census questionnaires will be delivered through the postal system or hand-delivered by an enumerator. A unique Internet access code is pre-printed on the front of the paper questionnaire. Respondents will complete and transmit their questionnaire directly to the

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census Data Processing Centre, where the response will be registered and its data integrated into the regular flow of census returns. Responses received on paper and through electronic channels will be logged against a master control list of dwellings in order to track the status of all dwellings. This is essential in order to allow notification to field staff to either conduct or suspend non-response follow-up.

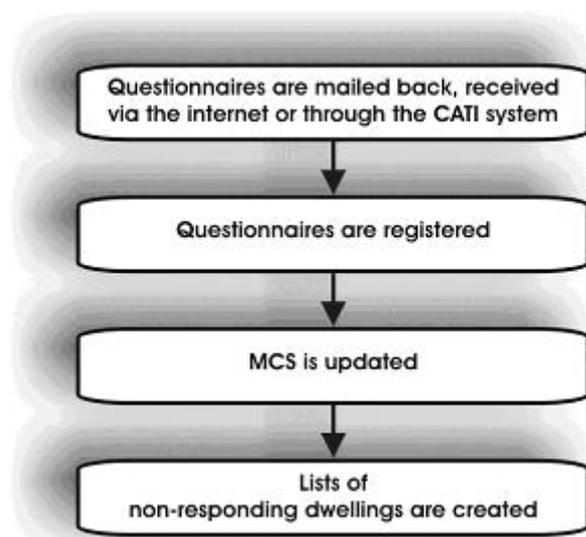
3. The Internet application has been designed so that after a respondent uses it to submit their questionnaire, no software trace (footprint) is left on his/her computer. Respondents who complete the long census questionnaires are able to save their partially completed form and establish a password. By using their password in conjunction with their Internet access code, respondents can complete their form over multiple sessions. If a respondent chooses to save their form and does not return within a pre-specified period of time, the partially completed form is submitted on their behalf automatically and is passed onto subsequent processing steps. In addition, Internet respondents who save their form can access it from different locations (roaming). For example, they can start the form at home, save their partially completed form and complete it from work. The Internet application will be available in both of Canada's official languages (English and French), and respondents can toggle back and forth between languages as they complete the form.

## **PRECONDITIONS**

4. In our experience, there are a few factors that are considered essential before a census Internet option can be considered, and there are some elements, which if present, would greatly enhance the likelihood of a relatively successful census online offering.

### A methodology that is conducive to adding an Internet option

5. Adequate literacy levels and the ability of the population to self-enumerate are absolutely essential for an Internet census option. Although the manner in which the questionnaire is delivered (manually or through the postal system) does not factor heavily, the ability to provide each household (or individual) with a unique Internet access code linked to a geographical location is essential in order to have an effective tracking system. A canvasser (face to face interview) methodology would certainly pose some significant challenges for the viability of an online option. For the 2006 Census, Statistics Canada will create a list (the Master Control System or MCS) of all dwellings with a unique identifier linked to a physical address (where a questionnaire was mailed-out) or linked to a geographical code (where a questionnaire was manually dropped off). Questionnaires will be pre-printed with this unique identifier as well as a unique Internet access code. When questionnaires are mailed back, received via the Internet or via the Computer Assisted Telephone Interview application (CATI), they are registered using this unique identifier and the MCS is updated. Non-response follow-up lists are created from the MCS and transmitted to Field staff on a regular basis, allowing contact with respondents only for those dwellings that have not responded.



### Connectivity and public expectations

6. Clearly any country considering the viability of developing an application for online filing of census forms must consider the level of connectivity amongst the population, their access to high-speed Internet, as well as the extent with which the population conducts “business” using the Internet (for example, online banking, filing tax forms). The latter may be indicative of the level of trust of online applications among the population and a potential indicator of the willingness of respondents to provide their confidential information online.

7. In Canada, an increasing proportion of households are connected via Internet. Based on the 2003 Household Internet Use Survey, an estimated 7.9 million (64%) of the 12.3 million households in Canada had at least one member who used the Internet regularly in 2003, either from home, work, school, public library, or other location. An estimated 6.7 million households (54%) had a regular user from home, with 4.4 million (65% of the home users) with high-speed access to the Internet. Furthermore, about 57% of households using the Internet at home had someone who accessed online banking services, well above the 44% in 2001. This growth indicates that Canadians are becoming more confident in the security aspects of the Internet

8. High in our consideration to offer an online option was the fact that the enormous penetration of the Internet in Canadian households, along with the sophistication of its use in differing types of transactions, would result in an expectation on the part of the public for a secure and efficient online option for the 2006 Census.

### Mature security infrastructure

9. While Canadians in general are taking to the web, trust in the level of security offered by the vendor or institution plays a big factor in their decision to either conduct or not conduct an online transaction. For a statistical agency, the provision of a secure infrastructure thus becomes absolutely essential in ensuring that the trust factor is high enough for the respondent to be willing to provide confidential census data online. For Statistics Canada, it was important to provide an infrastructure that was in reality more secure than most other online transactions to which Canadians have become accustomed. The fundamental difference in a statistical survey

or census is that the respondent is being solicited for a response, rather than having an incentive or benefiting directly from the transaction—such as in the case of online banking or requesting unemployment insurance.

10. Serious consideration should be given to the level and type of security as this affects the design and overall cost of the Internet option. There are a variety of options and undoubtedly more will emerge in the years to come. In Canada we were faced with the choice of having a downloadable application that would have allowed the respondent to complete a form and would then encrypt the respondent's data before transmission. This was the model tested in 2001 and due to the unacceptable download times and other technical factors, we decided not to pursue it in 2006. Another choice was to use SSL128 that is being used by a number of banks. While this is fairly secure, STC felt that for the census we required a higher level of security.

11. Finally, as part of its Government on line (GOL) strategy to have all government services online by 2005, the Government of Canada pursued the creation of a "Secure Channel" through which citizens could transfer confidential information using the Internet. This initiative is offered to Federal departments as they implement their individual online strategies. Secure Channel's original plan was to only offer unidirectional encryption (i.e. encrypt the data flowing from the user's computer to the department's servers). Statistics Canada required bi-directional encryption since confidential information would also be flowing from its servers to the user's computer. This functionality was required in order to conduct online edits as well as to offer the respondent the choice to save and resume a session in the future. Statistics Canada made the investment required to have this implemented within the Secure Channel environment. This, with the use of anonymous, limited-use certificates, and the isolation of Statistics Canada's internal network brought an exceptionally high level of security for the information. Specifically, Statistics Canada wanted to ensure that there was no possibility, or a possible perception, that Canadians' census information could go to anyone other than Statistics Canada, and that the digital certificates were not "generic" but used exclusively for the census.

12. The scale and scope of the Census requires a robust security infrastructure, and while it was possible for Statistics Canada to develop it for the Census specifically, with the flexibility shown by the government wide initiative to accommodate our unique needs, it was deemed less risky and more cost-effective for us to leverage from the investment on this initiative.

#### Online surveys experience

13. Our pre-2001 Census consultations indicated a growing demand and expectation for an online application for the 2001 Census. We met this demand by offering a relatively inefficient but secure and functional application to a very small sub-set of the Canadian population. The Internet option was made available in two specific test sites to approximately 190,000 households and 8,300 farms. The only public communication message was through an insert in the questionnaire package that also contained the unique access code for the respondent. Security requirements meant that the online application had to be downloaded to the respondent's computer. This turned out to be an onerous task as the application size was 6 to 7 MB, representing a download time of approximately 30 minutes with a 56K modem. A total of 4,300 Internet responses were received. Lessons learned involved mainly design issues, as well as the recommendations for 2006 to offer a true online application that did not have to be

downloaded and in fact, one that would leave no footprint on the user's computer.

14. Not offering an Internet option in 2006, given the expressed demand and expectation in 2001, would have been contrary to government policy (GOL), potentially resulted in non-response by specific groups expecting and demanding an online response option, and resulted in unacceptable risk and costs for 2011. Statistics Canada used private sector expertise in the development of the 2001 Census application, in providing certain security elements of Statistics Canada's Business Survey's Electronic Data Reporting initiative, and in the development of the 2006 Census application/infrastructure. Although private sector expertise exists, and there are definite advantages in leveraging from it, in house experience in the deployment of applications used specifically for statistical data gathering has proven invaluable, and is largely non-existent outside, particularly in a Census context.

15. Many of Statistics Canada's business surveys have offered respondents the option of providing data electronically. While these initiatives are largely geared to reducing respondent burden for companies who supply data on an on-going basis, and there are significant differences between the census and business surveys in terms of content and the respondent community, we have successfully leveraged from these initiatives to plan and implement the census infrastructure and to address a number of risks.

16. Thus prior to embarking upon an online census offering, factors such a compatible collection methodology, an effective control-tracking system, high connectivity and public acceptability, and the presence of a mature security infrastructure are deemed essential. Previous online survey and/or Census experience is certainly considered to be a desirable asset in potentially reducing some of the risks associated with such an undertaking. Above all factors however, is the willingness of the statistical and any funding agencies to consider an internet response channel as a potential long term investment with a clear understanding of the potential risks and opportunities. Sufficient funds must be clearly identified in advance and not predicated on uncertain future savings.

## **STRATEGIC CONSIDERATIONS**

17. Having worked through the essential and highly desirable pre-conditions for offering an online census option, a number of strategic considerations weigh heavily on the manner in which to proceed with the design, planning and implementation of such an undertaking.

### Investments and potential savings

18. The main cost drivers for the internet application are questionnaire development and testing, secure infrastructure, the application development, testing (functional, integrated and volume) and support (technical and respondent) effort, telecommunications infrastructure, hardware/software and public communications expenditures. In our 2006 Census context, about half the expenditures are associated with the customization of the secure channel infrastructure and could possibly be considered as a one-time investment. The maximum number of concurrent users plays a critical role in determining the capacity and thus cost, and in our case, we have sized the infrastructure to accommodate 15,000 concurrent user sessions. Our total target response rate over the Internet is 20% of households that respond prior to non-response follow-up (approximately 2 million questionnaires), which if not met has a direct impact on the

capacity of the paper-handling systems and operational costs.

19. The potential savings opportunities are in the areas of reduced paper-handling costs, mail-back postage costs, and reduced follow-up costs for missing or inconsistent information. For 2006, with a 20% Internet return rate, these are anticipated to approximate the cost of developing and supporting the Internet application. Although not quite at a break-even position with a 20% response rate in 2006, an increased take-up rate in the future and being able to leverage from the Government of Canada's Secure Channel investment should provide for some long-term efficiency. Some have argued that not having an Internet option in 2006 would increase non-response costs and that these should also be factored as cost avoidance in the return on investment formula.

20. With the rapid advancements in technology, introduction, obsolescence and terminated support for various software and operating system platforms, predicting the future (10 years plus) costs and uptake over the internet for the Census can only be based on subjective and risky assumptions. Scenarios range from the Internet option being too costly to offer, a necessity that requires additional investment, to one that could potentially be the major mode of delivery and return of questionnaires which would result in significant cost reductions with concomitant timeliness and quality gains.

#### Developing the application in house or contract out?

21. In 2001, with the help of internal and external advisors, we developed and subsequently applied criteria to determine which components of the 2006 Census were best developed in-house versus by the private sector. One of the key considerations was the level of expertise and where this was best capitalized upon in order to minimize development, integration and implementation risks. For us, the conclusion was that we were best positioned to design, user-test and specify the online questionnaire format, flow, skip-patterns, and rules for online edits. These factors influence the respondent experience, the overall look and feel of the application, comparability to the paper questionnaire (possible mode effects), as well as the resulting data quality, and it was determined that we had the necessary expertise to specify these requirements. Conversely, it was concluded that the private sector was better capable of meeting the systems integration challenge associated with programming and linking the online application with downstream processing systems and ensuring that it was optimized to handle the anticipated volumes.

22. Thus conducting a competency profile, with a comprehensive view of the overall census system and process design, proved beneficial in capitalizing on the respective talents of our in-house staff as well as those of the private sector.

23. Having made the distinction at a high-level, there are grey areas where competencies overlap, and in our case, we have worked with external contractors in developing the census Internet application, in an integrated team environment. This type of working relationship has yielded dividends even in areas where typically we have the upper hand. Statistical agencies are by far the best qualified when it comes to creating paper questionnaires. Decades of experience, huge samples, exhaustive data analysis and qualitative tests and studies have resulted in a level of expertise that is without equal in the private sector. Our experience in creating web based data collection vehicles is more limited and in some cases there is a risk

that in attempting to adhere too closely to the existing paper form in an attempt to minimize a mode effect, we can actually create a larger mode effect. Respondents who choose to respond via the Internet tend to be experienced Internet users, and have expectations about how the form should work based on their experience with other web-based forms. Working closely with the contractors as well as through our census test experience, useful lessons have surfaced on how to better design the web based census questionnaire to achieve desired results. For example, web based forms generally order yes/no questions consistently. On paper, we tend to place the response that is most often selected first. On the web, users apparently learn the order of the yes/no responses from their first encounter with this type of question and then expect all others to be ordered in the same way. Switching the order of these responses on the web to keep them consistent with the paper form can result in the opposite of the desired effect.

24. Another example pertains to questions for which there is only one logical answer (e.g. male/female) that use radio buttons. If the user selects "male" by accident, then selects "female", "male" is automatically deselected. An experienced Internet user expects this behaviour and a situation where the response ends up with both "male" and female" being selected is more likely if radio buttons are not used in the design of the questionnaire. In Canada, we struggled when introducing anything in the Internet form that was different from the paper form, but in the end found a comfortable compromise with a general adherence to the paper form while incorporating many useful web standards.

25. Finally, thought must be given to how respondents will react to the private sector being involved with real or perceived concerns about data confidentiality and privacy. Any widespread negative reaction could have an adverse impact on overall response rates and create respondent relations issues for the statistical agency.

## **MAIN RISKS AND CHALLENGES**

### Integration

26. One of the major integration challenges was determining how the data received from the Internet would be integrated with those received from different streams such as paper and the telephone. Our decision to implement some of the web standards resulted in a small number of differences between the data received from the Internet and those received from paper. This required co-operation between those creating the database, and those designing the paper data capture system and the Internet questionnaire at all stages of the development cycle.

27. In trying to gain the maximum return on the Internet application development effort, a conscious design decision was made early in the process to try and use the same basic logic and code-set with only necessary modifications for two other similar applications. Specifically, in our context we plan to complete questionnaires over the telephone in a Computer Assisted Telephone Interviewing (CATI) mode as well as use a similar application for following up on failed-edit follow-up (FEFU) cases, once again using a CATI application. All three of these (Internet, CATI and FEFU) share the same basic code-set with some customization. While we have had some success with this design, using this approach has resulted in a number of challenges. For example, while the Internet application has built-in edit-logic, the FEFU application has to also deal with data supplied on paper questionnaires where skips may not have been followed and inappropriate multiple responses may have been provided. In the

FEFU application, it is necessary for the operator to address specific discrepancies with the respondent, by being able to access responses that don't respect the logic built into the Internet application. These types of challenges are now being addressed for the 2006 Census.

### Public communications

28. To have a reasonable prospect of success in achieving the desired uptake level, it is necessary to have a comprehensive communications strategy that effectively promotes the Internet option. As witnessed in our Census test, where there was no public communications effort to promote response, the questionnaire alone promoting this option is insufficient. In the 2004 Census test, the Internet option and the URL were advertised on the front cover of the questionnaire and the Internet access code was uniquely and prominently pre-printed on each form. The first step in the questionnaire asked each respondent to select if they wished to use either the Internet option or the paper option. Despite this, results of a follow-up survey indicate that 17% of the respondents who completed a paper questionnaire were unaware that an Internet option existed. While providing a paper questionnaire to each dwelling is seen as an absolute necessity for 2006, it does reduce some respondents' inclination to log-on and use the Internet application.

29. Promoting the online option presents some unique challenges. While our target is to achieve a 20% response, we have to be equally cognizant of our technical capacity to handle a finite (15,000) number of sessions at any one time. If 15,000 users are logged on at the same time, the next respondent logging in can be presented with a "graceful deferral" screen that asks them to try again later, while allowing respondents already on the system to continue uninterrupted. It is entirely possible that we may exceed the infrastructure's capacity on Census day, but not meet the overall online response objective. Getting respondents to wait and try once again online, and not simply become frustrated and refuse to respond at all is an inherent risk that needs to be acknowledged. Similarly, an untimely pervasive virus, worm or perceived/real breach of security in another government department, even if completely unrelated to our application, occurring at a critical time in our collection activities, would present significant public communications challenges and in all likelihood impact online response rates.

30. In Canada, the revenue agency has had significant success in providing incentives to Canadians for filing their taxes online. By promoting a quicker tax refund to those eligible, they have been able to secure the co-operation of approximately 50% of Canadians in filing online (25% through accounting firms who file on behalf of Canadians and the other 25% through commercial tax-filing products with built-in online transmission facilities). While this is certainly impressive, the Census clearly cannot offer a similar incentive. The possibility of offering some tangibles (year-books, cash, donated prizes, etc) through online draws was contemplated, but quickly dropped due to strict regulations restricting such practices, logistical, cost and other considerations.

31. Statistics Canada's public communications efforts have typically relied heavily on third-party support, where the public and private sector have partnered in promoting maximum participation in the Census. These partnerships have resulted in significantly higher visibility of the Census messages at very low-cost. For the 2006 Census, the same basic approach is planned with the added challenge of promoting the online application as an easy, secure,

convenient and cost-effective means of fulfilling one's civic duty. Implicitly, we plan on passing on the message that the Census not only tracks societal trends, but that the statistical agency responds to the evolving preferences of Canadians in providing information.

32. Many of the major organizations we typically engage have developed online clientele relationships and have large numbers of employees connected to their internal networks. Our third-party support initiatives are geared towards promoting the Internet option at key points during online activities offered by those reputable organizations who have a major online presence. Thus our target audience for the Internet application is that which is already comfortable with conducting online transactions. At the same time, we are also exploring how this medium could possibly help us in reaching the 18-34 year olds, who have a proportionally higher undercoverage in the census. Under consideration are initiatives such as working with Internet Service Providers (ISPs), banks (online banking), major vendors (e-commerce) as well as cellular phone companies (text messaging) to see how we could reach this segment of the population, and promote the census-on-the-web as a quick, secure and easy way to be enumerated.

33. The paid-advertising and media relations campaigns will highlight the option for Canadians to complete the questionnaire online. A number of stories are planned for technical magazines, columns, journals, and online media to showcase the high level of security (relative to other online transaction facilities), as well as the design and ease of use of the online application.

34. The public communications program is just beginning its implementation phase, and while there is a great deal of optimism in our ability to partner effectively and promote the census online application, our ideas and assumptions at this stage remain largely theoretical and untested. The efforts over the next 6-8 months will yield a better indication of the viability of our plans.

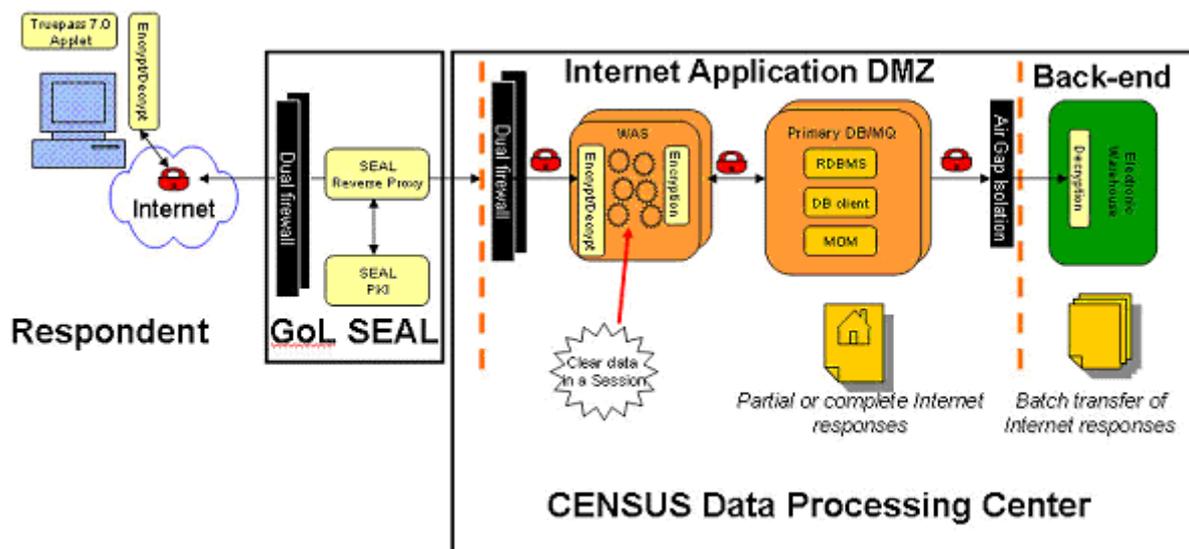
#### Infrastructure

35. One of the major challenges in implementing an online option for the census is the size of the infrastructure that is necessary to handle the peak number of users. The infrastructure generally consists of servers, storage devices and communication vehicles that can be extremely expensive to purchase, set-up and test. The strategy was to reach a balance in terms of what was a reasonable cost versus the risk of not being able to handle the peak number of concurrent users and having them give up on the Internet and complete paper questionnaires, or in the worst case scenario, give up entirely and not respond at all. The peak demand on the infrastructure is driven by 3 variables, the number of users logging in during the peak time, the average number of pages each user will see, and the average length of time each page is viewed. For example, a less robust infrastructure is required to support a scenario where each of 50 users is presented one page that they will view for 5 minutes than is required for 15,000 users to view 20 pages for an average of 10 seconds per page.

36. Another part of the calculation to determine the infrastructure necessary is the total number of online forms expected. However, the Census test demonstrated that while users logging on and submitting forms represented the most significant burden on the infrastructure, other types of activities that consume system resources also require consideration. These

include users who attempt to log in but who use invalid access codes, users who stop and save their forms to return another day and those who log in, start their form but never save or submit it. Assumptions used to estimate the infrastructure required must include estimates for these activities in addition to the number of forms that will be submitted.

37. Another major consideration related to the infrastructure is the system's architecture, how it interfaces with the other components of the processing system, and how it secures respondent's data. STC's processing systems have no connections to outside networks. The Internet response channel (IRC) is obviously connected to the Internet. The STC architecture protects respondent data inside the IRC servers with a dual set of firewalls and by encrypting respondent data. It also moves the encrypted data from submitted forms to the main processing systems through the use of an "air gap" device that physically separates the two networks but allows authorized data to pass through a physical switch at pre-determined time intervals.



## MAIN BENEFITS

### Quality

38. A number of studies lead us to believe that the responses received from the Internet are more complete than those received from paper. In our census test, we observed that the incidence of item non-response is many times lower for Internet submissions than for paper. Specifically, for short census of population forms the item non-response rate was 0.01% for Internet responses and 2.54% for paper responses. For long census of population forms the item non-response rate was 1.80% for Internet responses and 6.97% for paper responses. Some of this can be explained by the fact that average Internet users tend to submit more complete responses even on paper. To determine if the Internet option improved the already high quality of responses submitted by the Internet user community, we compared the data individual respondents submitted to our 2004 test to that which they submitted on paper for the 2001 census. When we controlled for the fact that the 2004 test was voluntary and the census was mandatory, we found that the questionnaires these users submitted on the internet in 2004 were more complete and had lower item non-response than those they submitted in 2001.

39. There are a number of factors that contribute to the improved quality observed with online responses. By design, a number of online edits have been built into the application that prompt respondents when they have left questions blank or entered conflicting information. Automated skips have been programmed that guide respondents past questions that are not applicable, and questions have been personalized with respondents' names which reduces the likelihood that one person's responses will be inadvertently recorded in another's response area. Also, no data capture errors are introduced during processing. The use of radio buttons in certain questions eliminates the possibility of conflicting responses and the use of drop down menus where appropriate, assists users in providing appropriate responses. Finally, there is a general perception on the part of users, confirmed by a survey conducted with a sample of Internet respondents after the census test, that the Internet form is easy to use and quick to complete. This is likely at least part of the reason behind the observation that more respondents completed the whole form online (in comparison to paper) rather than getting discouraged and quitting before the end.

40. Completing a complex (household, matrix format) questionnaire online remains as yet somewhat unique and possibly considered by some as a novelty. It is not clear if the same perceptions with regard to ease of use or quality results will hold as more and perhaps less sophisticated users are enticed to use the online application in 2006.

### High level of user satisfaction

41. Ensuring a high-level of satisfaction with the online experience is essential in retaining the respondent for the duration of the session, resulting in a completed questionnaire. User satisfaction is influenced by a number of factors, such as the ease with which the questionnaire is accessed, which is influenced by the minimum system requirements of the security solution and the complexity of the login process. Other factors include the absence of lengthy downloads or foot-prints, working with the default configuration of most users' machines, being compatible with common browsers, intelligent skip patterns, soft edits that permit the user to continue even if a particular response was not valid or provided, and the respondent's perception of the

relative speed and ease of use of the application. After the 2004 Census test, Statistics Canada conducted a follow-up survey with a small sub-set of those who responded over the Internet to judge their level of satisfaction. Some of the relevant results are as follows:

- the majority of the respondents (89%) indicated that they completed their Census test questionnaire at home;
- 79% of the respondents indicated that they had a “high speed” connection;
- when asked why they chose to complete their Census test questionnaire online, 52% said because it was easier, 30% said because it was faster, 18% said because of personal preference, 16% said because they did not have to mail it;
- 95% of the respondents rated their overall experience with the Census Internet application as favourable;
- 88% of respondents felt that the time it took to complete the Census Test questionnaire was acceptable, of which more were short-form respondents. Respondents who indicated that they did not have ‘high speed’ were more likely to say that it took too long;
- 98% of respondents indicated they would complete their Census questionnaire online in 2006;
- 57% of respondents were not at all concerned that the privacy and the confidentiality of their Census test questionnaire data were more at risk on the Internet, while 34% were concerned and 8% were very concerned;
- when asked how secure it is to transmit personal information over the Internet, 73% stated that it was secure, 13% stated it was very secure and 10% stated it was not secure at all.

#### Long term opportunities

42. Predicated on a number of basic assumptions such as the continued acceptance and use of the Internet by most citizens, the Internet option holds prospects for long-term cost savings, quality gains, and reduced respondent burden.

43. In geographic areas with a very high Internet penetration rate, it may be feasible to offer the online option as the default with a simple mailing of the URL and an access code, possibly significantly reducing the printing and delivery costs of the paper questionnaire. In Canada this may present proportionally higher savings, as in most cases we have to print and deliver a questionnaire in both English and in French. The challenge is in being able to deliver a paper questionnaire in the language of choice in a timely fashion to those who cannot or do not wish to use the online application (through a phone call to our help-line). We are in the process of investigating if a small test to exercise such an option is feasible for 2006. Clearly, a much higher take-up rate in the future would reduce the infrastructure required to handle paper questionnaires (scanners, physical space, logistics, shipping, people, etc.) potentially resulting in significant savings.

44. Our Census test experience indicated a much higher rate of item response and very low edit-failure rates for the Internet questionnaires. A higher take-up rate would concurrently result in lower follow-up and imputation rates, resulting in lower costs as well as increased quality. The online application also holds prospects for presenting a wider range of options to select from for certain responses, such as those in the labour or education categories (occupations, industries, educational attainment), thus reducing manual coding effort.

45. With an ever-increasing diversity in the Canadian population, the Internet makes it

possible to present the census questionnaires in multiple languages at modest additional cost. Even if the respondent chooses to use the paper questionnaire, the Internet can be used to provide translation of the questions in multiple languages. Overall, these could hold the prospect of increased response and lower follow-up costs. Similarly, the online application provides some real alternatives to people with disabilities such as those who are blind to self-enumerate rather than rely on an enumerator.

## CONCLUSION

46. Statistics Canada's experience with the development of an online Census application for the 2006 Census has been positive to date. The execution of a sizable and live Census test in 2004 provided us an opportunity to exercise an innovative design with respondents in an integrated collection and processing environment. Although a number of modifications are necessary prior to offering the option in 2006, we appear to be in a relatively healthy position to address the residual, controllable, and known risks. A number of factors favour the introduction of the online census application for 2006, such as the relatively high connectivity rates and comfort with transacting over the web by a majority of the Canadian population. Our census collection methodology of mailing-out/dropping off questionnaires for respondents to self-enumerate also is conducive to the introduction of the online application. We have developed an integrated processing design whereby all modes of collection culminate in the same downstream editing, follow-up, and imputation systems and processes. Our contracting approach has yielded a competent and experienced vendor, well positioned to deliver a robust, integrated and user-friendly application. Our in-house online survey experience has allowed us to test and specify relevant and priority requirements. The timely development of the Government of Canada's secure channel initiative and their flexibility in adapting it to suit our needs has aided us significantly in presenting a secure infrastructure. We have instituted a robust governance and project management structure in order to ensure that design changes and costs are closely monitored and tightly controlled. Although a number of risks remain, overall we are well positioned to meet the expectations of Canadians for a secure, efficient and user-friendly online application in 2006. Should the experience be as expected, a number of opportunities to increase data quality, reduce collection and processing costs, and reduce respondent burden exist for the future.

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