

## Article

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### **Changes in the Management of Data Collection Operations for the Canadian Census in 2011**

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## **Changes in the Management of Data Collection Operations for the Canadian Census in 2011**

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### **Abstract**

A census is the largest and possibly one of the most complex data collection operations undertaken by a government. Many of the challenges encountered are linked to the sheer size of the operation, when millions of dwellings need to be contacted, and thousands of people must be mobilized to help in the data collection efforts. Statistics Canada is a world leader in its approaches to census data collection. New collection approaches were introduced with the 2006 Census, more particularly an Internet response option, to add to the mail-out, telephone and face-to-face collection approaches. Such diversity in data collection methods requires an integrated approach to management to ensure quality and efficiency in an environment of declining survey response rates and a tighter fiscal framework. In preparing for its' 2011 Census, Statistics Canada is putting in place a number of new systems and processes to actively manage field data collection operations. One of the key elements of the approach will be a Field Management System which will allow the majority of field personnel to register enumeration progress in the field, and be informed in a very timely fashion of questionnaires received at the Data Operations Centre via Internet, by mail or other channels, thus informing them to cease non-response follow up efforts on those dwellings, in an attempt to eliminate unnecessary follow-up work.

Key Words: Census, Data collection, Field management, System.

### **1.1 Introduction**

Canada conducts a census of population and agriculture every 5 years. Results from the census are central to several key decisions and processes in the Canadian economy and society, such as transfer payments from the federal government to provinces and territories, determining electoral districts, determining requirements for municipal services, etc. Up to 2006, the Canadian censuses were conducted using more 'traditional' methods where most of data collection was conducted and controlled by field personnel. Large numbers of people would be hired to deliver and collect completed census questionnaires from all dwellings in their respective collection units. Questionnaires returned by mail were delivered to Crew Leaders, who then forwarded them to the respective enumerators. The enumerators conducted questionnaire edits and performed failed edit follow-up as well as non-response follow-up. Enumerators knew how many questionnaires had to be returned for the area for which they were responsible, and conducted collection operations accordingly.

Significant changes to the overall census collection process were introduced for the 2006 census, such as the option to complete the questionnaire on line via the Internet (Roy and Laroche 2006), and the mail-back of paper questionnaires to a central location for registration, automated edit and failed edit telephone follow-up. These changes were put in place to respond to concerns about privacy (specifically local enumerators reviewing questionnaires for completeness), to improve the efficiency of collection and to reduce overall costs. This approach drastically changed the collection work in the field.

### **1.2 Changes for the 2006 Census**

Important changes were introduced in 2006 for the collection of the Canadian Census. The mail-out approach as a way to deliver questionnaires was extended to more dwellings than ever before. Close to 70% of all private dwellings received their census questionnaire by mail. Response options were also more diverse. Respondents had

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the option to complete their questionnaire on the Internet using a secure process, or complete a paper questionnaire and mail it back to a central location for registration and processing. The job of field enumerators in the majority of collection areas now consisted of following up on non-respondents after a certain period of time, when it was clear that they may not respond any other way.

To support these changes, a number of new systems and tools were put in place. To be able to mail to a large portion of private dwellings, the Address Register was expanded using different administrative sources. The register contains the mailing address and other related information for all dwellings in defined census geographic areas. The fact that questionnaires could be completed and returned using various channels also required the creation of a Master Control System (MCS). It was imperative to have a central database which would include the entire universe of dwellings, to track the response status of each questionnaire in order to be able to efficiently direct non-response follow-up efforts.

## **2.1 Challenges in field operations in 2006**

Introducing such important changes for the 2006 Census was not done without encountering some challenges. Many impacted field collection operations. The new internet response option and centralized registration meant that for the first time, enumerators in the field were not totally in control of the return of questionnaires in their designated area. They had to be notified of questionnaires received centrally at the Data Processing Centre by mail, Internet or collected over the phone at a Census Help Line site. The registration status of each dwelling was maintained on the Master Control System which received daily updates from the Data Processing Centre which in turn were passed once per day to the Non-Response Follow-up system. This communication to and from the field was critical to identify which dwellings had to be followed-up as non-respondents, and which questionnaires had been collected in the field to facilitate the monitoring of overall collection progress. The communication to deliver assignments, notification lists of returned questionnaires and for any other related purpose was taking place between local census offices, Crew Leaders and enumerators using fax machines and telephone calls. Some problems and delays were encountered in doing so, which made communication less timely, resulting in a lot of unnecessary work being done following-up on households who had already returned their questionnaire, or continuing work in areas where quality standards had been met for the release of accurate results.

In addition to not obtaining timely data on the work performed in the field, enumeration expenditures were also slow being fed back to the Management Information System (MIS). This greatly affected the capability of managers to know how much money was being spent on collection, and the capacity to make decisions on priorities.

Communication and MIS problems were compounded by Statistics Canada's inability to attract and retain field staff in planned numbers throughout the data collection cycle. Timely information would have been critical in deciding how to use the smaller workforce for collection operations.

## **2.2 Field Management System**

One of the most important innovations being introduced for the 2011 Canadian Census is the Field Management System (FMS). This system is being developed mainly to address the communication problems encountered in 2006, but will also include other features to support collection work in the field. The FMS is a web based application that all field personnel will be able to access using their own personal computer and Internet connection, or by using equipment provided by Statistics Canada. It will allow field staff to have access to lists of dwellings requiring non-response follow-up, notification lists (of questionnaires received at the Data Operations Centre), action requests, management information reports, and timely instructions and messages from management. Field staff will also use it to indicate daily what work has been performed, and to enter their pay and expense claims.

Statistics Canada is planning to hire more than 30,000 enumerators and Crew Leaders to conduct field collection operations for the 2011 Census. Provisions will be made to ensure that all Crew Leaders have access to the FMS, either by providing a monetary compensation for the use of their own computer and Internet connection, or by providing them with a laptop computer and an Internet connection. It is expected that at least 70% of enumerators

will have the proper equipment to do the same, and they will also be compensated for this. Enumerators who do not have FMS access will communicate by telephone, and will rely on the Crew Leaders and/or their assistant to retrieve and enter information in FMS on their behalf. Enumerators will not necessarily be recruited based on their capacity to have access to a computer, but since Canada has a very high connectivity level, and given the fact most enumerators hired in 2006 applied for their job on line, we feel confident that at least 70% of recruited personnel will have direct access to the system.

## **2.3 FMS access and security**

The application for the Field Management System (FMS) will be housed on Statistics Canada's external network. Only authenticated users will be able to access the system. On their first day of work, field personnel with a personal computer and Internet will be provided with a system account, and a temporary user name and password. At first log-on, they will be instructed to create a personal password. The authentication process will also require the entry of randomly generated values from a unique card provided to the user.

The backbone of the FMS is the Field Assignment Structure which is housed in a separate administration system. This structure defines which position reports to which, which employee occupies which position, what geographic areas each position is responsible for and what permissions each individual position has in the various census systems that interface with the administration system. The information in this system is used to control what employees see when they log in to the FMS, what they are able to do while they are logged in and what information they are provided. For example, the Field Assignment Structure allows us to present only those collection units or dwellings that are relevant to an individual based on the position they are assigned to and the area of responsibility defined for that position. The area of responsibility can be modified to either increase or decrease the scope of a position's responsibility. For example, if one crew leader position is vacant, another occupied position can be given responsibility for the vacant position's geographic area. The Field Assignment Structure also allows the system to direct geographically sensitive information to the field staff responsible for a given geographic area.

## **2.4 FMS functions**

The FMS' most critical functions have already been developed and will be tested in the 2009 Census test. They include the creation and management of non-response follow-up assignments, pay entry and management features, access to and management of respondent action requests, access to management information, data capture of visitation records and the capture of collective dwelling information. The system will also contain links to an Enumeration Reference Library and a Generic Tracking Service. The reference library will contain all procedures and instructions for every field operations plus other reference material. The tracking service will be used to track all shipped confidential documents while in transit.

### **Non-response follow-up assignments**

Crew Leaders will be responsible for creating and managing assignment lists in 2011 for all field collection methodologies. The largest and most important operation is the Non-Response Follow-up (NRFU) of private dwellings. Crew Leaders will have near real time access on the FMS to the universe of dwellings in their Crew Leader District (CLD) that have not responded. From this, they can manually create work assignments or select parameters (such as the presence of a phone number, or the number of dwellings to include) and have the system create assignments automatically. Once lists are created, Crew Leaders can assign them to members of their staff. Dwellings on one list are not available for inclusion on another list. Lists can be "closed" at any point and any unresolved dwellings are then available for inclusion on a subsequent list. For example, after enumerators have spent several days working with their assignment lists it may be desirable to close the lists and combine the remaining unresolved cases on to a single list

There are also a number of quick reference tools available to the Crew Leader on the system to indicate the progress of each collection unit within the crew leader's district, and of each assignment list within each collection unit. They will be able to see at a glance progress on every assignment on a visual indicator similar to a cars' dashboard. They

will also be able to see all unassigned cases. Finally, they will have access to key indicator reports. These are described later in this paper.

Enumerators will be able to access their assignment lists on the FMS. They will be able to see all cases assigned to them, and to print the list to bring on the road for follow-up. Any relevant information about the cases, such as previous contact attempts for example, will also be visible. Enumerators will be required to indicate daily on their list in the FMS the progress they make. They will need to enter any final status codes for work completed, and any attempts made to contact dwellings. The final codes will be relayed in near real time to the Master Control System to keep an up to date picture of overall progress. Information on the effort required to complete the work, e.g. call attempts and field visits, will be available for the first time for a Canadian Census. This will be key information for planning of future censuses, but will also be used to monitor how effectively enumerators are working.

### **Notification lists**

One of the most important problems with the field operations in 2006 was the lack of timeliness of the updates on questionnaires received via mail or Internet. A daily notification via an automated fax process was used to send Crew Leaders lists of dwellings for which a questionnaire had been received and sorted by collection unit. The Crew Leader would then phone the enumerator to inform them of the dwellings for which non-response follow-up attempts should cease. In some cases the automated fax process did not work and a time-consuming manual fax process had to be performed from the local census offices to the Crew Leaders, causing communication delays. This prevented the Crew Leaders from contacting enumerators before they left their homes to conduct field follow-up. When timely notification was not achieved, enumerators would continue to make telephone calls and/or personal visits to dwellings that had already answered the census. For 2011, updates to assignments will be provided at least twice a day via notification lists on FMS. The FMS keeps track of which dwellings are on which list, and which employee has which list, so it will be possible to forward all notification lists to appropriate individuals in a timely fashion. These lists will be triggered from updates made to the Master Control System. Updates to the MCS will be made several times a day for all questionnaires received on the Internet, and all questionnaires mailed back and registered in any of 18 Canada Post facilities located across the country (compared to one centralized facility in 2006). This will improve the timeliness of notification in the field when compared to 2006, in some cases by several days.

### **Pay process**

All field staff will be instructed to complete their pay claims daily via the FMS. The system will provide users with a calendar view indicating which days require a pay claim. The pay process will be an important source of management information on overall expenditures, and this is why it will be important to have information from each employee each day, whether work was done or not. At the time of entry, users will be forced to enter information for any delinquent day before they can enter information for the current day. In addition to hours worked and kilometres travelled, enumerators will need to indicate which collection unit they were working in, and which task by code they were performing. This information will be used to monitor expenditures by activity, but will also form the basis for down stream cost controls by Crew Leaders or other levels of management.

Crew Leaders will need to review and either modify or recommend pay claims for their enumerators daily. To facilitate this process for some of the larger field operations such as NRFU where we are expecting enumerators to enter pay and progress information, calculations will be run on the Management Information System database every night based on overall pay and productivity information received, and fed back to FMS the next day. Crew Leaders will be presented a visual indicator for every claim that shows how the productivity of the employee making the claim compares to that of all other employees who made a claim for that day. The indicator will assist Crew Leaders in deciding whether the pay claim can be recommended as is or if clarifications or changes are required.

These features in FMS should greatly improve the timeliness of processing of pay claims compared to 2006, help to ensure that all personnel are paid on time, and provide higher quality and more accurate management information on expenditures.

## **Action Requests**

The census help line and local census offices often receive requests for assistance from respondents, such as requests for additional questionnaires, requests for service in another language, etc. Such requests will be geographically linked at the time of the call, and then forwarded to the appropriate Crew Leader for follow-up. Crew Leaders will then have the option of assigning the request to the appropriate enumerator, or addressing and resolving it themselves. The function in FMS will also include management information on the status of all action requests.

## **Messaging Functions**

The FMS will include a couple of messaging functions to provide information to field personnel. One will be a broadcast messaging function. This will enable management to send generic messages to a large number of FMS users at the same time. It will be possible to send these messages to groups of employees based on their assigned role in the Field Assignment Structure.

A second feature will be an alert function. This will be used to alert users to particular situations requiring priority attention, such as delinquent pay claims, delays in acknowledging shipments of confidential material, new action requests received, new notification lists received, etc.

Both the alert and broadcast messages boxes will be available on the first screen upon entry into FMS. This should represent an efficient tool to help field staff focus on priority activities.

## **Targeted Non-response Follow-up**

Statistics Canada is currently working on a model of targeted non-response follow-up which could be integrated with the FMS. Response rate targets for the Canadian census have traditionally been set at 98% per collection unit (CU). This is also referred to as the tolerance level. We strive to reach this response rate to ensure that valid quality results can be released for any defined geographical entity. However, it may be possible to release reliable results or indeed to improve the overall quality of census results by accepting slightly reduced response rates in certain areas if this translated in to higher response rates in other areas.

The process to determine if or when collection could be stopped below tolerance was manual and work-intensive in 2006. Delays in making decisions about when to stop collection also meant that collection continued longer than it needed to in some areas.

The notion for 2011 is that at minimum, a function could be implemented in FMS to indicate how many more questionnaires and of which type are required before collection can stop in a CU. A function a bit more sophisticated would be able to determine at higher levels than simply the CU if tolerance has been met in a given area. Such a function would potentially allow an important efficiency gain in the coordination of field operations.

## **Visitation Record Data Capture**

A portion of the census is conducted using a List/Leave methodology for collection units where it is not feasible to have the questionnaires delivered via the mail. Enumerators systematically canvass assigned collection units delivering questionnaires and listing all dwelling addresses and attributes in a visitation record. The questionnaires are pre-printed with barcodes and geographic identifiers that correspond to specific rows in the visitation record. Once all questionnaires in the collection unit have been delivered, the MCS is then updated with the universe of private dwellings for the collection unit. In 2006, the MCS was updated only with the dwelling counts and geographic identifiers for the private dwellings in all List/Leave CUs. For the 2011 Census, the entire Visitation Record including each dwelling's address will be data captured by crew leader assistants using the FMS. This will result in more precise information much sooner in the MCS, simplify non-response follow-up operations in these areas, and increase the likelihood that callers to the Census Help Line who live in List/Leave CUs can be linked to a record on the MCS.

## **Management Information**

Field managers will have access via the FMS to more precise and timely management information than ever before. All information on expenditures and productivity will be compiled in the census MIS data warehouse at the end of each day, and fed back to FMS. Crew Leaders, Field Operations Supervisors and other collection managers will have access to dashboard type indicators which will provide a quick and easy look at the state of progress for their area of responsibility. Key Indicators will also be available in the form of reports, providing drill down details on progress and costs of collection and on progress and state of recruitment activities of field staff to the lowest level of collection geography.

Crew Leaders will also have access to a staff summary which will list all of their employees, a count of the number of assignments each has, a count of any unacknowledged notification lists, a count of overdue pay claims, whether there are pay claims to recommend for each employee and a count of any outstanding action requests.

## **Peripheral Functions**

A number of other tools are also being developed to support field operations. Many of these will be available on one of the Statistics Canada networks and links will be built for access via the FMS. A central repository of all directives and procedures known as the Enumeration Reference Library is being built using a Wiki approach. This tool will contain far more details than the various workbooks that are being prepared to support field staff daily. The Enumeration Reference Library will be available via FMS using a simple link.

It is Statistics Canada's policy that all confidential written or printed information be systematically tracked when shipped from one point to another. A new generic tracking service has been developed by Statistics Canada for this purpose. It is available to any survey or operation which may require it. An interface is being built to connect the service to the FMS. Enumerators will be able to simply indicate from their registered productivity (complete work) which questionnaires they want to ship and the interface will transfer the information to the tracking service. Other users will be able to access the service to acknowledge receipt of shipments and prepare new ones to be sent on.

## **Conclusion**

With declining response rates, recruitment challenges, and continuing pressure to collect data more cost efficiently and release results more quickly, new tools and approaches need to be put in place to support collection operations. The FMS offers opportunities to increase the efficiency of collection operations, reduce respondent burden, decrease clustered non-response, and increase the quality and timeliness of management information towards decision making. Statistics Canada is able to implement a tool such as the FMS because of a high internet connectivity rate in the general population, experiences in large scale internet application deployment and investments in other tools such as the Master Control System. For both the 2009 census test and the 2011 Census the FMS will contribute to the more timely transfer of information to and from the field, more focused non-response follow-up, fewer respondent relation issues, less staff frustration due to negative encounters with respondents, and fewer delays in remunerating employees. These benefits will go a long way in ensuring the success of the field collection operations, even if the same recruitment issues are encountered again in 2011. Looking ahead, the FMS is part of the solution to implementing an even more targeted non-response follow-up approach and will be leveraged to support ongoing survey operations. It will be considered for use by other household surveys conducted by Statistics Canada.

## **References**

Roy, L. and Laroche, D. (2006). The Internet Response Method: Impact on the Canadian Census of Population Data, *Proceedings of the Joint Statistical Meetings*, American Statistical Association.