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**CENSUS TECHNOLOGY: RECENT DEVELOPMENTS AND IMPLICATIONS ON
CENSUS METHODOLOGY**

Implications of the Internet Census for the Management of Field Operations

Submitted by New Zealand*

This meeting is organised jointly with Eurostat

Summary

The Bureau of the Conference of European Statisticians (CES), at its meeting held in Washington, D.C. (United States) on 19-20 October 2006, approved the renewed terms of reference for the Steering Group on Population and Housing Censuses and the plan for future CES activities on population and housing censuses. The CES Bureau also agreed that the Steering Group would coordinate the work on the diverse types of meetings. The present paper was prepared on request by the Steering Group on Population and Housing Censuses, for presentation and discussion at the Joint UNECE/Eurostat Meeting on Population and Housing Censuses in Astana (Kazakhstan), 4-6 June 2007. The paper provides substantive basis for the discussion in the session of the meeting dedicated to "Census technology: recent developments and implications on census methodology".

* This document has been prepared by Statistics New Zealand.

I. INTRODUCTION

1. Statistics New Zealand introduced an online response option for the first time in the 2006 Census of Population and Dwellings. While a number of challenges were faced both from the business and technical perspectives this paper focuses primarily on the impact on the field operation. It explores how Statistics New Zealand managed the integration of the online response option into the collection process, while at the same time maintaining the quality and integrity of the census.

2. The paper covers four key aspects of this integration:

- (a) changes to the business processes and the implications of these changes;
- (b) effective management processes and field structures to respond to the challenges faced;
- (c) the critical importance of effective and efficient reporting mechanisms with timely links between systems and field staff to provide essential information, e.g. notification of forms received;
- (d) required changes to training and field procedures and materials.

II. BACKGROUND

A. General background

3. Statistics New Zealand conducts a census of population and dwellings every 5 years, in accordance with the New Zealand Statistics Act (1975). Censuses in New Zealand are based on the model of collector drop-off and collect, although a small proportion is returned by mail. A de facto collection method is used. This means that every person within New Zealand's geographic boundary must complete an individual census form at their census night address. Census night counts from the New Zealand 2006 Census of Population and Dwellings are included in Annex I.

4. Since 1945, separate dwelling and individual forms have been provided for all households. These have been available in both English and bilingual (Māori English) formats since the 1996 Census.

5. Support for the census remains high, with the Census Coverage Survey in 2006 showing an estimated net undercount of 2 percent. It is recognised that this high level of support cannot be taken for granted. New Zealand society is changing in many ways. It is becoming more diverse; people are busier and less available, and less willing to accept the need to participate in statistical activities such as the census. Public attitudes in New Zealand, and in many other countries, indicate a strong demand for choice and convenience when interacting with government. This was an important driver in deciding to proceed with the provision of an online response option for 2006. The introduction of the online response option also aimed to provide the opportunity for future financial saving and improve aspects of census data quality.

6. As the 2006 Census was the first multi-modal census in New Zealand using both internet and paper, the learning gained from it can be used in the next census in 2011. There are also wider government benefits. The provision of the online census response option makes an

important contribution to meeting government's digital technology objectives which are to deliver a wide range of government services in the future via the Internet.

B. Online response option implementation strategy

7. Statistics New Zealand made the decision to promote the online option on the dwelling doorstep and through selected high usage Internet sites only. Collectors, the field staff who undertake the door-to-door data collection, were trained to offer an envelope to all households which contained internet Personal Identity Numbers (ePIN) and all information required to use the online response option.

8. Collectors were required to visit all dwellings to deliver census forms. If all of the individuals in the dwelling on census night completed their census forms using the online option, then a return visit to collect the forms was not required. The online response option was introduced as an investment for the future. It was recognised that there would not be financial savings in its implementation in the 2006 Census

9. In planning the implementation of the data collection phase Statistics New Zealand's strategy was to promote new technology and respondent choice, while positioning Statistics New Zealand to manage a significantly higher Internet participation rate in the future. The strategy was to:

- (a) ensure the availability of an online response option to all householders in both English and Māori;
- (b) ensure the online response option was available to anyone with access to a computer with the minimum connection requirements;
- (c) maintain a full parallel paper based system i.e. all households issued with an ePIN would still be issued with a full set of paper forms;
- (d) accept that the online response option would provide the opportunity to reduce input processing but not field costs;
- (e) provide experience with the medium, and maximise the future potential to improve coverage and quality of reporting;
- (f) develop a field communication process to ensure speedy transmission of online lodgements to collectors;
- (g) use the 2006 experience to assess the impact on traditional data collection processes, data quality, budgets, workloads within the census programme, and workloads and contracts for field staff.

C. Online form

10. The online census form was designed to mirror the paper form as closely as possible to minimise the impact of modal effects on data quality. It was available in both English and Māori, and there was a screen reader version for the visually impaired. The development phase included a comprehensive respondent and field testing programme. To aid form completion and supplement the paper household information leaflet, online assistance was provided in the form of help notes and general census information. The online form was available 24 hours a day for 3 weeks before and 3 weeks after census day (7 March 2006).

11. Despite very low promotion the online option was very successful, not only in terms of the uptake but an almost completely trouble-free operation. A follow-up Public Attitudes survey conducted after the 2006 Census reported that 74 percent of respondents were aware that people could complete their forms online. Over 7 percent of all census dwelling and individual forms, almost 400,000 forms, were received via the internet.

12. The online response option received a range of unsolicited praise from the New Zealand public and across the Information Technology (IT) sector. It was short-listed for two New Zealand IT Awards as well as being the subject of a chapter in an international textbook on e-government. At one Information Technology award, the New Zealand Prime Minister identified the online response option as an exciting example of innovation in the use of Information Technology within Government.

D. Field Structure

13. In 2006 the census field structure consisted of approximately 6,500 standard collectors, 1,000 special collectors, 11 Census Trainers, 412 District Supervisors, and 22 Area Managers. The field force was supported by the Data Collection Unit Manager and Field Management Team (see Annex II).

III. INTEGRATION INTO THE DATA COLLECTION PHASE

A. Summary of impacts

14. A summary of the impacts on the Data Collection phase of having an online response option are listed below:

- (a) The online response option needed to be integrated into the whole 2006 Census process from development of the strategic direction to data output and final evaluation;
- (b) Changes were required to the Census Data Collection Business Process Model e.g. collectors would no longer need to collect every completed census form;
- (c) Potential solutions for the new or changed processes needed to be developed and tested. This meant an extensive testing programme was undertaken;
- (d) Procedures had to be put in place to deal with the cultural changes required by the introduction of new technology;
- (e) The risks of introducing a new collection mode and the related technology needed to be identified and mitigated;
- (f) The impact of the changed collection environment on field activities needed to be assessed and managed;
- (g) A suite of information technology systems for field managers to support the online response option needed to be developed and deployed;
- (h) The text messaging service to collectors needed to be developed and implemented;
- (i) The procurement processes for, and contract management of, the external vendors employed needed to be undertaken e.g. call centre and text messaging service providers;

- (j) The field resources to support the online option e.g. ePINs had to be produced or purchased;
- (k) A full range of public information services to support the option needed to be available e.g. developing a specific census information website and training specialised call centre agents;
- (l) The training programmes and support materials to ensure the option was presented to respondents in the prescribed manner e.g. the census online training facility needed to be developed.

B. Business process development

15. The most important element of the online response option was the successful integration into the data collection phase. This also produced many challenges. The immediacy of the Internet heightens public expectations that the same level of technology is used across the whole census process. This created an increased expectation that no collector would personally call post census day on any household who used this option. In many ways rolling out the technology was the easiest aspect. Managing the cultural change needed to reduce the risk of purely focussing on the new technology and not data quality and the core tasks that underpinned the whole census process was challenging.

16. To meet these challenges Statistics New Zealand began by examining the Census Data Collection Business Process Model, identifying areas that would be affected by the introduction of the online response option and investigating solutions. This work was led by the Data Collection Business Unit in close cooperation with the project teams designing and developing the online and input processing solutions. This teamwork was vital to the successful implementation as everyone needed to feel the same sense of ownership to ensure a seamless flow from data collection to data output.

17. Each activity identified as needing changes was individually examined and a process established to incorporate the required changes into the existing methodologies. Where integration was not possible a parallel process was developed. This development was carried out so that the impact of an expected increase in respondent initiated mailback was catered for at the same time.

C. Management processes and field structures introduced

18. Standard corporate project planning principles were used throughout, with a focus on risk management given the large number of risks associated with a public exercise of this scale, and the introduction of new technology in particular. There were behavioural impacts and expectations on both the part of the field staff and the public that required as much management as the technology itself. The field structure was not significantly changed by the introduction of the online option, largely due to uncertainty of uptake patterns. However the 2006 experience is expected to influence the scope of field staff roles in the future.

19. A conscious decision was made to ensure that Statistics New Zealand conducted a very wide and inclusive planning and review process before key decisions were made. This took a

variety of formats from building relationships with external stakeholders including previous field staff, during and beyond the field tests, to conducting a formal external review of the training documentation and programmes produced. The value of this kind of input into the successful outcomes achieved cannot be over emphasised.

20. The Field Management Team, a key part of the Data Collection Unit, was set up to develop all of the processes and tools required and to provide day-to-day management responsibility of the 2006 Census field operation. Their mandate stretched from the development of the data collection strategies to the evaluation and review of the field operation. Many other areas of the census programme and Statistics New Zealand also made significant contributions to the development and operation of the field phase.

21. The Field Management Team and the field structure implemented proved to be a successful model including the introduction of a team of external and regionally based trainers. Careful consideration was given to the impact of the greater use of technology. Alongside the investment in training and field based support, clear performance management practices were introduced at all levels of the field structure. These were based around putting key performance indicators in place for field staff to enhance both their understanding of, and compliance with prescribed procedures.

D. Development of an effective and efficient reporting mechanism

22. To support the field operation Statistics New Zealand developed and deployed a comprehensive suite of IT systems, known as the Field Geography, Field Management, Field Communication and Call Centre (Public Helpline) Systems. These were developed with the objective of streamlining communication between respondents, field staff and census management. The key outcomes required of these systems were to:

- (a) ensure the needs of respondents were effectively met by coordinating requests received by the call centre and the notification of forms completed via the online response option or returned by mail;
- (b) enhance the flow of management information, provide administrative support and communication facilities for field management staff to enable them to have a stronger field presence and focus on quality assurance.

1. The Collection Systems Project

23. The Collection Systems Project was set up to manage the development of most of the field related systems. The development and operation of the online response option was the responsibility of a separate dedicated team. The complexity of these systems and the need to integrate with existing processes and systems for the paper form collection and data processing posed a real challenge but resulted in a seamless and successful operation. All field systems were developed and deployed using a mix of technology developed in-house alongside externally sourced and developed applications.

24. The Area Managers, Census Trainers and District Supervisors had web based access to the full suite of field systems via thin client devices and Microsoft terminal services over a

secure Virtual Private Network. The key IT systems for the integration of the online response option into the field process were the Respondent Management System, the Action Log and the Field Communication System. These all included key integration points with the field staff Human Resources System, which held all the field staff contact details and the Census Data Store where the online census data was held.

25. Statistics New Zealand acknowledges the role that the external call centre vendor played in this. Their contract covered the development and operation of the Action Log and the Field Communication System and included full integration of both the online response option and other field related systems. This was successfully achieved to the specifications required, on budget, on time and within a tight time frame.

2. Systems for online integration

26. The Respondent Management System collected and collated the information on forms received online and by mail. The Field Communication System provided information through communication of call centre action requests and notification of forms received directly to the collector's mobile phone. The Action Log provided a "transaction log" of all the text message information. The Action Log also provided the tools for District Supervisors to pass on messages to collectors who were out of cell phone range, as well as monitoring progress and identifying areas experiencing problems. Around the critical census day period Statistics New Zealand was able to map the receipt of online forms, as well as identify potential trouble spots by incorporating call centre and Action Log data with geographic information system (GIS) tools.

27. A total of 279,211 text messages were sent from the Field Communication System. Text messaging is a useful tool and was the best available for Statistics New Zealand's purpose. Statistics New Zealand needed to manage collector expectations of the text messages they received and the impact on managing their work flow. The form notification messages were bundled and despatched at set points in the day. This was to both complement field staff work patterns and minimise the impact on the national telecommunications infrastructure. Messages generated by calls to the call centre were sent immediately.

28. Statistics New Zealand recommends reusing the Field Communication System, but with further evaluation given the impacts for designing field staff workloads and contract payments in future. A range of appropriate guidelines, incentives and / or sanctions need to be introduced to ensure messages requiring actions are actioned, but in the most cost effective and timely manner. The Field Communication System could be complemented by web-based access for collectors to the Action Log if all of the related privacy and security issues were addressed. There is also potential for this system to be used more widely in Statistics New Zealand, for example within other household surveys.

E. Development of training and field procedures and materials

29. While the availability of the online response option was a key message for the communications campaign, it was not heavily promoted. The option was offered to all households when the collector made contact on the doorstep. This delivery method meant that not everyone in New Zealand was directly offered all of the available response options. It relied

on contact being made, and the contact person making the decision on behalf of all members of the household. No online materials were left when no personal contact was made. Information about the availability of the online option, and instructions on how to order the required ePIN from the call centre, were included in the household information leaflet. This leaflet was left with a set of paper forms when no contact had been made after three visits by the collector.

30. To use the online response option a household was given a sealed envelope containing an ePIN number. In conjunction with the household identification number written on the paper form, this ePIN provided a unique logon for each household. Details of the minimum computer system requirements needed to use the option were on the outside of the envelope. More detailed instructions in both English and Māori were inside, along with the census website address and the individual personal identification number or PIN. Enough ePIN envelopes were printed and distributed to the field to cover the maximum estimate of 70 percent of all households requesting an envelope. While many households requested an ePIN, only a small proportion of them used it.

31. A lot of time and thought was given to the development of a series of “Frequently Asked Questions” and scripted responses to inform both the public and field staff. A basic set was given to all field staff in their handbooks, and a more detailed range made available to all the call centre agents and to the public via the Statistics New Zealand and “About Census” websites. Both the call centre and website reference material could be updated in real time at any point. This provided the flexibility to respond to any new questions or issues that arose. A specialist team at the call centre was trained to answer any queries about the online option. Any queries the call centre could not handle were escalated to a technical support team provided by the external vendor contracted to develop the online option.

32. All staff, including collectors and call centre agents, were given access to a census online training facility to familiarise themselves with the option before it went live. This was invaluable as an aid to their understanding of how the option would be viewed as a respondent. The training site was well received and had a positive impact on staff attitude and promotion of the option.

33. A predetermined five point script was introduced for collectors when communicating with householders on the doorstep. This five-point script was heavily promoted in the handbooks, training video / DVDs and face-to-face training sessions. The checklist used by District Supervisors during quality and performance assessment visits with the collectors also emphasised the importance of these scripts.

34. Extensive training programmes were developed. These included specific training modules about the online response option at all levels and a system of cascade training set up within tight guidelines to facilitate the delivery of these programmes. To mitigate the risks of cascade training and ensure the consistency of the messages delivered, a team of specialist contract trainers were deployed to train the District Supervisors. The risk management was complemented by ongoing senior management field presence, mentoring and peer support. The census trainers also provided field based training support, particularly in the use of the IT systems deployed and during collector training.

IV. FUTURE DIRECTION

35. For the 2011 Census of Population and Dwellings Statistics New Zealand plans to actively promote the online response option (to maximise its uptake) and enhance the supporting data collection processes and systems specifically by:

- (a) promoting the internet as an integral component of a potential suite of collection options, including mailback;
- (b) reviewing the field structure required to operate those options (as opposed to the traditional collector delivery and collection model);
- (c) continue to refine field communications systems to better support and utilise technology in the field.

V. CONCLUSION

36. The 2006 Census was the first time people in New Zealand were able to fill out their census forms online. The online response option successfully provided choice to the public of New Zealand in their transactions with government, met government's digital strategy objectives, and contributed to maintaining, if not improving, participation in the census and the quality of the supplied data.

37. An independent assessment of the 2006 online response option and its surrounding processes was conducted by Associate Professor Dr. Rowena Cullen from the School of Information Management at Victoria University, Wellington, New Zealand. Cullen's assessment has since been documented in *Digital Government: Advanced Research and Case Studies*. She concluded that:

“Overall the New Zealand 2006 Census successfully collected data from nearly everyone in New Zealand on census night in spite of what is clearly a more challenging social environment for the collection of census data than in the past. Each Business Unit involved in the online census project was able to point to successes, and key objectives that had been met, e.g., getting information out fast to field collectors via the text messaging system. Underlying these achievements is the organisational learning, the knowledge sharing, and the improvement in internal processes, seen by staff as a result of pulling the right teams together (from both internal and external appointments) and the adoption of very thorough planning procedures.”

38. The learning gained from New Zealand's first multi modal census successfully positions Statistics New Zealand to take advantage of the efficiencies and benefits the technology can provide in 2011 and following censuses.

Bibliography

Cullen, R (2006) “New Zealand's 2006 Census online: a case study”, *Digital Government: Advanced Research and Case Studies*, Victoria University, Wellington, New Zealand.

Annex I**2006 Census of Population & Dwellings Census Night Counts**

Census Night Population in New Zealand			
1996, 2001 and 2006 Censuses			
	1996	2001	2006
Usual residents	3,618,303	3,737,277	4,027,947
Overseas visitors	63,243	83,472	115,332
Total census night population	3,681,546	3,820,749	4,143,279

Note: The census night population is the count of all people in New Zealand on census night. It includes overseas visitors, but excludes residents who were temporarily overseas on census night.

Dwellings in New Zealand	
2006 Census	
Dwelling Status	New Zealand
Occupied	1,478,709
Unoccupied	159,276
Under Construction	13,560
Total	1,651,542

Note: This data has been randomly rounded to protect confidentiality. Individual figures may not add up to totals, and values for the same data may vary in different text, tables and graphs.

Annex II

2006 Census of Population & Dwellings Field Operations Structure


