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Census technology, innovation and outsourcing

Innovation, outsourcing and security: Key results of the UNECE Survey on National Census Practices, and first proposals about the CES Recommendations for the 2020 census round

Note by the UNECE Steering Group on Population and Housing Censuses

Summary

In early 2013, UNECE conducted an online survey among its member countries on national practices in the 2010 round of population and housing censuses. This document presents an overview of the main results of the survey on innovation (part I), outsourcing (part III), security and confidentiality (part V). Some first proposals are also presented about the preparation of new Conference of European Statisticians (CES) Recommendations for the 2020 Round of Population and Housing Censuses, with regard to innovation (part II) and outsourcing (part IV). The proposals for the new recommendations regarding security are presented in the paper on census methodology (ECE/CES/GE.41/2013/3).

I. Key results from the innovation section of the UNECE survey on the 2010 round of Census

A. Introduction

1. Innovation has always been an integral part of Census taking. The Census of population and housing is most often the largest and one of the most important statistical activities in most countries. By its nature, important resources are allocated to these programs, in all aspects of the statistical process. This creates the opportunity to innovate. Different factors inherent to census taking are also conducive to the introduction of innovations, such as the sheer size of the activities, costs, privacy issues, etc. This paper presents the results of the innovation section of the UNECE survey on the 2010 round of Census, and potential options for updates to census recommendations.

B. Results

1. Question 1: Did you introduce innovations in your last census?

2. There were 49 countries (96 per cent of the total who responded to this section) that provided responses — either in the question options or the comment box. Of the responding countries, 25 were from the European Union (EU) (51 per cent of respondents).

Table 1
Count of countries responses by method of census (Percentage is of responding countries)

Responses options	*Traditional*	*Register-based*	*Combined*	*Total*
Used Innovation	28 (93%)	8 (89%)	9 (90%)	45 (92%)
Did not use Innovation	2 (7%)	1 (11%)	1 (10%)	4 (8%)
Unanswered	2	0	0	2

3. Of the 49 countries who responded to this question, 45 countries (92 per cent) introduced innovation in their last round of census. Only a small minority of responding countries (8 per cent) did not introduce innovation. The percentage of innovation used by countries that conducted a register based or combined census was very similar (around 90 per cent) and slightly lower compared to countries that conducted a traditional census (93 per cent).

2. Question 2.1: Which aspects did you innovate on?

4. There were 45 countries (88 per cent of the total who responded to this section) that provided responses — either in the question options or the comment box. Of the responding countries, 25 of which were from EU (55 per cent of respondents).

Table 2
Count of countries responses by Innovation aspect

Innovation aspect	*Traditional (including rolling)*	*Register-based*	*Combined*	*Total*
Methodology	***12***	***6***	***9***	***27***
Use of registers	8	6	9	23
Sampling	3	1	5	9
Rolling estimates	1	0	0	1
Coverage surveys	4	0	0	4
Data collection	***14***	***5***	***9***	***28***
Internet collection	9	0	7	16
Hand held technology	2	0	4	6
Long form/short form	3	0	1	4
Administrative data/registers	1	5	8	14
Data capture/processing	***15***	***1***	***6***	***22***
Scanning	9	0	1	10
Intelligent character recognition	11	0	2	13
Automated coding	11	0	5	16
Edit and imputation	10	1	6	17
Geography	***17***	***1***	***6***	***24***
Geographical Information Systems	15	1	6	22
Remote sensing	0	0	0	0
Use of Global Positioning Systems	2	0	4	6
Data dissemination	***17***	***4***	***7***	***28***
Internet	15	3	7	25
Disclosure control	8	3	3	14
Other	***6***	***0***	***1***	***7***
None	***0***	***0***	***0***	***0***

5. Across the four types of censuses, innovation was relatively evenly distributed between methodology, data collection, data capture/processing, geography and data dissemination. The least amount of innovation was in the area of remote sensing, as no countries listed this as an aspect where they innovated.

Traditional Method

6. Out of the 32 countries which conducted a traditional census, the highest amount innovation was seen in the areas of geographical information systems (15 countries selected this aspect) and the Internet for both data collection (9 countries selected this aspect) and dissemination (15 countries selected this aspect).

Other Methods (includes Register Based and Combined)

7. Of the remaining 19 countries, which used either a register based or combined method, the highest amount innovation was structured around the aspects of methodology, specifically in the use of registers and administrative data; as well as, data dissemination.

Figure 1
Number of countries introducing innovation aspects by census methodology

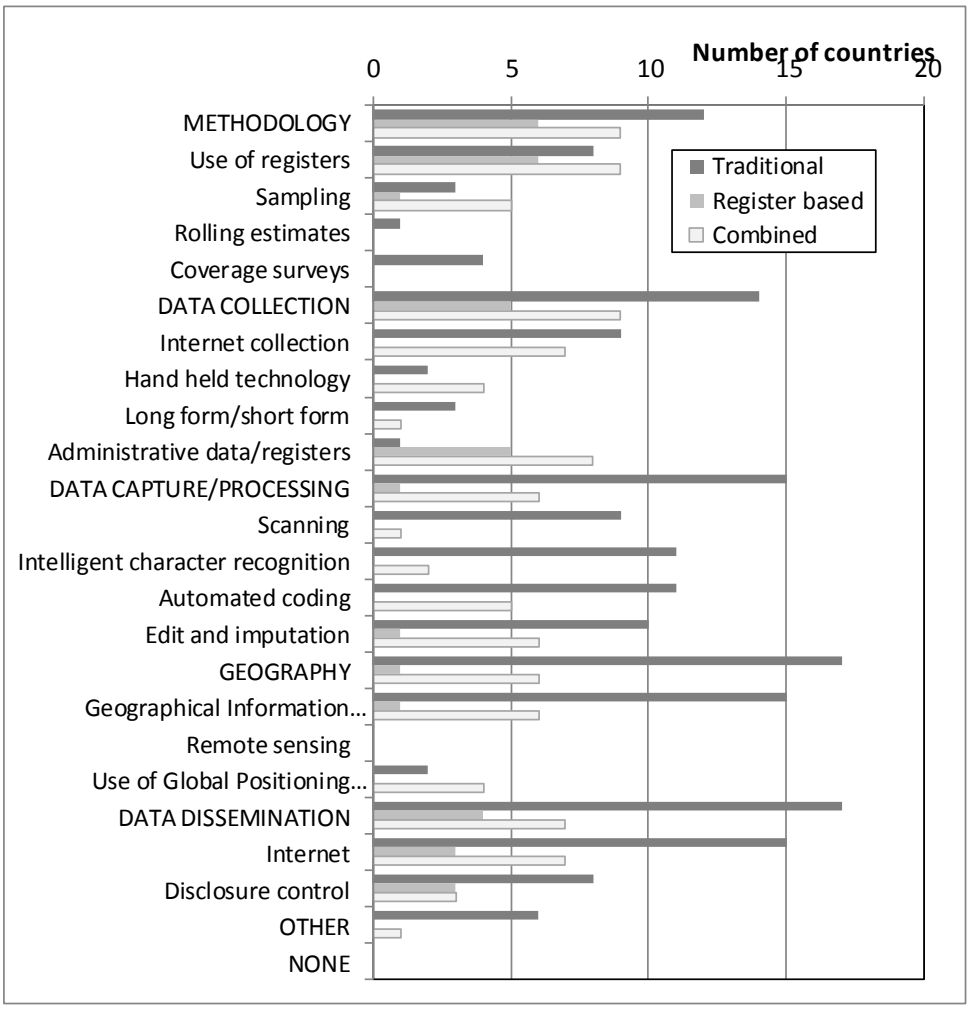
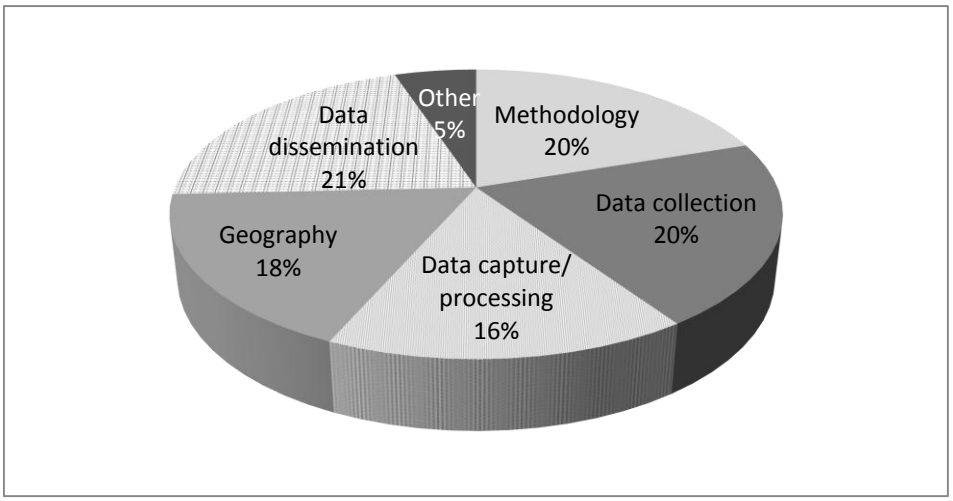


Figure 2
Distribution across aspects of innovation



3. Question 2.2: What aspects are you considering innovations on for your next (2020 round) census?

8. There were 50 countries (98 per cent of the total who responded to this section) that provided responses — either in the question options or the comment box.

Table 3
Count of countries responses by Innovation consideration for the 2020 census round

Innovation aspect	*Traditional (including rolling)*	*Register-based*	*Combined*	*Total*
Methodology	***17***	***3***	***6***	***26***
Use of registers	15	3	5	23
Sampling	5	1	2	8
Rolling estimates	2	0	1	3
Coverage surveys	1	0	0	1
Data collection	***21***	***3***	***5***	***29***
Internet collection	17	1	2	20
Hand held technology	10	0	2	12
Long form/short form	5	0	0	5
Administrative data/registers	13	2	5	20
Data capture/processing	***11***	***0***	***2***	***13***
Scanning	6	0	0	6
Intelligent character recognition	5	0	1	6
Automated coding	6	0	1	7
Edit and imputation	8	0	2	10
Geography	***11***	***1***	***3***	***15***
Geographical Information Systems	9	1	2	12
Remote sensing	0	0	1	1
Use of Global Positioning Systems	5	0	2	7
Data dissemination	***12***	***1***	***3***	***16***
Internet	9	1	2	12
Disclosure control	7	0	2	9
Other	***1***	***0***	***0***	***1***
None of the above	***0***	***1***	***1***	***2***
Don't know, too early for plans	***11***	***3***	***3***	***17***

9. As demonstrated in table 2, previously there has been innovation in the areas of geographical information systems, the internet (for both data collection and dissemination); as well as, the use of registers and administrative data. Going forward with planning for the 2020 round of census, these aspects are still being considered as areas for innovation but not to the same degree.

Traditional Method

10. On the horizon for countries who conduct a traditional census, data collection was ranked highest in terms of an area being considered for innovations (21 out of 32 countries), specifically internet collection (17 countries), hand held technology (10

countries) and administrative data/registers (13 countries). Ranked closely thereafter was methodology (17 countries), specifically the use of registers (15 countries).

Other Methods (includes Register Based and Combined)

11. Among the 10 countries which used a combined method, the areas with most countries considering innovations for the 2020 round are methodology (6 countries) and data collection (5 countries), specifically the use of registers and administrative data (5 countries). Among the nine countries which used a register based method, there seems to be moderate interest towards innovations for the 2020 round: three countries reported that they are considering innovations in the use of registers or administrative data, and all other areas were selected by no more than one country.

Figure 3
Innovation considerations for 2020 round of census

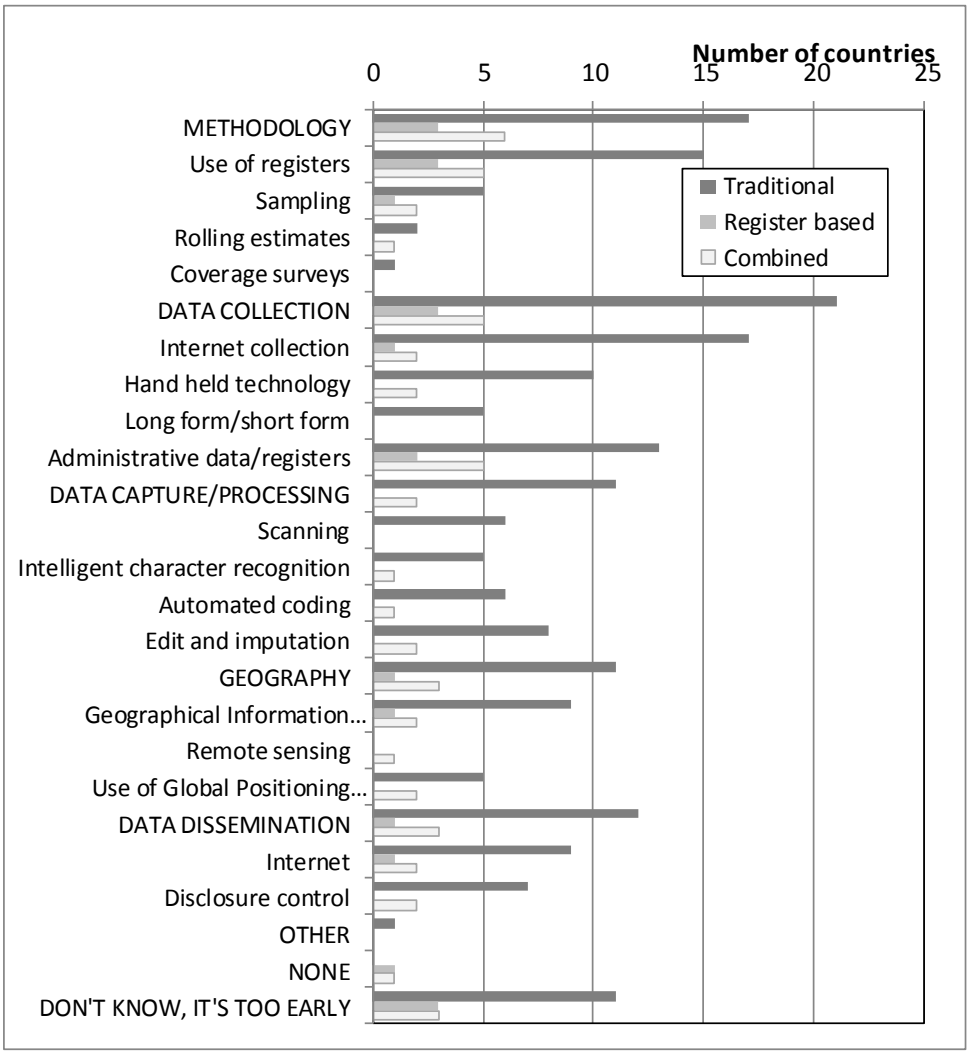
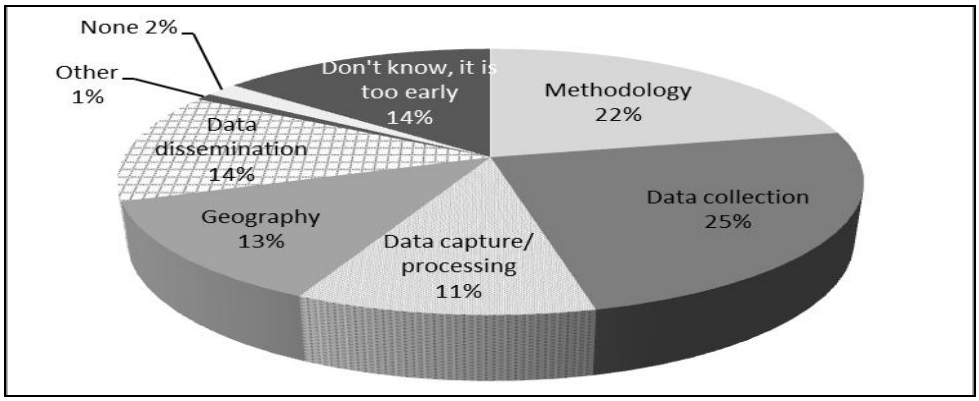


Figure 4
Distribution across innovation considerations for 2020 round of census



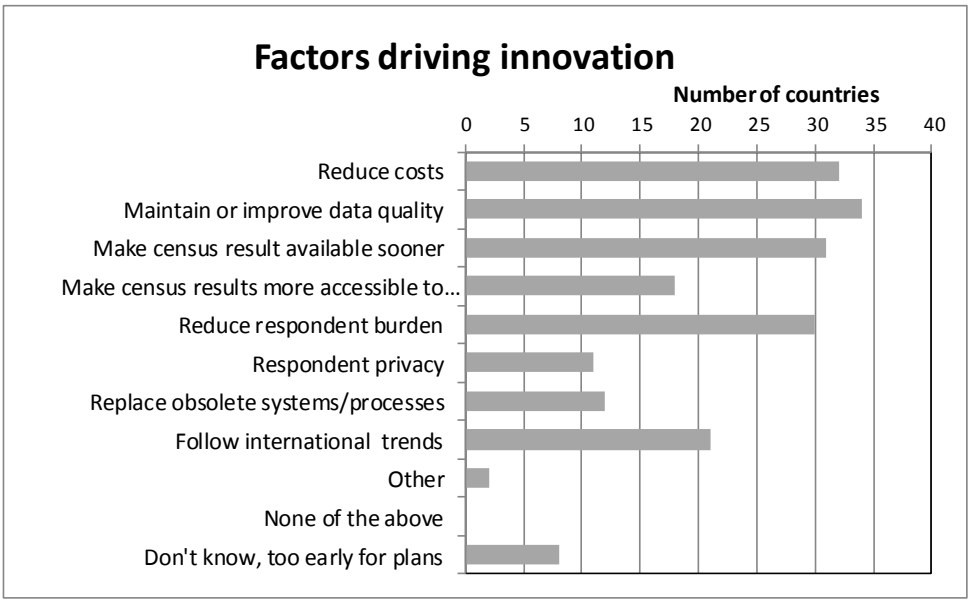
4. Question 2.3: What is driving the potential introduction of innovations for your next (2020 round) census?

12. There were 50 countries (98 per cent of the total who responded to this section) that provided responses — either in the question options or the comment box. Maintaining or improving data quality was ranked highest on the priority list as a major driver for the introduction of innovation for the next round of census. Almost equally important, in terms of a driver of innovation, was reduced costs, making census results available sooner after the census and reducing respondent burden.

Table 4
Factors driving innovation by census method

Innovation factors	*Traditional (including rolling)*	*Register-based*	*Combined*	*Total*
Reduce costs	22	2	8	32
Maintain or improve data quality	22	5	7	34
Make census result available sooner after the census	20	3	8	31
Make census results more accessible to users	13	1	4	18
Reduce respondent burden	21	0	9	30
Respondent privacy	9	0	2	11
Replace obsolete systems/processes	9	0	3	12
Follow international trends	17	2	2	21
Other (specify below)	2	0	0	2
None of the above	0	0	0	0
Don't know, it is too early for plans to be made	3	4	1	8

Figure 5
Factors driving innovation



II. Proposals for text on innovation in the 2020 CES Recommendations

13. The results of this survey clearly demonstrate that the majority of the countries are innovating in one area or another in their respective Census programs.

14. Based on this analysis, two recommendations could be added to the UNECE report in preparation for the *Conference of European Statisticians Recommendations for the 2020 Censuses of Population and Housing*. The topic of innovation is not specifically addressed in the recommendations, although there are references to innovation in technology section for example. The survey measured the use of innovation in relation to various aspects of the census process, such as methodology, data collection or the use of technology. In this context, it may be difficult to add related recommendations to various chapters, although this could remain an option.

15. A short section or chapter could be added in part one of the recommendations to generally refer to the introduction of innovations in the census process. Innovation has become an important step in the census process. A first recommendation could indicate the innovations should be considered as an essentially building block with respect to planning for all future censuses. A second recommendation would be that a review and/or consultation should be held amongst countries conducting similar types Census to discuss and share innovation ideas, strategies and challenges and to further define concrete recommendations specific to the process of innovation before they are implemented in any given country.

III. Key results from the outsourcing section of the UNECE survey on the 2010 round of Census

16. The complexity of much of the new software and the infrastructure required for many of the new and emerging technologies go beyond the current technical capabilities of

many census agencies. It is likely that significant components of any solution to the census operation will need to be outsourced. The value of doing so is that external suppliers bring with them considerable technical experience and expertise which would otherwise be unavailable to census takers, and allows National statistical institutes (NSI) to focus on their main task of carrying out the census rather than developing in-house procedures and skills that are not part of their core competencies. Furthermore, the 5 or 10-year cycle for the traditional census activities, the short processing timetable and extensive data systems required, mean that outsourcing provides the opportunity for efficiencies and value for money**.**

17. This is now widely recognised across the UNECE region in which 37 of the 39 countries that responded to the UNECE survey indicated that they contracted out the provision of one or more services or activities for the census operation to external agencies. Two responding countries (Albania and Turkey) reported that they did not do so (but the author knows from personal involvement that the Albanian Institute of Statistics did in fact outsource several of the operations for the 2011 Albanian census). Of the 11 countries that did not respond to the outsourcing section of the UNECE survey, 9 were those countries that carried out a full register-based census, in which the opportunities for effective outsourcing are clearly much reduced — if one considers that the creation and maintenance, by external agencies, of the registers from which the census information is extracted, is not "outsourcing" in the generally accepted meaning of the concept.

18. The printing of questionnaires and other documentation required for a field enumeration, and the publicity campaign were, by far, the most often reported activities to be outsourced. More than three quarters of the outsourcing countries did so. And more than half the countries outsourced the translation, delivery and collection of questionnaires and other field documentation, and the primary data capture and coding processes. Table 5 ranks the top 20 activities that were either fully or partially outsourced by the proportion of countries doing so. But there was a range of other outsourced activities that one in ten or fewer countries reported, including payment of field staff, tabulation, printing of reports, data archiving, data linkage, the production of digital media, and contract management.

19. Of course, some countries outsourced more than others. The Russian Federation led the field by outsourcing 21 different activities (although they had to report that not all services were delivered successfully within the contracted times), and the United Kingdom also undertook an extensive outsourcing programme with some 19 different activities (although in their case many of these were subsumed under a single contract). At the other end of the scale, Israel reported outsourcing only one activity, and (with the proviso noted above) Albania and Turkey reported none at all.

20. But why did countries outsource? As noted above, the main value of doing so is that external suppliers bring with them considerable technical experience and expertise which would otherwise be unavailable to census takers. In their responses to the survey many countries acknowledged this.

21. Some 26 countries (70 per cent of those that responded) cited the utilisation of resources and expertise not otherwise available as a reason for outsourcing. Outsourcing also clearly provides an opportunity to reduce operational timescales — some 23 countries (62 per cent) reported this — and to reduce costs 16 countries, 43 per cent). The improvement of data quality was reported as reason for outsourcing by 12 countries (32 per cent). These results are summarised in table 6.

22. But was the strategy successful? Did outsourcing achieve it aims? Table 6 also shows the main gains and benefits achieved by those countries that outsourced their activities.

Table 5
Census activities that were either fully or partially outsourced

	Countries responding (37)	
Activity	*Number*	*Per cent*
Printing of questionnaires	30	81
Printing of other field documents/materials	29	78
Publicity	29	78
Delivery of questionnaires/field documents	24	65
Primary data capture and coding	21	57
Translation of field material	19	51
Collection/return of questionnaire/field documents	19	51
Mapping field operation (enumeration) areas	17	46
Questionnaire destruction	17	46
Call centre/telephone help line	12	32
Design and provision of online response technology	11	28
Online/web access design	9	24
Data storage	8	22
Recruitment and training of field staff	7	19
Design and provision of questionnaire tracking	7	19
Mapping of output/dissemination areas	7	19
Data editing	7	19
Evaluation	7	19
Imputation	6	16
Data quality assurance	5	13

Table 6
Reasons for outsourcing and main gain/benefits achieved

	Aim		*Gain/benefit achieved*	
Reasons and main gains/benefits	*Number*	*Per cent*	*Number*	*Per cent*
Utilise resources/expertise not otherwise available	26	70	29	78
Save time	23	62	23	62
Gain knowledge	-	-	21	57
Reduce costs	16	43	19	51
Improve data quality	12	32	12	32
Improve coverage	4	11	6	16
Improve public perception/trust	1	3	6	16
Improve response	-	-	4	11

23. The striking result to note is that even more countries (29) reported achieving a gain from the utilization of resources/expertise not otherwise available than had reported this as a main aim (26). This is clearly shown to be the biggest gain from outsourcing. But more countries also reported actual costs savings (19) than had been anticipated (16) showing

that this, too, was a major benefit. The same number of countries (23) both planned to save time by outsourcing and achieved this gain.

24. But were those countries that outsourced for a particular reason the same countries that also achieved a gain/benefit from doing so? Interestingly, although not one country had identified "gaining knowledge" as a purpose for outsourcing, some 21 countries (more than half) reported this as a gain/benefit from doing so. But perhaps if this aim had been specifically included in the survey question on the reason for outsourcing countries would also have reported this as purpose as well as an achieved gain. However for most of the other factors the same countries that outsourced for a particular purpose also achieved the anticipated gain/benefit (more or less).

25. With regard to the utilisation of resources, only Cyprus and Tajikistan among the 26 countries that had outsourced for this purpose did not reap any benefit. But several countries reported a benefit that they had not initially expected — Armenia, Estonia, Georgia, Luxembourg, Malta, and the Russian Federation.

26. When considering the time-saving factor, neither Poland nor Serbia achieved the gain that they had anticipated, while Cyprus was alone among the countries that saved unplanned time.

27. Cost saving showed a similar pattern, but here only Tajikistan did not reduce costs in the way they it had planned, while Armenia, France, Georgia and Spain all reported reduced costs that had not been anticipated.

28. When it came to improving data quality, the situation was less predictable. Although table 6 shows the same number of countries (12) expected and achieved improvement, they were not all the same countries. France, Romania, Spain and Ukraine planned to improve data quality through outsourcing, but did not report that they had done so (Ukraine has not yet carried out the census), whereas the reverse was the case for Estonia, Ireland, the Russian Federation and the United States.

29. Despite the fact that some 19 countries achieved cost reductions through outsourcing (table 6), the cost of doing so was perceived by nine countries, particularly Canada and the United States, to be the biggest disadvantage of outsourcing — even though other benefits had been gained. The effect of outsourcing on the overall management of the census operation was also seen as detrimental, and again, nine countries reported this as a disadvantage — though no country had reported both.

30. Other factors associated with outsourcing that were reported as being a disadvantage covered: the creation of a negative public perception (this was a particular problem in Ireland, the United Kingdom and the United States, where contracted supplies were widely reported in the press to have had military associations); and a detrimental effect on data quality (reported by Armenia, Italy, Kazakhstan and Romania. Indeed, Romania also reported that they considered that response to the census had also suffered as the result of outsourcing — so perhaps for them, at least, in assessing the overall benefits of using external suppliers the jury is out (see below).

31. Countries were also asked to identify what the main challenges were when considering the overall strategy of outsourcing. The results are shown in table 7.

32. Keeping to (an often tight) schedule emerged as the most challenging aspect, and was identified as such by two thirds of responding countries. Managing the contract(s) with suppliers also proved difficult for almost half the countries, reflecting the advice given in the 2010 Recommendations that outsourcing should only be considered if the census agency "….has sufficient skills to manage the process" and "… the ability to manage complex development projects".

Table 7
The main challenges from outsourcing

	Countries responding (35)	
Main challenges	*Number*	*Per cent*
Keeping to schedule	24	69
Contract management	16	46
Keeping to budget	15	43
Integrating systems	12	34
Managing data quality	10	29
Managing change control	10	29
Meeting user needs	9	26
Managing press and public perception	7	20

33. Many countries (17) reported three or more challenges, including the United Kingdom and the United States who, even with their extensive experience of managing outsourced operations, reported five aspects where there were challenges. Top of the poll, however, was Latvia who reported six. However, Romania, despite the suggestion above, only reported two, so perhaps they will indeed consider outsourcing again next time.

34. Speaking of which, the final question asked countries to report on any plans to outsource specific activities for the next (2020) round of censuses. At least seven countries intend to use external agencies for their publicity campaign, and four reported that data processing was likely to be an activity ripe for outsourcing. But most (30 out of 36, including Romania), said that it was too soon to report on such plans.

IV. Proposals for text on outsourcing in the 2020 CES Recommendations

35. The complexity of much of the new software and the infrastructure required for many of the new and emerging technologies go beyond the current technical capabilities of many census agencies. It is likely that significant components of any solution to the census operation will need to be outsourced. The value of doing so is that external suppliers bring with them considerable technical experience and expertise which would otherwise be unavailable to census takers, and allows NSIs to focus on their main task of carrying out the census rather than developing in-house procedures and skills that are not part of their core competencies. Furthermore, the 5 or 10-year cycle for the traditional census activities, the short processing timetable and extensive data systems required, mean that outsourcing provides the opportunity for efficiencies and better value for money.

36. The appropriateness of contracting out should be determined step-by-step and after subdividing the overall census operation into separate stages. It is likely that a number of components will offer themselves as potential candidates for outsourcing. These might include:

- printing of questionnaires and other field documents/material
- recruitment and training of field staff
- publicity campaign
- translation of field materials into other languages

- delivery and/or collection/return of questionnaires/field documents
- design and provision of questionnaire tracking system
- provision of mapping services
- primary data capture and coding
- questionnaire destruction
- provision of call centre/telephone help line
- design and provision of online response technology
- online/web access design for outputs
- data storage
- data editing and/or imputation
- quality assurance
- evaluation

37. Many of these activities will, of course, be less relevant to those countries that carry out a full register-based census, in which the opportunities for effective outsourcing are clearly much reduced — if one considers that the creation and maintenance, by external agencies, of the registers from which the census information is extracted, is not "outsourcing" in the generally accepted meaning of the concept.

38. The decision to outsource will depend on the requirements of the census agency, whether the skills are available in-house and the ability of the census agency to manage complex system development projects. Total outsourcing might seem at first to be a simpler process to manage. However, it is unlikely that a census agency will choose to outsource the total solution to the census operation, but rather identify discrete components of the system that involve a combination of outsourced components, different external service providers working as contractors on specific projects, and in-house developments. Nevertheless, there will be advantages if several linked activities are provided by a single contractor; for example, the technical requirements for the printing and scanning of the questionnaires are so closely inter-related that a single contractor to provide both services would seem to be a prerequisite.

39. A clear understanding of requirements is needed before any contracts can be tendered so that these can be specified unambiguously to the contractor. These include understanding the objectives of the project, the outputs to be achieved and the standards these outputs must meet (quality, timeliness, cost), and confidentiality and public sensitivity issues. Specifications must allow for the possibility of requirements changing over the lifetime of the project. How these changes are agreed and approved by the census agency and the provider need to be determined and managed.

40. Timetabling, including milestones for key deliverables linked to payment schedules, needs to be agreed with the contractor. Regular monitoring on a routine basis needs to be undertaken at an operational level. In addition, processes should be established to allow senior staff to monitor progress and to deal with any major issues that cannot be resolved at the operational level.

41. A mixed approach to systems development is one in which the overall system may consist of outsourced systems, systems developed by external contractors working alongside census agency staff and systems developed in-house. This approach can have many advantages such as greater flexibility to adapt systems as more is learned through the systems development, systems testing program and actual census processing operations.

This can lead to improved data quality and savings in processing costs as systems are optimised. However, census agencies will need to be aware that, for such an approach, management becomes much more complex. The census agency must be skilled in the management of complex projects, have a clear understanding of business processes and manage carefully the integration of both the technological and clerical processes. Team-based working, where external contractors work very closely with census agency staff is essential, if this method of systems development is to be successful.

42. Throughout the overall process, activities should be conducted by a method that can best meet the requirements of users (with regard to the accuracy and timeliness of the results) and reassure the general public on matters relating to confidentiality and data protection. Indeed, it is important that no part of the outsourced operations should be done by a method that may result in loss of trust of the general public. So, in judging the propriety of contracting out, it is recommended that census agencies should carefully consider the following criteria:

(a) strict protection of data confidentiality.

(b) method of confidentiality assurance that satisfies the general public.

(c) guaranteed measures of quality assurance.

(d) ability to manage and monitor the outsourced census tasks/activities.

(e) control over the core competence of the national statistical office.

43. Confidentiality assurance is perhaps the first foremost issue that has to be considered, rising above cost and efficiency. National statistical offices are responsible for data confidentiality, in terms of both reality and perception. Consequently, contracting out of tasks that pose an actual or perceived risk to security of data confidentiality risk should be avoided. For example, for any the data collection or processing operations carried out by external suppliers safeguards should be put in place to ensure that there strict protection of confidentiality. The contracting out of such services should be carefully considered so that public trust and confidence in the census is not eroded. Where, for example, temporary enumeration staff are engaged under contract, this should be done in such a way that they are subject to strict measures of monitoring and control by the census agency. These enumeration staff should be engaged in such a way that their activities are governed by the relevant statistical legislation to preserve the confidentiality of the data they collect.

44. Another key issue to be considered in outsourcing is the quality assurance that should be guaranteed. A key point is that the census agency must be satisfied that the goods or services paid for are provided to an agreed and acceptable standard. in this respect, cost should not be the first priority in considering and judging the successful bidder. Although it is desirable to engage in fair competition among several companies to reduce costs, the census agency must be aware that merely considering low price bidding as a determining factor may adversely affect the quality of the service provided by the successful bidder. Low quality work could cause as significant a loss of trust among the user and general public as would the risk to confidentiality.

45. To assess the quality of work, as part of the contract allocation process, potential contractors should be required to provide samples of their work or to list referees who could be contacted to verify their claims and/or sites at which previous work can be inspected. Once the contract has been awarded, continuous monitoring of the progress of work entrusted to the selected company is necessary and the census agency should ensure that a system for monitoring quality is built into the contract.

46. Further discussion of the issues to be considered in outsourcing, and in the evaluation of software and hardware can be found in the *Principles and Recommendations*

for Population and Housing Censuses, Revision 2, United Nations, New York, 2008, and the *Handbook on Census Management for Population and Housing Censuses*, United Nations, New York 2001.

V. Census Confidentiality and Security — main results of the survey

A. Introduction

47. Recently, an online survey on national census practices was held among the UNECE countries. Now that most of these countries have completed this survey we can analyse the results. The seven questions on security, confidentiality and disclosure control are discussed in the seven next sections in which conclusions based on the information now available are drawn.

B. Question on national legislation

48. In all countries the security and/or confidentiality of personal census information seems to be protected by national legislation.

C. Question on a formal policy

49. Most countries have answered to have a formal policy and/or strategy for ensuring the security and confidentiality of personal census information. Seven countries replied that this policy was not public. Seven countries gave more detailed information as a comment to explain their situation. Only Georgia replied not to have such a formal policy and/or strategy. However, Georgia will not conduct a Census until 2014.

D. Question on access of personal census information or microdata

50. In about half of the countries personal census information or microdata is made accessible to persons outside the NSI for the purpose of scientific or statistical research while it remains closed to public inspection. Nineteen countries gave comments, mainly on the conditions or restrictions of the access given.

51. There is a large difference between countries with different Census methodologies regarding the access of personal census information or microdata. From table 8 we learn that in most countries with a traditional Census no access is given whereas in most register-based countries access is given. Countries with a combined Census take up a middle position: five of these countries give access and five of these countries do not give access.

Table 8
Access of personal census information or microdata

Is personal census information or microdata, ever made accessible to persons outside the National Statistical Institute for the purpose of scientific or statistical research while it remains closed to public inspection?	*Count (row total)*	*Count combined Census*	*Count register-based Census*	*Count traditional or rolling Census*
Yes	26	5	8	13
No	24	5	1	18

E. Question on imposing safeguards

52. If the question on access of personal census information or microdata was answered positively, an additional question was asked on imposing safeguards to protect the security and confidentiality of closed personal census information and/or microdata that is accessed for the purpose of scientific or statistical research. All countries that were asked this question indeed imposed such safeguards. In addition the United States mentioned in a comment that this is due to their information technology security policies and procedures. All their employees must take an oath to protect individual responses from disclosure and take annual refresher training.

F. Question on measures to protect the statistical confidentiality

53. Most countries take measures to protect the statistical confidentiality of published output from the census. Post-tabular methods are more popular than pre-tabular methods in this respect. One should realise that in a European census context the consistency of the census tables and their protection could get lost in case pre-tabular methods are applied differently for the national and European results. A similar question on protection measures posed last year by Eurostat to European countries showed a number of countries that had not taken final decisions on the precise way of protecting their census tables. In a new survey by Eurostat this year still the majority of the countries did not indicate that they had made a final decision on the protection of their Census tables. That was also indicated in the comments given on this question.

54. There is a remarkable difference between the countries of the European Economic Area (EEA) and non-EEA countries when it comes to protection measures. From table 9 we learn that in the EEA countries using post-tabular measures only is the most popular option whereas in non-EEA countries using both pre-tabular and post-tabular measures is the leading approach.

Table 9
Measures to protect the statistical confidentiality

Do you take measures to protect the statistical confidentiality of published output from the census?	*Count (row total)*	*Count EEA countries*	*Count non-EEA countries*
Yes, pre-tabular measures only	8	7	1
Yes, post-tabular measures only	17	13	4
Yes, both pre-tabular and post-tabular measures	21	9	12
No	2	0	2

G. Question on kind of protection measures

55. It is interesting to see what measures countries plan to take to protect the statistical confidentiality of published output from the census. Restricting the number of output categories into which a variable may be classified in any table implies introducing global recodes and is the most popular (post-tabular) method. Global recodes are often applied on the age variable, but could be applied to any census variable. Applying minimum population and/or household thresholds for outputs for small areas are also mentioned by many countries. When it comes to modifying the data the method of cell suppression is the most popular one.

56. In table 10 some more information is given on the kind of protection measures. From this table we learn that there is not much difference between EEA and non-EEA countries when it comes to the kind of protection measures taken. Some countries have indicated cell suppression (or another method to modify the data) without indicating that this method modifies the data. This explains why the number of countries applying a technique to modify the data can be higher than the number of countries modifying the data.

Table 10
Kind of protection measures

What measures do you take to protect the statistical confidentiality of published output from the census?	*Count (row total)*	*Count EEA countries*	*Count non-EEA countries*
Restricting the number of output categories into which a variable may be classified in any table (such as aggregated age-groups)	36	23	13
Applying minimum population and/or household thresholds for outputs for small areas	33	19	14
Modifying the data in one or more ways (Indicate all that apply)	22	17	5
Rounding	9	7	2
Record swapping	6	4	2
Over-imputation	2	0	2
Small cell adjustment	2	2	0
Cell suppression	18	12	6

H. Question on independent review

57. The majority of the countries did not commission an independent review or reviews of the measures taken to protect the physical security and/or statistical confidentiality of census information. In case such a review exists it is normally not published. However, Greece answered that a Security Policy Study is to be submitted by the end of 2013. Within the framework of this Study, there will be an evaluation of the current security policy, realization of a system penetration test and, finally, vulnerability assessment. At the same time, a thorough contingency plan is to be implemented. This will include multiple physical disaster scenarios, providing the respective solutions, taking into account the importance of statistical data and the available back-up systems, for all the statistical surveys, including the census.

Annex

Detailed responses to survey questions on innovation

Question 2.1: Which aspects did you innovate on?

1. Ten countries provided open responses made in the comment field, as follows:

- Response from the Netherlands (EU, Register Based method):
  - For the 2011 Census we used more register data and less survey data than for the 2001 Census. To estimate more detailed tables extra methods were developed.
- Response from Georgia (Non-EU, Traditional method):
  - Will be identified after conducting of census.
- Response from Greece (EU, Traditional method):
  - It was conducted in the course of 15 days, while previous censuses were conducted in one day
  - A large Post-Enumeration Survey for the 2011 Population-Housing Census was conducted on a large and representative sample of households
  - The selection of the enumerators and the chiefs of the census sectors ("sectionists") for the conduct of the 2011 Censuses was done through transparent procedures and according to meritocratic criteria
  - The survey questionnaires were designed in a manner enabling their reading by a system of optical character reading
  - The use of Google maps.
- Response from Hungary (EU, Traditional method):
  - Online monitoring system for many aspects of the field works.
- Response from Ireland (EU, Traditional method):
  - Interpretative reports with graphs, maps, charts created enormous public value. Used as address register for the first time.
- Response from Latvia (EU, Traditional method):
  - Data collection: electronic questionnaire and laptop technology.
- Response from the Republic of Moldova (Non-EU, Traditional method):
  - Housing census will be carried out for the first time; as well as use of Geographic Information Systems (GIS) for dissemination of census data.
- Response from the Russian Federation (Non-EU, Traditional method):
  - Create a bank of electronic addresses and automatic division of the territory into census areas.
- Response from the United Kingdom (EU, Traditional method):
  - Development of purpose built address register
  - Mail out of questionnaires
  - Form Tracking system with use of bar codes

- Outsourcing recruitment and training of field staff
- Online response option
- New questions on: national identity, citizenship, language, civil partnership, date of entry into the United Kingdom and length of intended stay, second address, number of bedrooms, and type of heating
- Online data visualization.

- Response from the United States (Non-EU, Traditional method):
  - Handheld data collection refers to the address canvassing operation, not enumeration.

Question 2.2: What aspects are you considering innovations on for your next (2020 round) census?

2. Seven countries provided open responses made in the comment field, as follows:

- Response from Switzerland (Non-EU, Combined method):
  - Switzerland carries out an annual census. We plan on continuing and innovating with the current system beyond 2020.
- Response from Denmark (EU, Register Based method):
  - We will also use administrative registers in 2020.
- Response from the Netherlands (EU, Register Based method):
  - Some variables that appear in both surveys and incomplete registers could possibly be estimated more accurately by better combining these sources.
- Response from Canada(Non-EU, Traditional method):
  - Timelines.
- Response from Georgia (Non-EU, Traditional method):
  - Will be identified after conducting of census.
- Response from Ireland (EU, Traditional method):
  - Answers refer to over and above what we did in 2011.
- Response from the United Kingdom (EU, Traditional method):
  - Innovations will depend on methodology selected. Consideration is being given to a move away from a wholly traditional field enumeration.

Question 2.3: What is driving the potential introduction of innovations for your next (2020 round) census?

3. Five countries provided open responses made in the comment field, as follows:

- Response from Switzerland (Non-EU, Combined method):
  - Continuous innovation and optimization.
- Response from Georgia (Non-EU, Traditional method):
  - Will be identified after conducting of census.
- Response from Ireland (EU, Traditional method):

- Customer expectations of internet being available; fit in with Irish eGoverment strategy.

- Response from Italy (EU, Traditional method):
  - Make census data available yearly.
- Response from the United Kingdom (EU, Traditional method):
  - Make population data available more frequently.