



TWINNING CONTRACT

CRIS 2015/370-467



Support to the Israeli Central Bureau of Statistics in Improving the Quality of Official Statistics

MISSION REPORT

on

Component D

**Methodological and geo-spatial tools for
improving the quality and efficiency of field surveys**

Activity D.3

**Assessment mission - Managing and monitoring field surveys
during the collection process using geo-spatial tools**

Implemented by

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Jerusalem

11-14 July 2016

Version: Final

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List of Abbreviations

BC	Beneficiary Country
DST	Statistics Denmark
CSO	Central Statistical Office – Statistics Poland
CAPI	Computer-assisted personal interviewing
CATI	Computer-Assisted Telephone Interviewing
CAWI	Computer-Assisted Web Interviewing
CAII	Computer-Assisted Internet Interviewing
CxI	Common name for all above methods of data collection
PAPI	Paper-Assisted Personal Interviewing
EU	European Union
GIS	Geographic Information System
ICBS	Israeli Central Bureau of Statistics
IT	Information Technologies
MS	Member State (of the EU)
ToR	Terms of Reference

Executive Summary

The overall purpose of this activity was to present and discuss optimal management of the fieldwork in real time by using geo-spatial tools. The goal was not only to achieve high response rates, but also to identify under-coverage areas and nonresponse in the midst of data collection and reallocate resources for optimal treatment of under-coverage and nonresponse. In addition, the experts also revisited and discussed the recommendation and outcome from the previous mission on optimization of management and monitoring of multi field surveys.

Presentation of organizational solutions for interviewer network in both the Israeli Central Bureau of Statistics (ICBS) and the Central Statistics Office of Poland (CSO), despite the differences in the scale of the research, pointed to the many similarities that allow for the formulation of valuable proposals for further work aimed at optimizing the organization of surveys. Polish experiences associated with the implementation of previous censuses as well as intensive use of GIS technology at all stages of the statistical production process was met with great interest by the ICBS. Attention is paid to the differences in the size of the interviewer network resulting from population size and the scope of research representations. In the previous mission (D1) experts assessed the differences between the solutions of Statistics Denmark (DST) and the ICBS. Under the current mission a review of these arrangements was carried out in connection with the possibility of comparing them to a much larger network of interviewers and scope of the research conducted by the Statistics Poland (CSO). Finally ICBS can compare their solutions to organizational studies carried out by e.g. Statistics Denmark as well as an organizational solution on a larger scale introduced by the Polish Statistical Authority. This provides a solid foundation to formulate reliable conclusions regarding the possibilities for improving the effectiveness of the interviewer network of the ICBS, in particular in the use of components of GIS for monitoring and management of the interviewer network in ICBS.

With respect to the five main differences outlined in mission D1 report the list was, based on input from the Polish expert, updated as listed below:

1. At the Central Statistical Office of Poland (CSO) drawing of sample units are done centrally but workload allocation to individual interviewers is decentralized in 16 regional Centers. At DST similarly but decentralized in 3 regional Centers. At the Israeli Central Bureau of Statistics (ICBS) both drawing of sample units as well as workload allocation is performed centrally. At DST, allocation of workload is based on addresses and at ICBS, workload allocation is based on geo-codes (x,y coordinates) whereas at the CSO allocation is based on geocoded addresses containing x,y coordinates.
2. At the CSO interviewers work simultaneously on multiple surveys in sixteen geographical areas on the basis of Full Time Employment (FTE) and with supporting staff (including supervisors and controllers) for each of the sixteen areas. At DST interviewers work simultaneously on multiple surveys in three geographical areas and with one full time supervisor for each of the three areas. At the ICBS interviewers usually perform interviews only on a single survey. Each survey is managed by up to 12 supervisors located at three Data Collection Centers, each with its own geographical domain.

3. CSO has about 960 permanent interviewers on the base of FTE whereas DST has about 250 part time field interviewers and the ICBS has about 300 part time employees working up to 80 hours per month as interviewers..
4. CSO has a stable employment system based on a full time work relation between the interviewers and the CSO. The stable employment system in Poland provides a relatively easy and simple opportunity for planning and managing of workload allocation. At the ICBS, the remunerating system for interviewer is based on working hours including time travel by the individual interviewer. At DST, the remunerating system is based on distance traveled and performance. The differences between the remunerating systems in the three countries are partly based on national legal requirement for employment.
5. Neither the CSO nor the ICBS operate in the commercial market for interviews, whereas this is the case for DST. CSO doesn't use any other administrative or educational institutions for data collection.

Findings:

1. The main objective of the mission was to discuss the basic conditions necessary to build a spatial data infrastructure in the ICBS allow for the construction of a system for monitoring and managing network interviewers with the support of GIS tools.
2. It was found that the ICBS have advanced thoughts and ideas on the issue of the use of GIS tools for monitoring and management of network interviewer.
3. Administrative data used in the ICBS for samples contains addresses connected to geo-data which allows the construction of spatial databases. Exact x,y coordinates can be found for 74.5% of the addresses in the Central Population Register and for 79% of the addresses in the Dwelling register. Most of the remaining addresses can be connected to a geographical polygon.
4. It was noted that to enhance the credibility and effectiveness of the GIS system to support monitoring and management of the interviewer network it is important to improve the accuracy and adequacy of the data address, especially in the proper spatial location through precise determination of the appropriate x,y coordinates to the address points. Monitoring and managing of the field activities of interviewers/enumerators without precise x,y coordinates is not regarded as satisfactory for an active point positioning strategy and a need for responsive monitoring and managing during field operations. Furthermore, mixing point base localization with polygon positioning is very difficult for GIS because it needs different strategy of linkage data and several different IT tools.
5. It is recommended by the experts that statistical data are collected by interviewers using a tablet equipped with GPS receiver, which allows the correct location of address points of data collection. Tablets also provide data transmission to and from the mobile device, which allows the construction of an effective on-line system for supporting interactive management of interviewers in the field work with the usage of GIS tools. However, presently the ICBS is only planning to use tablet in the upcoming census not in surveys. Field surveys data will be are collection with laptops or on paper with no built-in GPS system. The laptop is not connected to the internet in the field and ICBS have no plans of changing that due to data security issues. Batch transmission of data is done once or twice a day by the interviewer.

6. In the MS experts opinion, the ICBS staff has the necessary knowledge and experience that enables the IT departments to build a relatively simple tool independently that will allow to present the necessary phenomena on maps based on data collected in spatial databases and makes spatial decisions for survey management using getable GIS tools (like COLLECTOR and SURVEY123 applications of the ArcGIS packet from Esri).

7. The necessary condition to build the right IT tools is a precise functional requirements for this tools expected by the ICBS Survey Department for reallocation of the interviewers tasks based on geospatial presentation of the maps. This implies the need for good cooperation between the data collection department and the IT department. During mission D3, it was found that such willingness for cooperation exists in ICBS and should be further nurtured.

8. Reviewed process of changes in the organization of field works in the direction of change in the profile of interviewers and controllers from one-tasking profile into multi-tasking profile with the possibility of handling in the territory several surveys simultaneously. By spatial grouping selected samples from several surveys (supported by GIS tool) it will be possible to optimize traffic interviewers in the field and, consequently, increase the efficiency of field operations regarding data collection (more surveys at lower cost travel). To empower efficiency also considered extension of working hours from 5 to 7 (or 8) hours.

9. It was agreed that the implementation of GIS solutions to monitor and manage the network of interviewers will take place step by step and implementation will precede the necessary pilot actions carried out by the ICBS.

10. The selection of interviewees is done with a two-stage selection. A number of smaller units are selected in the first step. Their definition may depend on the specific study (statistics office or administrative unit). A number of persons or households in the selected administrative units are selected in the second step. This means that the selected administrative units are the basically building blocks in an optimal allocation of interviewees for the interviewers. Specifically, could the following process be supported in GIS solution:

- Selected administrative units can be divided into smaller units (building blocks), e.g. if there are large. For example 8-10 interviews. Or because of different restrictions.
- When the new building blocks are defined, the GIS tool optimized the distance from their centers to interviewers residence. Possible weights, besides the distance, could here be the numbers in building block or accessibility. In this process, blocks are put together, which together provide the minimum distance to interviewers, when accepting a normal working loud for the interviewers.
- There may be different restrictions on the allocation e.g. languages, religion or the concrete survey. These restrictions may result in the best solution not is the one with the shortest possible distance, but a little longer. These restrictions must be included in the allocation process, and there consequences estimated.

Challenges:

During mission D3, the experts and the ICBS staff examined issues related to the greater participation of relevant MS GIS experts (it was mentioned in mission D1 as the main challenge) due to the limited competence of the Danish experts in this area. Now it seems that the inclusion of an expert from CSO proved to be the right action because it provides the appropriate knowledge and skills expected by the ICBS. An issue to further consider is the

necessity of future participation of additional MS experts (programmer level) for support on the technical construction of IT tools and GIS implementation by the IT department of the ICBS. However, this will depend on the accuracy of the description of the functional requirements for the monitoring & management system developed by the Survey Department supported by the IT department as well as the expectations of ICBS in this regard.

1. General comments

This mission report was prepared as part of the Twinning Project “Support to the Israeli Central Bureau of Statistics (ICBS) in Enhancing the Quality of Official Statistics”. This was the second mission devoted to managing and monitoring field surveys during the collection process using geo-spatial tools within Component D: Methodological and geo-spatial tools for improving the quality and efficiency of field surveys.

The overall purpose of this activity was to present and discuss optimal management of the fieldwork in real time by using geo-spatial tools. The goal was not only to achieve high response rates, but also to identify under-coverage areas and nonresponse in the midst of data collection and reallocate resources for optimal treatment of under-coverage and nonresponse. In addition, the experts also revisited and discussed the recommendations and outcomes from the previous mission on optimization workload allocation.

The main activities of the mission were:

- *ICBS presented the current situation and tools for the managing and monitoring field surveys, including geo-spatial tools.*
- *MS-experts presented EU / MS experience on the same issues focusing on using GIS tools*
- *MS and ICBS staff discussed and defined various managing and monitoring tools for field surveys during the collection process using geo-spatial tools*

The position analysis assisted the ICBS and the Twinning Project experts in getting an overview of the present situation regarding the use of geo-spatial tools.

MS experts presented the background and the strategy behind their planning of field surveys, sampling, and the allocation of workload to interviewers using geospatial tools.

The position analysis thus established the current state of play regarding planning and sampling of field surveys using geo-spatial tools.

Furthermore, based on conclusions from the first activity the experts revisited the decision to use only GIS as a tool for optimization for management and monitoring of field surveys since other initiatives may provide more gains for a smaller effort.

The experts would like to express their thanks to all officials and individuals met for their kind support and for the valuable information they provided, which highly facilitated the experts work.

The views and observations stated in this report are those of the consultants and do not necessarily represent the views of the EU, the ICBS, Statistics Denmark or the Central Statistical Office of Poland.

2. Assessment and results

All of the foreseen activities were carried out following the plans in the ToR; cf. *Terms of Reference (Annex D3 - 1)*. Outcomes were favorable, and results and conclusions are described in the following section.

ICBS presented:

- *Introduction to Survey Department*
- *Introduction to Component D and Activity D3*
- *Future Planning for GIS & GPS Tools in Upcoming population Census*
- *Current Situation methodologies and IT-tools for managing and monitoring field work (Dwelling surveys)*
- *Current Situation Methodologies and IT-Tools for Managing and Monitoring Field Work (Individuals and Households Surveys)*
- *GIS' Tools Usage in Surveys*

The MS experts presented:

- *Introduction to Field Surveys in Poland*
- *Methodologies and IT-Tools for Managing and Monitoring Field Work using Geo-spatial Tools and Other IT-Tools for Monitoring*
- *Design and Usage of GPS, GIS and Handheld Devices Supporting Interviewers Work within the Field*

2.1 Current situation at ICBS assessed

ICBS had prepared comprehensive presentations providing the experts with an overview of the current situation for field surveys at the ICBS. In parallel some of the challenges that ICBS find most significant were highlighted (Please find uploaded presentations at www.dst.dk/israel).

2.1.1 Organization and responsibility

The organization, position in ICBS and duties of the Survey department was described in the Mission D3 report (<http://www.dst.dk/ext/6262144215/0/israel2016/D1-Mission-report-D1--pdf>).

2.1.2 Methods of data collection

Field surveys in the ICBS are performed by face-to-face interviews either by using a tablet or laptop computer – CAPI or by data collection using paper questionnaires in the case of the Household Expenditure Survey - PAPI. Currently, intensive work on increasing the share of data collection by telephone interviews based on Call Centers is conducted - CATI method. Also a broad introduction of interview via Internet is planned – CAWI method.

In the last three cases, it is essential to link the address data with the x,y coordinates to the correct location of the data collection points in the territory (an address points localization). This will allow proper updating of the spatial statistical databases and hence efficient channel management (CAxI) supported by a common system management of data collection supported by GIS tools - multichannel system management for data collection. The

integration of all data containing x,y coordinates obtained from several channels of data collection is essential to reduce the burden of the interviewers' network and proper interactive management of interviewers in the field work with usage of GIS tools.

2.1.3 Main contrast between collection of field survey data at DST and ICBS

On the basis of the information presented by experts from the ICBS and the CSO during the mission D3 a table of the basic parameters of the survey systems in Israel, Denmark and Poland has been updated with information about Poland as well as information on monitoring field surveys during the collection process. Table1 list the main differences between collection of field survey data at DST, ICBS and CSO.

Table 1: Main differences between collection of field survey data at ICBS, DST and CSO

	ICBS	DST	CSO
Basic information			
·Number of field surveys per year	50	50	92
·Number of interviews per year	50.000	30.000	1.500.000
Staff members and interviewers dedicated for field survey			
·Central Staff	6	1	3
·De-central staff (Region, domains)	35	3	330
·Field Interviewers	300 part time employees ~ 100 full time persons per year	250 (part time) ~ 30 full time persons per year	960 full time persons
Remunerating system for interviewers	Based on time	Based on performance	Based on Full Time Employment
Methods			
·Workload allocation	Central – based on geo-coding	Decentral – based on addresses	Central – based on geo-coding addresses
·Multi/single survey workload	Single	Multi	Multi
·Allocation based on	Geo-codes	Addresses (zip codes)	Geo-codes
Monitoring			
·Frequency of data collection monitoring	Daily	Daily	Real time
·Output format of summary reports	Tables	Tables	Tables and maps
·Units for monitoring	Interviewer and statistical/geographical area	Interviewer	Interviewer and statistical/geographical area

Although cross national comparisons of *effectiveness* e.g. by calculating the average number of completed interviews per full-time interviewer pr year is difficult due national differences remunerating system.

However, as shown in Table 1, DST receives close to 1000 interviews per full-time interviewer, CSO receive 1562 interviews per full-time interviewer and at the ICBS receives approximately 500. Even though such a comparison does not take the type of survey e.g. personal or household survey, with or without census or length of the interview into account, there seems to be a significant difference between the countries. The differences might partly be explained by number of working days per year for a full time employee, differences in the national calculations of full-time interviewer, travel obstacles etc. Nevertheless, the organizational structure and work flow may also play a role and call for further investigation.

2.1.4 Geocoding and spatial databases

Address data and statistics collected by the CBS contains the x,y coordinates which allows the construction of spatial databases (the spatial address database and spatial statistical database) for management and analysis. Spatial databases allow multidimensional statistical spatial analysis thus providing added value to the official statistics. New data as a result of the synergies coming from linking statistical data with spatial data will enable the discovery of new statistical phenomena which are not available through the traditional approach to data analysis.

2.1.5 Capacity and capability

The ICBS has advanced thoughts and ideas concerning the use of GIS tools for monitoring and management of the network of interviewers. The professional staff of ICBS has the necessary knowledge and experience that allows the IT departments to independently build IT tools that can present the necessary phenomena on maps based on data collected in spatial databases and makes spatial decisions for survey management using gettable GIS tools like application COLLECTOR and SURVEY123 of the ArcGIS from Esri rce).

2.1.6 On-Line network supporting Monitoring and Managing system

In several statistical institutions data is currently widely collected by interviewers using a tablet equipped with a GPS receiver, which allows them correct localization of address points of data collection. Tablets also provide data transmission to and from the mobile device, which allows the construction of an effective on-line system for supporting interactive management of interviewers in the field work with usage of GIS tools. Exact x,y coordinates can be found for 74.5% of the addresses in the Central Population Register and for 79% of the addresses in the Dwelling register. Most of the remaining addresses can be connected to a geographical polygon.

However, presently the ICBS collect survey data by means of laptop with no built in GPS receiver or by paper forms. The ICBS is only planning to use tablets in the upcoming census but not in not in any other surveys due to data security issues. Batch transmission of data is done once or twice per day by the interviewer.

Nevertheless, the spatial databases operated by ICBS still contain sufficient data for the spatial analysis to support the monitoring and management of interviewers in the field. On such basis an application for an effective management of field works can be developed.

Taking into account capacity and capability of the ICBS staff such development and preparation of IT/GIS solution could be done in house. If necessary cooperation with commercial companies and telecommunication operators could be favorable.

3. Conclusions and recommendations

Geo-spatial tools can support field surveys from the early stage of sample design up to the dissemination phase. Geo-spatial technologies can support the identification and analysis of regional under-coverage, and enable rapid reaction and handling of problematic "hot spots ". These recommendations are intended to identify solutions regarding fieldwork management and monitoring. In addition, they can be helpful for the daily management of field interviews concerning data collection performed and combined in several surveys by the same interviewers. Introducing GIS technology into the management of the local response rates should be done by grouping (spatially aggregated) of specific statuses of address points identified by x,y coordinates creating new polygons, in order to be able to address region-specific problems like difficult to interview hot-spots areas.

After identifying under-coverage areas and pockets of nonresponse it is possible to reallocate resources for their optimal treatment. It can all take place in real time if tablets with built-in GPS device are used and if not nearly real time, it does all depend on an efficient system of communication between the interviewer's devices. The use of a CPU for exchange of steering data and statuses containing x,y coordinates of an enumerator is recommended if and allocated to the interviewer address points for data collection. By combining data collection for various surveys while taking into account their respective constraints it will be possible to optimized planning and allocation of workload units to interviewers, to reduce travelling time and increase data collection time.

Summary of Recommendations:

1. The ICBS aim for an on-line solution, which means real or **near real time** service for monitoring and management of interviewers work in field. They have necessary devices, skills in producing digital maps as well as good, communication between regional centers and interviewers. This is a key point if the ICBS will use CAPI together with CAWI and CATI in the same time.

The necessary condition in order to build the right IT tools is a precise description of functional requirements, for these tools are expected by the Survey Department for the reallocation of the interviewers tasks based on geospatial presentation of the maps.

2. The proper spatial location through precise determination of the appropriate x,y coordinates linked to the address points is crucial in order to improve the accuracy and the adequacy of the address data and to enhance the credibility and effectiveness of the GIS system supporting monitoring and managing of the interviewer's network during field operation.

3. Keep spatial data in the spatial databases (address and statistical data containing x,y coordinates) in the highest possible quality. The "Good enough" policy is acceptable.

4. Keep boundaries of statistical units and cells in the highest possible quality. The "Good enough" policy is also acceptable.

5. Updated spatial databases are a crucial basis for monitoring and management of the field operation and for all supporting GIS applications.

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6. GIS applications fully rely on good quality spatial data and the added value comes from a different presentation (on maps) of data, where they already exist in the database. Spatial analysis and data processing are also possible without GIS applications.
7. GIS applications are only supporting tools and never replace proper actions taken by a good qualified controller or dispatcher.
8. Bidirectional tele-communication between the center and the interviewers is critical conditions for establishing an efficient monitoring and managing system.
9. The frequency of information exchange between the central unit and interviewers depends on the information needs of controllers, dispatchers and senior management, and should be determined by ICBS.
10. Precisely description of functional requirements for IT/GIS applications is needed. A good dialog between the Survey Department - and the IT Department is crucial.
11. Good cooperation between the data collection Department and the IT Department is needed and should be further nurtured e.g. by establishing a working group surveyed by a Steering Committee.
12. The ICBS is recommended to develop the IT/GIS applications by in house – they have highly qualified staff with necessary knowledge and capability to do it. Be brave!