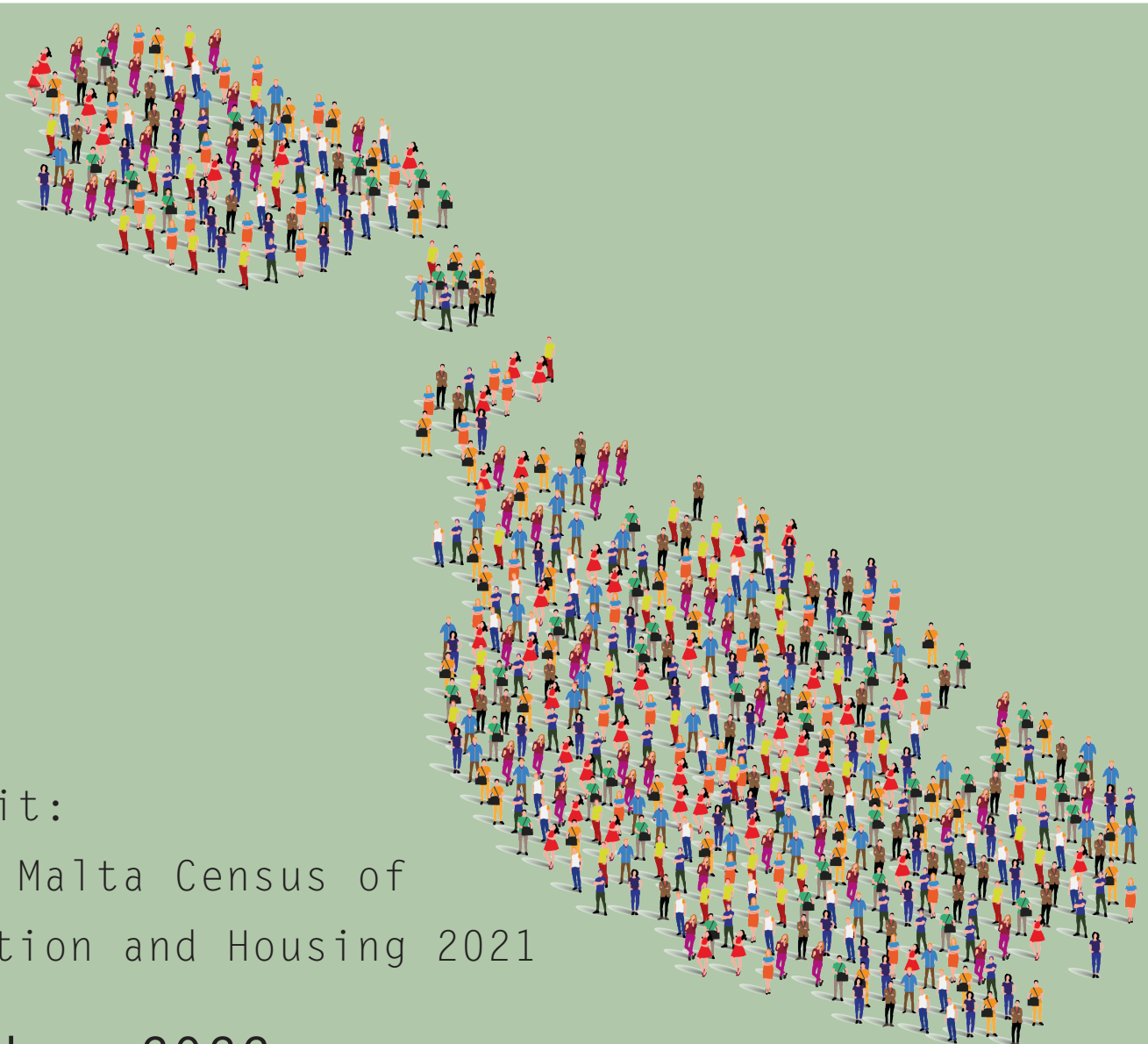
N A O
National Audit Office
MALTA



IT Audit:
Online Malta Census of Population and Housing 2021

December 2022

N A O
National Audit Office
MALTA

Information Technology Audit
Online Malta Census of Population and Housing 2021

Report by the Auditor General
December 2022

Table of Contents

List of Tables

List of Figures

List of Abbreviations

CAPI	Computer Assisted Personal Interviewing
CATI	Computer Assisted Telephone Interviewing
CAWI	Computer Assisted Web Interviewing
CBS	Central Bureau of Statistics
COBIT	Control Objectives for Information and related Technology
CT	Call for Tenders
DM	Data Management
EC	European Commission
EU	European Union
ISACA	Information Systems Audit and Control Association
IT	Information Technology
LAN	Local Area Network
MITA	Malta Information Technology Agency
MQ	Methodology and Quality Unit
MS	Microsoft
MS SQL	Microsoft SQL Server
NAO	National Audit Office
NSO	National Statistics Office
PAPI	Paper Assisted Personal Interviewing
UNECE	United Nations Economic Commission for Europe
VPN	Virtual Private Network

Glossary

Base Registers	A base register is a statistical register of great importance for the whole register system of a statistical office. The function of base registers is typically to keep stock of the population at any given time. In addition, they have to maintain identification information to be used by other sources. (Eurostat)
Blaise[1]	Blaise is a computer-assisted interviewing and survey processing tool developed by Statistics Netherlands. It is used for the production of official statistics.
CAPI	A method of data collection in which an interviewer uses a computer to display questions and accept responses during a face-to-face interview. (United States Bureau of Census)
CATI	A method of data collection by telephone with questions displayed on a computer and responses entered directly into a computer. (United States Bureau of Census)
CAWI	An Internet surveying technique whereby the respondent can choose a convenient time to complete an online survey. Respondents' answers are saved in a database.
Census	A census is the complete enumeration of a population or groups at a point in time with respect to well defined characteristics: for example, population. (UNECE)
Census Working Group	A group composed of representatives from EU National Statistical Offices and coordinated by Eurostat.
Combined census	A census in which some information are taken from administrative data sources held for non-statistical purposes, and other information, that is not available from such sources, is collected directly from individual persons and households by means of full or partial field enumeration or from other sample surveys. (UNECE)
Dwelling	A dwelling is a room or suite of rooms- including its accessories, lobbies and corridors- in a permanent building or a structurally separated part of a building which, by the way it has been built, rebuilt or converted, is

[1] https://blaise.com/products/general-information

	designed for habitation by one private household all year round. A dwelling can be either a one-family dwelling in a stand-alone building or detached edifice, or an apartment in a block of flats. Dwellings include garages for residential use, even when apart from the habitation or belonging to different owners. (EUROSTAT)
Endpoint management solution	Endpoint Protection solutions protect your corporate devices from malware, malicious applications, and investigate security incidents and alerts. These solutions allow administrators to manage all devices and perform investigation and remediation against threats.
Population Register	A population register is a register of permanent residents in a given country.
Record linkage	Record linkage refers to a merging that brings together information from two or more sources of data with the object of consolidating facts concerning an individual or an event that are not available in any separate record. (Handbook of Vital Statistics Systems and Methods, Volume 1: Legal, Organisational and Technical Aspects, United Nations Studies in Methods)
Register	A systematic collection of unit-level data organized in such a way that updating is possible. Updating is the processing of identifiable information with the purpose of establishing, bringing up-to-date, correcting, or extending the register, that is, keeping track of any changes in the data describing the units and their attributes. (UNECE)
Register-based census	A census in which the data on the numbers and characteristics of the population are derived from information taken from administrative data sources held for non-statistical purposes. No information is collected directly from individual persons or households. (UNECE)
Synchronisation	The transmission of data that was previously captured on a handheld device, to a central server.
Traditional census	A census based on the direct count of all individuals and the collection of information on their characteristics through the completion of either a self-completion or interview-based questionnaires, either in a paper or electronic format. (UNECE)

Executive Summary

The National Audit Office (NAO) embarked on the Information Technology (IT) audit of the 2021 Online Census reviewing the online component of the national survey. This included the evaluation of the planning and implementation phases of the Census, including the collection of data, data integrity and security, the technological challenges, and the costs of this project.

Key Findings and Recommendations

As noted in Chapter one, the NSO opted to conduct the 2021 Census using four data collection methods in parallel which included an online self-response questionnaire. This was the first time that such a method was used for a Census in Malta.

Chapter two deals with the project plan for the implementation of the 2021 Census and a review of the main project objectives, deliverables, allocated resources, budgets and timelines. The following are the key findings and recommendations included in the above-mentioned Chapter:

a. The NAO commends the local pilot studies and public consultation process adopted by the National Statistics Office (NSO) in preparation for the 2021 Census as well as the related feedback gathered from other countries.

b. The documentation showing how the technical specifications of the tablets procured for the 2021 Census were determined, was not made available to the NAO. Furthermore, these tablets were procured through an accelerated open procedure, which could have been avoided if the normal procurement process was started early enough.

c. Although the testing of IT tools was well recorded, the NAO was not given copies of formal test cases and sign-off documents. The NAO recommended that test cases are formalised, and test results are signed off.

d. The NAO observed that the selection process of Enumerators from among 1,800 applicants needed more attention. This Office recommended that in future, given limited available resources, the NSO should consider seeking the help of competent entities, to assess the IT skills of the applicants.

e. The NAO recommended that the NSO identifies and documents anticipated risks vis-à-vis future census projects, assigning a probability assessment for each risk, identifying possible impact and ways to manage these risks.

The following are the main recommendations included in Chapter three, which included a review of the 2021 Census website, the Census data collection IT software applications and approach adopted to communicate with the general public:

a. The NAO observed that the website was not clear in stating that the downloadable Census booklet was meant solely for participants who wished to familiarise themselves with the survey questions and this could lead to misunderstandings. Additionally, when the Census webpage is resized, the "Participate" button loses its position. This issue was encountered both in the English and Maltese version of the website.

b. Once the Census data collection period was over, online access to the questionnaire was discontinued. However, the webpage inviting the public to participate in the 2021 Census and the related "Participate" button remained visible. The NAO suggested that the website is updated and the "Participate" button is removed.

c. The requirements document for the development of the IT systems reviewed by the NAO was seen to define very high-level requirements and was not updated to reflect changes. Furthermore, documentation showing the monitoring of the implementation phase was not made available to this Office.

d. The NAO recommended that all Census IT systems' audit trails, copies of backup logs and evidence of data restores pertaining to the live Census database, are maintained and made readily available for audit purposes.

e. The NAO recommended that future plans for the procurement of one-off use hardware such as the tablets used in the 2021 Census, should include concrete plans for the continued use of such hardware once the survey is completed.

Chapter four of this report covers the key outcomes of the implementation of the option for online Census response submissions. The following is a list of the key findings and recommendations included in the above-mentioned Chapter of this IT audit report:

a. The NAO considered the 56% online submission rate as one of this project's success factors. However, the NAO recommends that the NSO analyses the distribution of online submissions and devise plans how to improve the percentage of online submissions further.

b. The NAO noted that the majority of serviced calls (35.9%) pertained to queries about the questionnaire and its contents. The NAO thus suggested that inbuilt help text is included with all data fields in future surveys.

c. The NAO strongly recommended that rather than issuing questionnaires to be filled in by the Census participants, the NSO should consider the use of administrative registers for Census data collection once it is ensured that the format and quality of data in administrative registers matches that required for the Census.

Chapter five included a comparative analysis of Census costs. The key finding and recommendation of this Chapter were:

a. The ICT investment made by the NSO which will cater for current and future survey needs, was commendable.

b. The NAO recommended that the NSO conducts a comparative analysis of actual costs of the 2021 (once these become available) and 2011 Census surveys.

Chapter six covered the lessons learnt and the following are the key findings and recommendation included in this Chapter:

a. The NAO commends the efforts made by the NSO to move towards having a register-based Census.

b. The NAO recommended that an inter-Ministerial committee is set up to oversee the move towards implementing a register-based Census and a population register.

Key Facts

Malta Census 2021

21 days

8 November - 28 November*

Duration of the data collection period

56%

Of respondents who opted to self-complete their forms online

1,091

Workforce for Census 2021 excluding call centre staff

31,668

Phonecalls serviced by the Helpdesk call centre

3.1M

Total cost of Census 2021

* In certain areas the duration of the data collection period was extended till the 18 December.

Chapter 1| Overview

1.1 Background

The Census of Population and Housing is a nationwide project held every ten years and is a comprehensive survey that aims to enumerate all residents and dwellings in Malta. The Census is a snapshot of the people residing in Malta and the dwelling stock at that point in time.

The legal basis is derived from the Maltese legislation namely Chapter 118, of the Census Act of 1948 and the Regulations of the European Parliament and Council.

In 2021, the Census in the EU was governed by the following five regulations of the European Parliament and Council:

- 763/2008 – This Regulation establishes common rules for the provision of comprehensive data on population and housing every ten years by the EU Member States.
- 2017/543 – The technical specifications of the classifications to be considered, topics and their breakdowns.
- 2017/712 – Establishes the programme of statistical data and the metadata for the Population and Housing Censuses to be transmitted to the Commission.
- 2017/881 – Implementing regulation (EC) No 763/2008 as regards the modalities and structure of the quality reports, and format for data transmission.
- 2018/1799 – Implementing regulation on the establishment of a temporary direct statistical action for the dissemination of selected topics of the 2021 Population and Housing Census geocoded to a 1 km^2 grid.

The 2021 edition was the eighteenth in a line of national Censuses conducted since 1842. The 2021 Census of Population and Housing was held on Sunday 21st November 2021, which is referred to as the Census Day/Night. From a Census technical aspect, this means that the Census data collected provides a snapshot of the local population and housing statistics as at midnight of 20/21st November.

The 2021 Census involved the survey of around half a million people living in private households and approximately 300 institutional households. The entire population, spread over 68 local councils, was evenly divided into 986 enumeration areas. Each enumeration area consisted of several streets or parts thereof in a locality, and typically encompassed an average of 220 dwellings. The enumeration areas were assigned to 990 Enumerators recruited purposely for the Census. These Enumerators were tasked with collecting the data directly from the households.

The execution of the 2021 Census marked the introduction of important innovations. In line with both Government and NSO policy, in promoting the adoption of environment-friendly measures as well as the automation of data collection, the 2021 Census was the first Census in which people could opt to fill in the questionnaire online. The plans to shift to a digital format took three years however, the COVID-19 pandemic made it an essential mode of submitting survey responses. Having an Enumerator visiting homes in person was an option that NSO wanted to avoid, in line with the guidance given by the Health Authorities.

All duties pertaining to the 2021 Census were carried out by staff at the NSO premises in Valletta and employees working remotely. The Call Centre services were handled by Centrecom Limited (Mosta).

1.2 Audit Scope and Objectives

Apart from being a large and complex program requiring the collection of information from the entire population of Malta, the 2021 Census also presented a new set of challenges with the introduction of online self-computed Census forms.

The scope of this IT audit was to review the online component of the 2021 Census. This review covered the evaluation of the planning and implementation phases, including the collection of data, data integrity and security, the technological challenges and the cost benefit analysis of this project. This undertaking also sought to identify any areas of possible improvements that are to be considered in the planning of the next Census. In this context, the audit identified various findings and made the necessary recommendations to mitigate these risks.

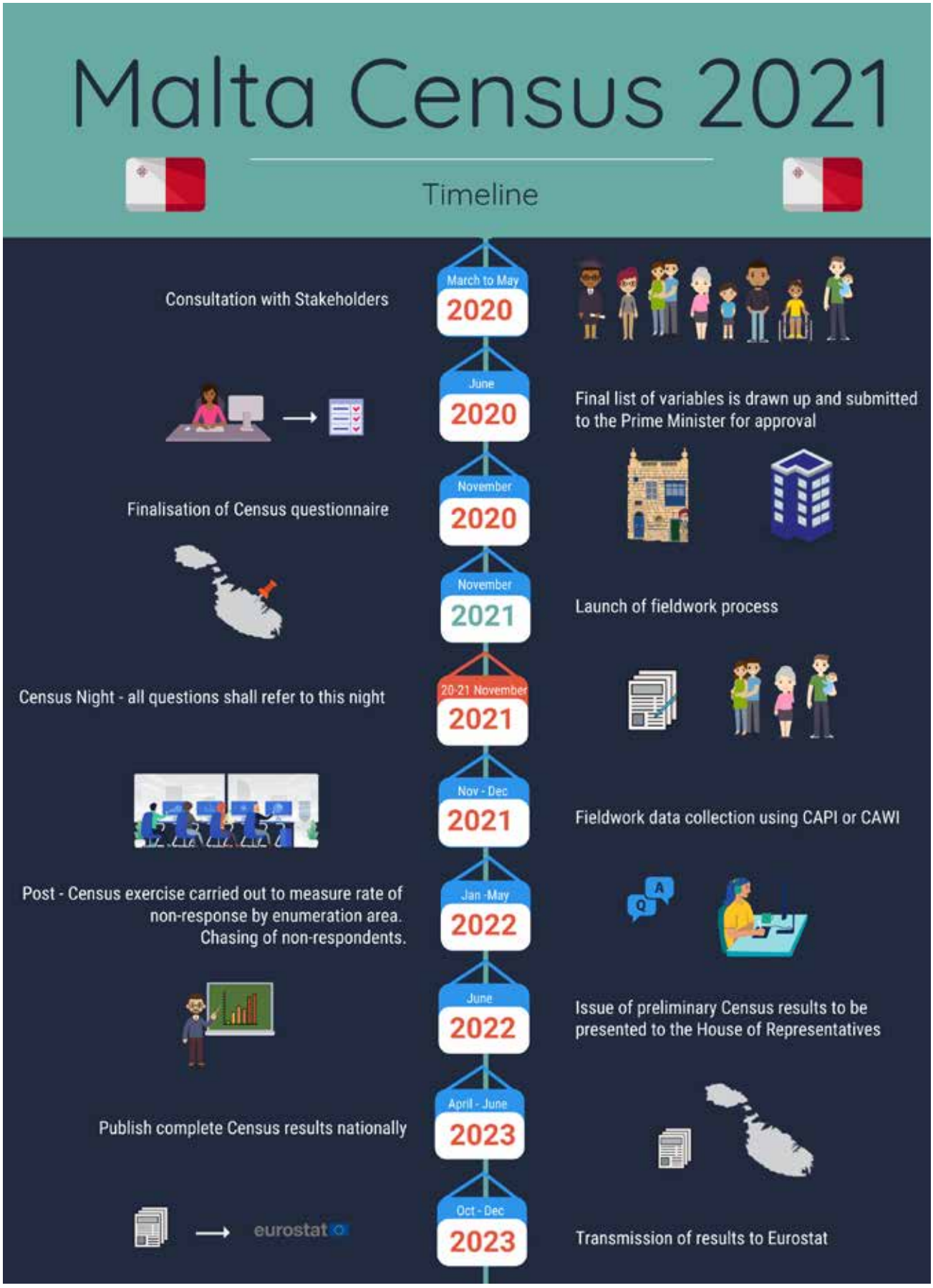


Figure 1: Timeline of the Census 2021 project

1.3 Audit Methodology

This IT audit was divided into six different stages:

- Initially, the NAO went through the Census objectives, legislation and regulation to gain a comprehensive understanding of this project.
- An initial meeting was held with the NSO, which sought to gather a wide understanding of this project and the challenges faced by both the NSO and the third parties involved in this project.
- Subsequently, other meetings were held with the Census Deputy and the NSO Head of IT, to discuss the planning, management and operations of such project in greater detail.
- A questionnaire was then sent to the NSO, to gather the necessary information along with the documentation needed. The information requested included project plans of the development and implementation phases, results achieved, uptake of the online version of the Census questionnaire and related costs.
- The documentation collected was analysed in order to identify possible risks.
- The NAO listed recommendations to mitigate identified risks, lessons learnt and improvements that can be made in preparation for similar Census exercises in the future.

In order to attain the objectives listed in Section 1.2 above, the audit methodology adopted by the NAO was based on the Information Systems Audit and Control Association's (ISACA) Control Objectives for Information and related Technology (COBIT).

COBIT is a comprehensive set of resources that contains all the information organisations need to adopt an IT governance and control framework. COBIT provides good practices across a domain and process framework in a manageable and logical structure to help optimise IT-enabled investments and ensure that IT is successful in delivering against business requirements. The controls that were considered during this audit are listed in Annex C.

1.4 Structure of the Report

This report includes six further Chapters as documented below:

- Chapter two deals with the project plan and a review of the main project objectives, deliverables, allocated resources, budgets and timelines.
- Chapter three includes a review of the development and implementation of the 2021 Census.
- Chapter four assesses the key outcomes of the introduction of a web-based questionnaire as the channel for submission of responses to the 2021 Census.
- Chapter five analyses the 2021 Census costs and includes comparisons with the 2011 Census costs of other countries and Malta.
- Chapter six lists the lessons learnt and recommendations to be considered when planning the next Census exercise.
- Chapter seven lists the management comments received from the auditee on completion of the audit.

1.5 Acknowledgements

The NAO would like to express its appreciation to all the key stakeholders who were involved in this audit, including the Director General of the National Statistics Office, the Census Deputy and Director Data Resources, IT and Methodology and the Head of IT at NSO.

Chapter 2| Project Plan

2.1 Pilot Studies

The NAO noted that in November 2018, the NSO conducted a Census pilot study that tested an online questionnaire form amongst 1,200 dwellings. This pilot study was conducted as part of the Eurostat grant funded project *"improvement of the quality of EU Census (2021 and post-2021)"*. The aim of this pilot study was to investigate, develop and test an internet response data collection method as an alternative data collection method for the 2021 Census. The NAO was informed that the form used for this testing exercise was not the actual form used during the 2021 Census but was simpler and less time consuming to complete.

The NAO observed that the response rate of this pilot study was 16.9%. It is to be noted that this was the first attempt by the NSO to implement computer assisted web interviewing methodology for survey data collection and thus, this response rate can be deemed satisfactory, especially when considering that no promotion was conducted for this pilot study beyond the initial invitation letter and subsequent reminders. The NAO noted that the NSO prepared a formal detailed methodological report listing the outcomes of this pilot study and the lessons learned.

Following this first pilot study, a committee was set up in August 2020 and the development of the required IT tools commenced.

In June 2021, the NSO then conducted a second pilot study. This time round the NSO focused on testing the Census questionnaire and the IT tools. This study comprised of around 200 dwellings spread amongst six different localities, one in each district (Birkirkara, Naxxar, Siġġiewi, Xagħra Gozo, Żabbar and Żejtun). The NSO appointed six Enumerators responsible for collecting a minimum of five paper questionnaires, conducting a minimum of five face-to-face interviews and five telephone interviews as well as collecting feedback forms from the participants of the online census. Participants in this pilot study were given a €15 voucher as a token of appreciation for their contribution. As a result of this pilot study, the NSO compiled a number of documents listing the feedback and action to be taken in order to update the paper, web based and tablet questionnaires; the content of the briefing session presentation for Enumerators, etc.

2.2 Public Consultation

The NAO noted that although the majority of variables included in the Census questionnaire are mandated by European law, a number of additional questions were included to cater for national requirements.

The NAO observed that in order to determine such national requirements, the NSO launched a public consultation on the 5th May 2020, whereby stakeholders were invited to submit proposals for additional

themes and questions that could potentially be included in the Census of Population and Housing. Through this exercise, the NSO sought to ensure that the needs of Census data users are carefully considered. The ideas generated through this public consultation exercise needed to be balanced with issues of response burden[2], cost-effectiveness, data quality and above all, the need to keep the questionnaire to a reasonable length.

The NAO noted that 39 proposals were received from individuals, entities, authorities and other stakeholders. The auditee provided the NAO with a detailed report listing each of the above-mentioned proposals and the NSO's conclusion on each. The NSO also stated that it communicated with stakeholders giving them a reason as to why their proposals were rejected and provided them with possible alternative solutions for collecting the additional indicators proposed.

2.3 Roles and Responsibility

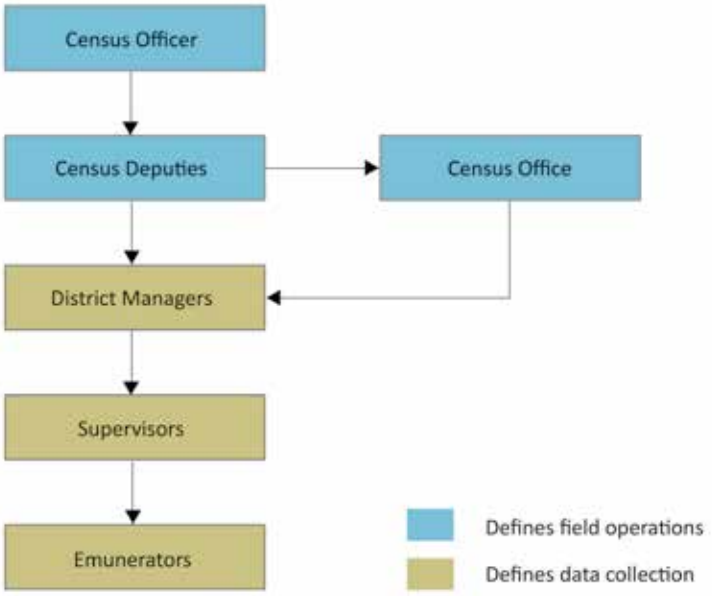


Figure 2: Roles and Responsibilities
Source: NSO

The NAO noted that the Census Officer was legally responsible for the entire Census process and all staff were answerable to him. The Census Officer was assisted by two Deputies, who ran the Census Office, and together with a group of seven District Managers, were responsible for field operations. District Managers were responsible to ensure the smooth running of the process of a number of localities and manage the Supervisors assigned to those localities. Each Supervisor was responsible for the group of Enumerators assigned to their area. The main task of the Supervisor was to co-ordinate and control the work of Enumerators, who were ultimately responsible for the collection of Census questionnaires from households. Supervisors were also required to check the quality of the data collected by Enumerators.

2 In accordance with Principle 9 of the European Statistics Code of Practice https://ec.europa.eu/eurostat/documents/4031688/8971242/KS-02-18-142-EN-N.pdf/e7f85f07-91db-4312-8118-f729c75878c7?t=1528447068000

Apart from the Census Call Centre staff, the 2021 Census of Population and Housing required a workforce of 1,071 as per Table one below:

Role	NSO Staff	Recruited
Census Officer	1	
Census Deputies	2	
District Managers	7	
Supervisors	50	
Enumerators		990
Census Office team	6	
IT team	5	
Communications team	3	
Procurement team	3	
GIS team	4	

Table 1: Workforce - Census of Population and Housing 2021

2.4 Identification of Software, Hardware, System Hosting Requirements

Software

The NAO noted that in 2017, the NSO embarked on a study amongst the contact points of the Census Working Group to gather feedback on the experience of using a mixed mode methodology for data collection; the outcomes of a Computer Assisted Web Interviewing (CAWI) tool (if one was implemented); as well as more technical questions on the IT infrastructure within the country's institution. A total of 18 countries provided a response to the questionnaire that was circulated. Through this exercise, the NSO noted that none of the respondent countries made use of PHP, Microsoft (MS) SharePoint or Blaise[3]. Four countries used HTML5 while two countries used .NET. Six countries reported using other technologies outlined in Table two below.

Technology used
Microsoft NET Framework 4.0, Microsoft SQL Server 2008 RT EE
ABBYY Flexi Capture 9.0
PDF files uploaded to the e-government website
Oracle, PL/SQL, C#
Custom software
Framework 4.5, MVC, jQuery, AJAX

Table 2: Other technologies used for the implementation and development of the online tool
Source: NSO

[3] The NAO was informed that Blaise was used by two other National Statistics Offices of EU Member States.

Following this exercise, the NSO IT Unit held several discussions with the entity's Data Management (DM) Unit and the Methodology and Quality (MQ) Unit to understand what is required out of the online questionnaire. The DM Unit provided the requirements from a data collection perspective whilst the MQ Unit focused on the questionnaire logic, validations and data integrity rules. Based upon the said requirements, the NSO programmers studied the options at hand in relation to technology/platform and web hosting. The NAO noted that the NSO selected the Blaise 5 web framework as the underlying platform for the online questionnaire, because it satisfied most of the requirements identified, and expertise was already available in-house. The NSO also decided that whilst Blaise was to be used for the user interface and the business process, the data collected was to be stored in a MS SQL Server database.

Hardware

The NAO noted that the NSO issued a tender for the supply of 1,100 tablets to be used in the 2021 Census. The Call for Tenders (CT2069/2021) was published through the accelerated open procedure as this was a re-issue of CT2462/2020 due to a lack of response to the first tender. The NAO was not provided with documentation showing the method used to determine the technical specifications of such tablets however, copies of emails showing discussions regarding Android tablet restrictions when using the selected end point management solution, were provided. The NAO noted that the end point management solution selected by the NSO supported the Android operating system running on the tablets procured by the entity.

System Hosting Requirements

The NAO noted that in July 2021, the NSO discussed their IT system hosting requirements with the Manager Infrastructure Services Department at the Malta Information Technology Agency (MITA) and decided that the Hybrid Cloud Platform of the Government of Malta was to be used. The system was hosted using seven virtual servers on MS Azure. This allowed the NSO to scale up or down as necessary. The NAO noted that after the collection period, the system was scaled down to two virtual servers.

2.5 Census Time Plan

The NAO noted that the NSO drafted a time plan of the 2021 Census starting from the finalisation of the questionnaire up until the collection of data. This time plan consisted of 23 milestones and covered the period from June 2020 till December 2021. Each milestone was also allocated to a particular team/s. The NAO was informed that the Census Deputies were responsible of this overall project plan and ensured that the tasks of each milestone were completed on time and with the required outcome. The NAO was also given a list of the persons appointed within each team in charge of reporting on the progress of completion of each milestone.

The NAO could also confirm that numerous correspondence documents provided by the NSO indicated that the level of communication between each team was effective and conducive to open communication and honest feedback.

The NAO analysed the below stages of this time plan and noted that:

- **IT requirements** – The NSO documented the requirements of the web interviewing online questionnaire and the personal interviewing questionnaire that was to be used by the Enumerators. These above-mentioned documents also included the validation rules of all the specific data fields.

- **Issuing of tenders** – The NAO observed that two tenders were issued in connection with this project. The Malta Statistics Authority issued a tender for the provision of Call Centre Services (MSA/7/2021) and the Department of Contracts issued a tender for the procurement of tablets (CT2069/2021) on behalf of the NSO.

- **Southern Harbour [159]:**
  Bormla [10], Floriana [5], Ħal Luqa [11], Ħal Tarxien [16], Ħaż-Żabbar [30], Il-Birgu [5], Il-Fgura [23], Il-Kalkara [6], Il-Marsa [10], Ix-Xgħajra [4], L-Isla [5], Raħal Ġdid [17], Santa Luċija [5], Valletta [12];

- **Northern Harbour [308]:**
  Birkirkara [47], Ħal Qormi [31], Il-Gżira [22], Il-Ħamrun [20], Is-Swieqi [25], L-Imsida [25], Pembroke [6], San Ġiljan [28], San Ġwann [26], Santa Venera [16], Ta' Xbiex [4], Tal-Pieta' [10], Tas-Sliema [48];

- **South Eastern [141]:**
  Birżebbuġa [20], Ħal Għaxaq [9], Ħal Kirkop [5], Ħal Safi [5], Il-Gudja [6], Il-Qrendi [6], Iż-Żejtun [22], Iż-Żurrieq [22], L-Imqabba [6], Marsaskala [33], Marsaxlokk [7];

- **Western [117]:**
  Ħad-Dingli [7], Ħal Balzan [9], Ħal Lija [6], Ħ'Attard [21], Ħaż-Żebbuġ [24], Ir-Rabat [22], Is-Siġġiewi [17], L-Iklin [6], L-Imtarfa (including L-Imdina) [5];

- **Northern [180]:**
  Ħal Għargħur [7], Il-Mellieħa [25], Il-Mosta [41], In-Naxxar [30], L-Imġarr [8], San Pawl Il-Baħar [69];

- **Gozo and Comino [81]:**
  Għajnsielem and Comino [8], Il-Fontana [2], Il-Munxar [4], Il-Qala [5], In-Nadur [9], Ir-Rabat, Għawdex [13], Ix-Xagħra [10], Ix-Xewkija [7], Iż-Żebbuġ [9], L-Għarb [3], L-Għasri [1], San Lawrenz [2], Ta' Kerċem [4], Ta' Sannat [4].

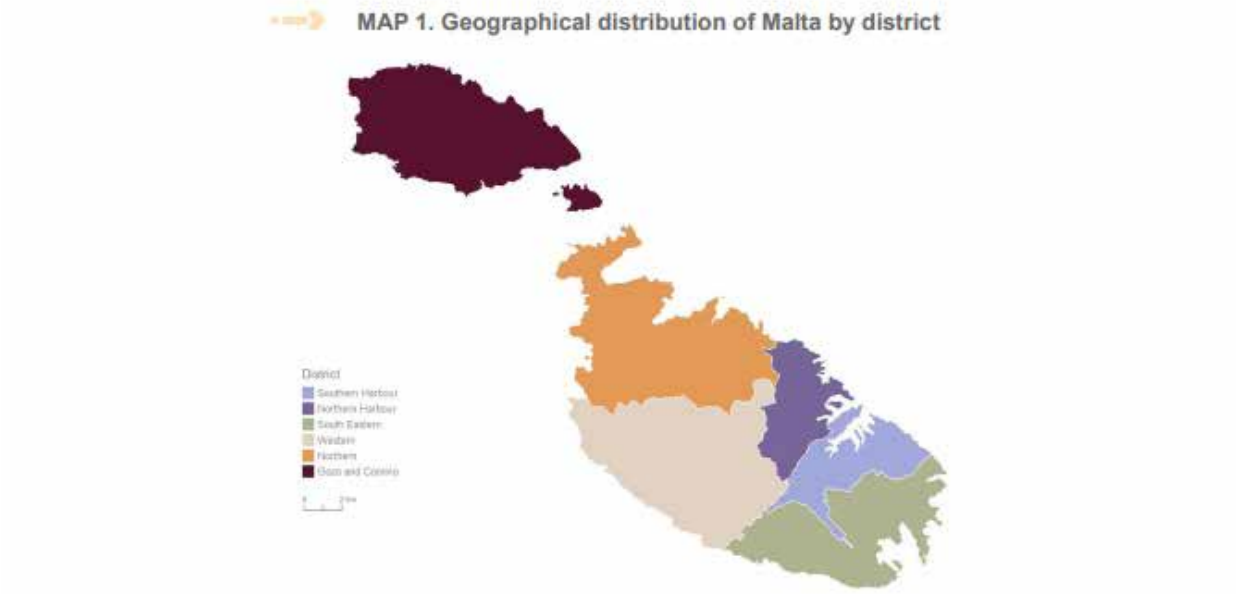


Figure 3: Geographical Distribution of Malta by District
Source: Census of Population and Housing 2021 Preliminary Report (NSO)

- **Setting-up of enumeration areas** – This process involved setting up the Enumeration Areas, which differed from those used for the 2011 Census. The 2021 Census involved 986 enumeration areas across six districts as per Figure three. Basically, an Enumeration Area consists of several streets or parts thereof in a locality, and typically encompasses an average of 200 dwellings.

- **Verification of enumeration areas** – This stage was completed by the Regional, Geospatial, Energy and Transport Unit and consisted of a number of verifications, to ensure that the Enumeration Areas assigned are complete and correct.

- **Design of interfaces** – The Census exercise consisted of four modes of data collection: CAWI (web), CAPI (face-to-face interviewing), CATI (telephone interviewing) and PAPI (paper questionnaire) as depicted in Figure four below. All data collection modes used the same IT system but through different interfaces (web for CAWI and PAPI data entry; tablets for CAPI and CATI). This stage thus involved the design of all the above-mentioned interfaces. All interfaces were designed by internal NSO staff.

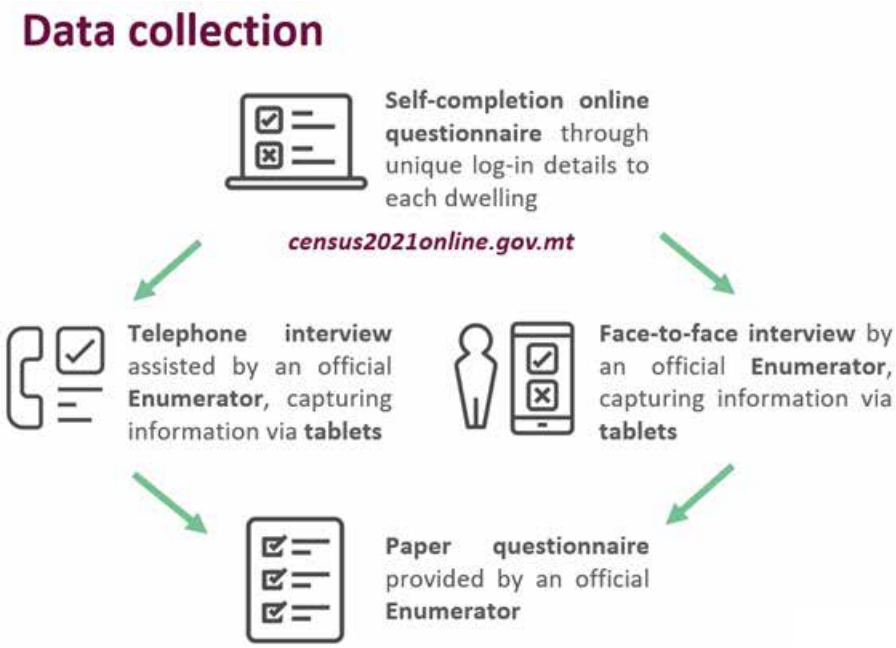


Figure 4: Modes of Data Collection

Source: NSO

- **Setting-up of servers** – The NAO noted that after discussions with MITA, the NSO drafted the architecture diagram shown in Figure five. It was decided that the system is hosted on the Hybrid Cloud Platform of the Government of Malta.

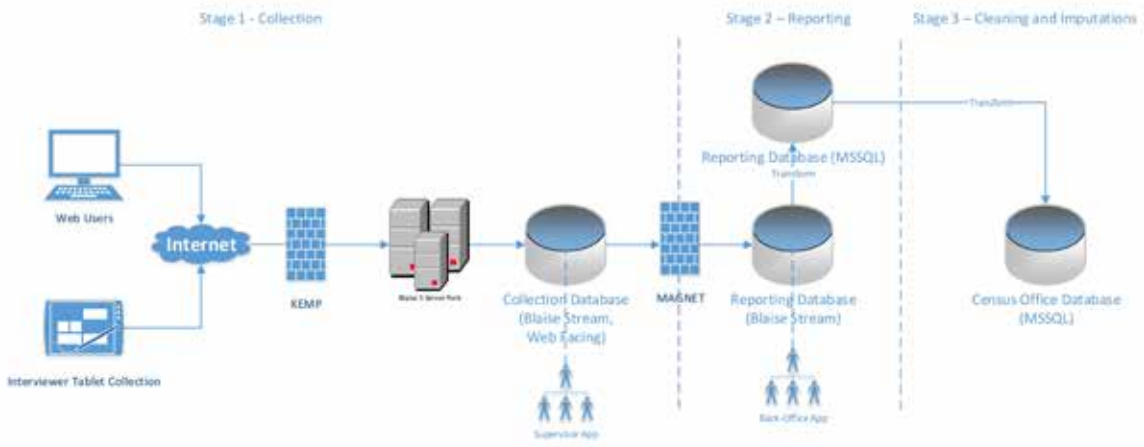


Figure 5: Architecture Diagram
Source: NSO

- **Testing of IT tools** – The NAO noted that all testing of the related IT tools was done by NSO staff. Although the NAO was not provided with any formal testing sign-off documents, the NAO saw several emails and excel sheets recording the results of this process.

- **Administrative forms** – The NAO noted that the NSO had seven different forms to document all the field work being carried out. These forms included one to document vacant properties, another to document cases of respondents that refused to reply and another that listed cases where no contact was made with the occupiers of a dwelling.

- **IT enhancements and coding application** – The NAO was informed that all IT enhancements and coding application were developed by the NSO IT Team.

- **Printing of material** – The NAO noted that although the NSO invested heavily in developing an online version of the 2021 Census questionnaire and had equipped all its Enumerators with tablets for data collection, the option of filling in paper questionnaires was also available. The NAO observed that a total of 84 hard copies of the questionnaire were printed for the pilot studies and a total of 45,400 copies of the questionnaire were printed for the 2021 Census as per Table three. Each Enumerator working on the 2021 Census was equipped with 10 copies of the Maltese version, 15 copies of the English version, five copies of the Italian version and five copies of the French version. Printed copies of the Arabic version were also made available on request.

	Printed copies of Questionnaire	Printed Questionnaires for Pilot Studies
Maltese	12,000	20
English	17,000	40
Italian	5,700	12
French	5,700	12
Arabic	5,000	0
	45,400	**84**

Table 3: Printed copies of Census Questionnaires

Translated versions in Albanian, Arabic, Chinese, Hindi, Serbian, Macedonian and Turkish were available for download from the Census website.

- **Recruitment** – The NAO observed that the NSO issued a public call for the recruitment of Enumerators and Supervisors in July 2021. No call for District Managers was issued as these were all NSO staff in Management positions (Heads and Directors) with proven experience in data collection and analysis.

  The NSO received over 1,800 applications, which were reviewed against a marking scheme. The NAO however, noted that claims made by applicants, including those regarding their level of IT literacy, were accepted but not verified by means of a practical test. The NSO explained that they did not have the resources to carry out such tests amongst this large number of applicants.

- **Allocation of enumeration areas** – This process involved the allocation of enumeration areas to Enumerators and Supervisors. The NAO noted that this allocation was not a simple one, as Enumerators were given the option to choose their preferred locality. The NSO thus had to allocate enumeration areas according to such preferences.

- **Mailing of Census letter** – During the month of October 2021, the NSO mailed an official NSO letter with the user credentials (username and password) and login information needed to access the Census form online to all households in Malta. A specimen of this mailing letter is included in Annex B of this report.

- **Training sessions (Enumerators/Supervisors)** – The NAO noted that the NSO organised training sessions for District managers, Supervisors, Enumerators and call centre personnel were held in Malta and Gozo between September and November 2021. The NAO observed that a very comprehensive 60-page Enumerator training manual was compiled and handed out to all Enumerators. This manual included amongst others: the Enumerators' responsibilities, dress code, identification, definitions of the terms used in the Census, an explanation of all the forms that were to be used by the Enumerators, and a thorough guide explaining the use of table system. The NAO also noted that the NSO had prepared a very similar 89-page manual for the Supervisors.

- **Launch of CAWI** – The NAO noted that following several discussions held by the IT Unit, with the Censes Office, a set of requirements from a data collection perspective was drafted. Such requirements and also focused on the questionnaire logic, validations and data integrity rules.

  The NAO observed that pre-testing of the CAWI tool was conducted in two steps: in the first stage, staff from the DM Unit tested the tool by inputting 'fictitious' data for the sole purpose of testing. The testing mainly aimed to verify the 'go to' functions, the layout and sequence of the questionnaire on the web, as well as the user friendliness of the program. The second stage of pre-testing was conducted amongst a random sample of 20 staff members from the NSO. The selected staff were invited via email to test the online tool and hence obtain feedback on the ease-of-use and the visual aspect of the online questionnaire. The resulting feedback was forwarded to the DM Unit. The CAWI tool was improved following several iterations of testing and bug fixing.

  The CAWI was then piloted with a stratified sample of households, selected from a subset of 17 localities representing all districts. The households were randomly selected from the register of private households in Malta. Following this exercise, the NSO collected feedback from respondents and noted that the most common issue was the lack of functionality of the CAWI tool on hand-held devices, mainly tablets and mobile phones. Participants also highlighted the difficulty of responding to the family matrix question, outlining that it was complex and not easy to complete. One respondent commented that it would be easier to input the password used to access the questionnaire if it was visible when typing, given its complexity.

  The NSO then embarked on an exercise to improve its CAWI interface and make it accessible from different devices. The NAO noted that in September 2021, the NSO embarked on a thorough testing phase of its latest version of the CAWI interface. This testing phase included testing the interface on various devices and the different languages available in the IT tool. The NAO observed that all issues discovered during the testing phase were documented, and such documents were updated with the actions taken. The final version of the CAWI interface was launched in October 2021.

- **Collection** – The data collection period, as depicted in Figure six, was planned on a span of eight weeks. The NSO planned to send letters to each household/dwelling listed in the register, informing them about the 2021 Census and that they are requested to fill in the questionnaire online. Instructions how to access the online questionnaire would be annexed to this letter. Consequently, Enumerators went about their assigned routes and contacted the residents in the households. The Enumerators were encouraging the households to submit the information through the self-completed web questionnaire, however, households that expressed difficulty filling the online version could opt for alternative methods. The Enumerator could either fill in the questionnaire in CAPI mode on the tablet, or else provide the household with a paper questionnaire that the respondent could complete and send

by post. The paper questionnaire was considered the least preferred option and highly discouraged. Enumerators were informed which households falling within their route had already submitted the self-completed web questionnaire and hence no longer needed to contact the residents of these specific households.

Supervisors assessed the received questionnaires for quality and consistency, and reverted to the Enumerators or District Managers with any queries. In cases where a lot of inconsistencies were identified, the Supervisors could instruct the Enumerator to call at the household again to iron out such inconsistencies.

Paper questionnaires received by post were inputted by the back-office team and then vetted by the Censes Office staff.

The NAO observed that the NSO also aimed to enhance the dwelling register with geospatial coordinates for each data point, apart from collecting the data needed through the questionnaires. The geospatial coordinates of each household within the NSO household register were to be pre-populated from the Water and Electricity register, that contained the XY coordinates of the water meters. The NAO was informed that a previous record-linking exercise merging the two registers resulted in around 70% of dwellings being matched. The NSO aimed to utilise this Census opportunity to act on the unmatched dwellings and input these based on the coordinates of the street, since Census questionnaires collected by the Enumerators on the tablet devices would store the XY coordinates of the device as part of the questionnaire para-data. These coordinates would then update the estimated coordinates in the register. The NAO observed that coordinates for self-completed questionnaires were not used to update the register as the respondents may not have submitted their replies from the dwelling itself.

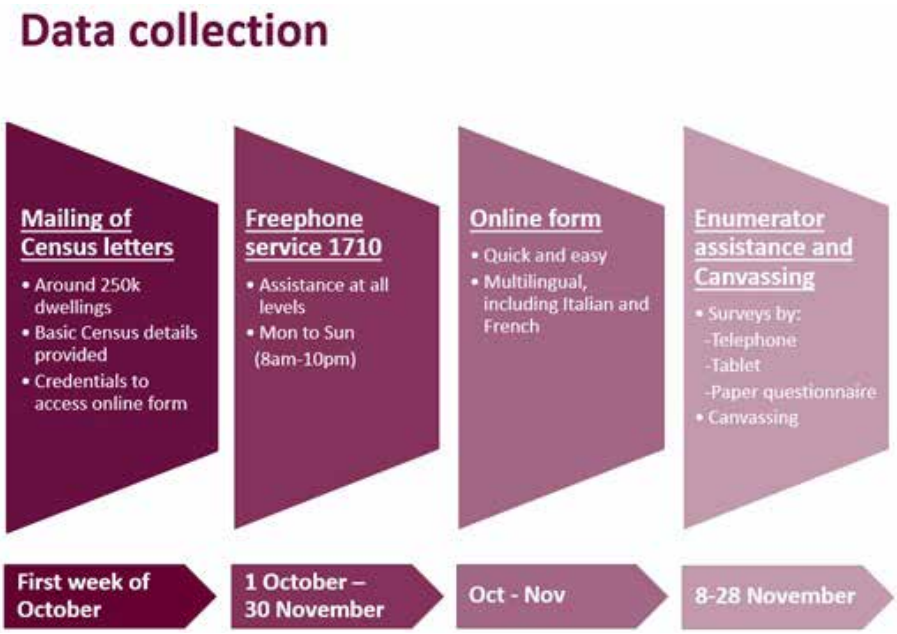


Figure 6: Data Collection Period
Source: NSO

2.6 Service Level Agreement with the Central Bureau of Statistics – Netherlands

The NAO noted that in November 2020, the Malta Statistics Authority established a service level agreement with the Central Bureau of Statistics (CBS) of the Kingdom of the Netherlands with respect of delivery of consultancy services by the latter. These consultancy services included assistance with:

- Development of the online questions including household identification/authentication, questionnaire structure and rules definition, GUI modification to the required layout, adaptation to different screen sizes, and the post questionnaire submission data processing.

- Enumerators application that was to be installed on Android tablets and make use of the Case Management App and the Blaise Android App. Assistance with the synchronization process of such tablets was also included.

- Server Infrastructure setup including the configuration of computing resources, the installation of Blaise on the servers, and the configuration of the various Blaise components to interact and collaborate as a single ecosystem.

The NAO noted that such consultancy services were to be carried out against a daily rate, based on an eight-hour working day. The consultancy could be delivered through tele/video conference and if personal visits were deemed necessary, the costs of such visits were to be billed separately.

2.7 Budget Plans

The NAO observed that the budget allocated for the execution of the 2021 Census included €1.2million in the 2021 budget estimates for the Ministry for Finance and Employment and a further €2million in the 2022 budget estimates of the same Ministry, totalling an estimated expenditure of €3.2million over two years. The NAO noted that no actual expenditure figures were available at the time of this audit.

2.8 IT Risk Assessment

The NAO is of the opinion that all projects are to be subjected to a formally documented IT risk assessment, which should include an analysis of business processes and the risks that these processes are exposed to.

Though the NSO did not draw up a formally documented IT risk assessment report for the execution of the 2021 Census, the NAO noted that the level of internal communication between all team members was an excellent one, and various project risks were discussed through email.

2.9 Conclusions and Recommendations

The NAO commends the thorough pilot studies conducted regarding the computer assisted web interviewing as a methodology for survey data. The NAO has also noted the positive public consultation approach in order to establish the national requirements vis-à-vis the data to be collected as part of the Census of Population and Housing.

Furthermore, the NAO lauds the NSO for embarking on a study that gathered feedback from EU countries forming part of the Census Working group. The NAO, however, did not find any documentation that showed how the technical specifications of the tablets was determined, and opines that accelerated open procedures for procurement of such tablets should have been avoided.

The NAO noted that although thorough testing of IT tools was conducted, and the NSO had numerous records of this process, there were no formal test case and no sign-off documents. The NAO recommends that testing is conducted as per previously documented test cases or automated test scripts, which are signed off and certified as completed.

The NAO recommends that the process of selecting Enumerators and certifying their level of competence should be given more attention. Whilst the NAO understands that the NSO may not have had sufficient resources to check the level of IT literacy amongst the 1,800 applicants, the NSO could seek the help of competent entities, to ensure that all the Enumerators have the necessary IT skills.

The NAO recommends that the NSO identifies and documents its risks vis-à-vis future Census projects, assigning a probability assessment for each risk, and identifying the possible consequences. The document should also identify ways of how these risks could be managed. This document can then be forwarded to senior management who would determine the best way of managing such risks.

Chapter 3| Project Development and Implementation

3.1 Census Website

The NAO noted that in May 2021, the NSO published a dedicated multi-lingual website (https://census2021.gov.mt/) for the 2021 Census. This website could be viewed in Maltese and English.

Through this website, the general public could:

- Apply for the vacancies of Census Enumerators.
- Access information regarding Census events and news.
- Access the Census questionnaire by clicking on the "Participate" button and logging on to the questionnaire using the credentials received in the official notification letter. The online Census questionnaire was available in four languages namely: Maltese, English, Italian and French.
- Download the booklet version of the 2021 Census. The general public could view/download the Maltese and English version of this booklet depending on the website language setting selected. The NSO clarified that the purpose of this booklet was to familiarise members of the public with the questionnaire and not for data collection purposes.
- Download translations of the questionnaire in the Albanian, Arabic, Chinese, Hindi, Serbian, Macedonian and Turkish languages.
- Understand the Census process and gather information about "What is the Census?", "Why it matters?" and "Data Privacy and Security".
- Find a list of frequently asked questions with corresponding replies.

This same website was kept online after the Census participation period was over, with the aim of using it for the uploading of Census Results and Publications. The NAO noted that in June 2022, the NSO published its preliminary report on this website, and intended to upload its full report when this is ready.

The NAO also noted that the website provided the general public with access to the Preliminary Reports and the Final Reports that were prepared in connection with the Census 2011 and the Census 2005.

This website was developed and hosted by a third-party supplier, and it includes the gov.mt link, a privacy policy and an accessibility policy. This website also has certain in-built accessibility functionality to increase and decrease the size of the text, to view the website in grayscale, to adjust the high contrast or negative contrast, etc. The NAO commends such accessibility functions.

3.2 Census Data Collection IT Software Applications

The NAO noted that the Census data collection process consisted of four modes of data collection namely CAWI, CATI, CAPI and PAPI. The NAO observed that all four of the latter mentioned modes used the same IT system but through two different interfaces. A web interface was used for the CAWI and the PAPI data entry, whilst tablets were used for the CAPI and the CATI. The software applications were thus used to capture data online from respondents, to allow Enumerators collect data on offline tablets, handle the management of cases and appointments, and assist with data cleaning and coding.

The above-mentioned software applications were developed in-house by the NSO IT team using Blaise and Blaise Android App. These software applications consisted of the tools listed below, each feeding into a central database:

- **Online data collection tool** – used to accept data from dwellings via a publicly available web form.
- **Offline tablet data collection tool** – used by the Interviewer when using the tablet to input the data provided by the residents of a dwelling in offline mode. This tool included a synchronization tool to be able to synchronize the data when connected to the internet.
- **Management tool** – used by Administrators to manage the synchronizations with all the data collection tools, connect with the data cleaning tool and perform various reports such as reports featuring duplicate ID's, missing members from dwelling data, etc.
- **Data Coding tool** – used to categorise data into a form that facilitates computer-aided analysis.
- **Supervisor application** – used to allow Supervisors to view their Enumerators' cases, approve surveys, etc.
- **Call Centre application** – used to assist the Call Centre Operators and provide a communication tool through which these Operators can send comments/feedback to Supervisors.

The NAO was given a copy of the requirements document and noted that the NSO listed requirements vis-à-vis each of the above tools and classified such requirements according to their importance level (i.e. critical and non-critical). The NAO was also given a copy of the document listing the validations that were to be implemented on the online questionnaire system and on the system accessed by the Enumerators. Furthermore, the NAO noted that the NSO compiled a document listing all the features of the online systems' screen design such as font names, font sizes, colours, etc.

The NAO noted that the NSO included a number of functions to aid usability including:

- Auto-save functionality that gave the respondents the option of saving as draft and continuing the questionnaire at a later stage, eliminating the need of having to complete the whole questionnaire in one sitting.

- Enumerators had the facility to pull a draft questionnaire that was initiated by the household and continue filling-in the data.

The NAO was informed that the NSO catered for data security at the network, central system, and tablet levels as outlined below:

- The online Census survey was public facing and therefore accessible from any device connected to the internet. This system had three levels of security namely: MITA's firewall, SSL certificates to allow HTTPS communication, and tokens exchanged between application component to restrict unauthorised communication.

- The tablets used by the Enumerators were encrypted using Samsung Knox and hardened using Microsoft Intune.

- Enumerators were encouraged to synchronise their tablets frequently (at a minimum of once a day) so that any data (including incomplete questionnaires) stored on the tablets is transferred to the server and hence backed up through the MS Azure facility. The tablets were also configured to synchronise automatically when connected to the internet.

- Back-office applications could only be accessed by Supervisors, District officers and Back-office personnel whilst connected to the NSO Local Area Network (LAN) or through a Virtual Private Network (VPN) when outside of the NSO premises. Such applications could only be accessed using the corporate login.

- Access was granted on a need-to-know basis. Whilst Enumerators could access partial questionnaires for households pertaining to their enumeration area, they could not access any completed web responses. Similarly, Supervisors could only access the questionnaires completed by Enumerators reporting to them and not to online replies that were fully completed and submitted by the respondents. All completed questionnaires were automatically locked by the system and could only be unlocked by the NSO IT team.

- The NSO ensured that all Enumerator tablets were collected upon completion of data gathering phase.

- A factory reset was done on tablets prior being used for other surveys or prior being passed on to other Government entities.

- Each component of the system had its own audit trail. The online questionnaire tracked successful and failed logins along with status changes of questionnaires. The tablet audit trail tracked activity on the tablet, whilst the back-office application tracked modifications to the backend data and extractions of reports. These audit trails were only accessible by the IT Administrators, but the NAO was not provided with copies of such audit trails.

The system was hosted on a scalable system of a maximum of seven virtual servers on Microsoft Azure. The latter hosting requirements were determined with the assistance of CBS (Statistics Netherlands) and MITA. This scalable hosting gave the NSO the flexibility it needed to deal with the peaks experienced during the data collection phase of the Census project. The NAO noted that when the data collection period elapsed and the IT system was being used to cleanse and verify data and compile results, the hosting was scaled down to two virtual servers.

The NAO was informed that the live database was backed up twice daily however, this office was not provided with copies of backup logs and evidence of data restores.

3.3 Tablets for Enumerators

The enumerators were provided with information about the households, where Census data was not submitted online through the Census Portal. The NAO noted that manual forms and the manual inputting of all census data was eliminated as the NSO opted for the implementation of an electronic solution whereby the Enumerators collected the data through the use of tablets, which is then transmitted to the core Census software database.

The NSO procured 1,100 tablets at a cost of €365,200. The NAO noted that after the completion of the census data gathering phase the NSO considered the redeployment of these tablets and the possible re-purposing of this hardware for a different use. The NAO was informed that 300-400 tablets were to be retained by NSO for internal use and 60-80 tablets were to be given to the Ministry for Finance and Employment. The NSO also stated that they were involved in ongoing discussions with the Office of the Prime Minister to redeploy the rest of the tablets.

3.4 Communication with the General Public

The NAO noted that the NSO implemented a broad communication and promotional campaign to encourage public participation, with specific focus on the use of the online questionnaire available for the first time in this Census project.

The NAO was also informed that the Census was featured extensively on a number of media platforms including TV, radio, newspapers and billboards. The NSO also published a number of infographics, such as the below (Figure seven refers), which was published on its website in May 2021. This infographic was emailed to various Government entities (including the NAO) by the NSO's Communications and Dissemination office asking such entities for their help in disseminating it to the general public. The NAO was informed that the NSO printed 500 copies of this leaflet, which were distributed at community centres, local councils and health centres.

The NAO observed that the NSO also sought to promote this Census exercise amongst the younger generation. This promotion was beneficial for them to help them appreciate the social value and the importance of this national Census exercise. Furtheremore, this promotion was also used to disseminate information other NSO projects especially social surveys. As part of this initiative, the NSO, in collaboration with the Ministry for Education, Sport, Youth, Research and Innovation held a competition among local schools through which students were invited to submit their artwork or literary compositions, which depicted the essence of the Census and the theme 'Everyone Matters'. Around 500 students from 18 schools submitted their entries for this competition and an exhibition was held on the 18th March 2022, presenting a selection of such entries. Furthermore, all participants received a certificate of participation, together with a medal as a token of appreciation, and all participating schools were given a commemorative trophy. Prizes were also given to the 12 winning students.

Apart from the promotion listed above, the NSO also sought to provide direct communication channels to aid communication with the public. The NAO observed that the public could get in touch with the NSO either through the online contact form on the NSO website or through the freephone service (freephone number 1710), which was launched in October 2021. This freephone service was the main contact point to address public queries raised during the execution of the Census fieldwork. (Freephone usage statistics can be found in Section 4.4 of this report.) Apart from this freephone number, the NSO also provided a dedicated email address (census2021@gov.mt) through which the public could reach out and contact the Census team.

Figure 7: Census Infographic issued by the NSO

3.5 Conclusions and Recommendations

The NAO noted that the questionnaire booklet downloadable from the website was not meant for data collection purposes, but solely to help members of the general public who wanted to familiarise themselves with the questions. The NAO observed that this was not made clear.

The NAO also noted that once the Census data collection period was over, the Census website was not updated accordingly. Although the general public could no longer access the questionnaire when this period elapsed, the website was still asking its viewers to participate in the 2021 Census of Population and Housing by filling in the online questionnaire and showing the "Participate" button. The NAO suggests that this website is updated, and the "Participate" button is removed, making it clear to the general public that the participation period is over, and this website was now being used to convey the results of the Census.

The NAO observed that when the webpage is resized, the "Participate" button loses its position. This issue was encountered or visible both in the English and Maltese version of the website.

The NAO reviewed the requirements document for the development of the IT systems and noted that although the requirements were classified according to their importance level (i.e. critical and non-critical), such requirements were very high level. Furthermore, this requirements document was not updated and the NAO did not see any documentation showing the monitoring of the development phase of this project. Whilst the NAO understands that the in-house development team was very experienced, the updating of the requirements documents, documents recording the progress updates, the handling of issues encountered during the development stage, and the project board decisions, are considered a must-have in any project and more so in projects of this scale and importance.

Furthermore, from an IT security perspective, the NAO recommends that all Census IT systems' audit trails are made more readily available for audit purposes, given that this Office was not provided with copies of such records. Additionally, given that this office was not provided with copies of backup logs and evidence of data restores pertaining to the live Census database, the NAO recommends that such records are maintained and readily available for audit purposes. The NAO commends the NSO for catering for data security at all levels (i.e. network, central system, and tablet levels). The NAO suggests the NSO in future considers the introduction of additional security measures at tablet level such as biometric fingerprint authentication, etc..

The NAO noted that the redeployment or reuse of tablets procured for the Census was not thouroughly planned for in the initial planning phases of the exercise and recommends that future plans for the procurement of one-off use hardware should include documented plans for its continued use by the NSO or other entities.

Chapter 4| Online Option Outcomes

4.1 Take-up of Online Survey

The NAO noted that the total number of completed submissions until the end of February 2022 stood at 175,141 of which, 97,678 submissions were made online by the residents themselves. This means that 56% of Census surveys were submitted online by the respondents themselves as depicted in Figure eight. The NAO noted that the NSO was targeting a 20% online submission and thus the 56% achieved exceeded NSO's initial expectations.

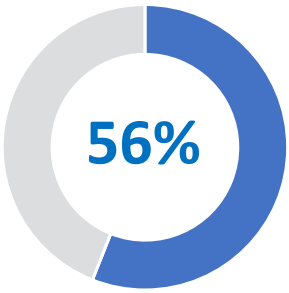


Figure 8: Percentage of Online Submissions

As part of this audit exercise, the NAO attempted to analyse the demographics of online respondents by age and town/village, however, the NSO provided preliminary raw data, which was still subject to verification and thus no conclusions could be elicited.

4.2 Take-up Comparison with Other Countries

The NAO also attempted to compare the online response rate of the Malta Census with that of other countries however, the figures published by other countries until the completion of this audit, were limited.

The NAO noted that 2021 England and Wales Census had an online self-completion response rate of 88.9%[4] which exceeded their target of 75% online completions. The NAO however observed that England and Wales had carried out their first online census in 2011 when the percentage of online Census returns was 16%.[5]

[4] https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/eliveringthecensus2021digitalservice/2021-10-04

[5] https://www.nisra.gov.uk/sites/nisra.gov.uk/files/publications/online-data-collection-in-the-census.pdf

The NAO also observed that the self-completion online census option has been offered in France since 2015. A 2017 UNECE report[6], shows that France conducted a rolling census and in 2015 had an online response from 38% of inhabitants. Furthermore, the report also states that the 2015 online response rate increased to 46% in 2016 and 54% in 2017.

The NAO is of the opinion that given the above-mentioned response rates, the 56% online submission rate of the Malta Census 2021, is a positive one and can be considered as one of the success factors of this project especially when considering that this was the first time Malta opted for this mode of data collection.

4.3 Surveys submitted through the Enumerators Tablets

The NAO noted that as depicted in Figure nine below, a total of 77,463 surveys (equivalent to 43%) were submitted by the Enumerators, including circa 2,400 surveys (equivalent to 1.4%), which were started online by the respondents but had to be completed by the Enumerators.

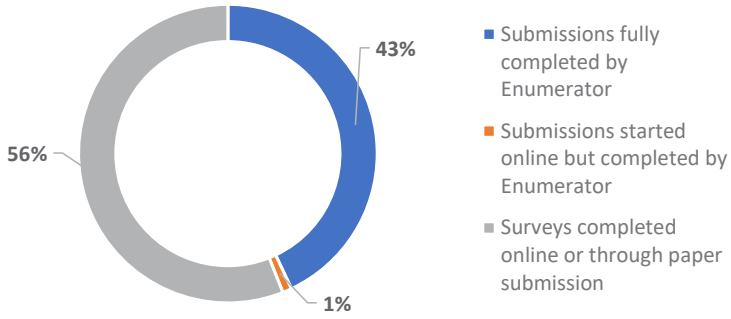


Figure 9: Surveys submitted through the Enumerator Tablets

[6] https://unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.41/2017/Meeting-Geneva-Oct/WP29_ENG.pdf

4.4 Surveys Submitted using the Paper Questionnaire

The NAO also reviewed the use of the printed version of the Census questionnaire and noted that this mode of data collection was used by circa 0.17% of respondents.

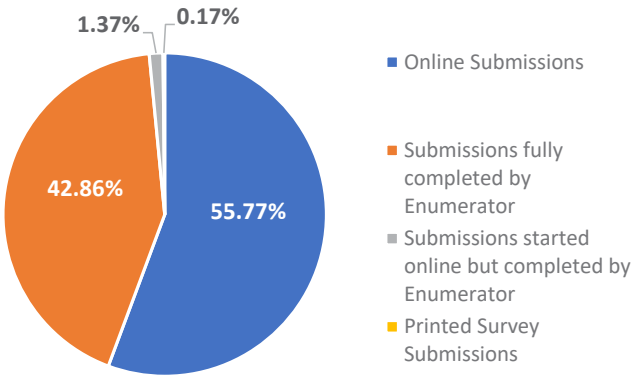


Figure 10: Distribution of Submissions

4.5 Helpdesk Calls by Month and Type

The NAO observed that the Helpdesk service was very well received and resulted in an effective tool to communicate with the general public. As depicted in Table four below, the NAO noted that the majority of the calls (48.9%) were received in November.

Month	Min: Max	Average	Total	%
October	[60, 764]	430	13,330	42.1
November	[89, 963]	516	15,480	48.9
December	[19, 614]	191	2,858	9.0
Total	**[19, 963]**	**417**	**31,668**	**100.0**

Table 4: Number of serviced calls by month

The NAO also noted that higher percentages of calls were registered between Monday and Friday (ranging between 16.4% and 20.3%) and lower percentages over the weekend (ranging between 4.3% and 7.8%).

Week day	Min: Max	Average	Total	%
Monday	[27, 963]	584	6,428	20.3
Tuesday	[117, 820]	513	5,644	17.8
Wednesday	[67, 764]	495	5,445	17.2
Thursday	[154, 780]	512	5,117	16.2
Friday	[148, 756]	472	5,195	16.4
Saturday	[45, 412]	224	2,468	7.8
Sunday	[19, 279]	125	1,371	4.3
Total	**[19, 963]**	**417**	**31,668**	**100.0**

Table 5: Number of serviced calls by week day

The NAO noted that all service calls were categorised in four different categories being:

- Appointments and Fieldwork – consisting of public queries about the role of Enumerators, fieldwork process, etc.
- Online form Assistance – consisting of queries on how to fill out the Census online form – focusing on the tool itself not the questionnaire.
- Questionnaire Queries – public queries about the Census questionnaire and/or specific questions.
- Other.

The NAO observed that as depicted in Table six below, the majority of the calls (35.9%) pertained to queries about the questionnaire and its contents.

Month	Appointments and Fieldwork	Online Form Assistance	Questionnaire Queries	Other	Total
October	3.0	15.1	30.7	51.2	100.0
November	5.2	13.7	39.3	41.7	100.0
December	4.6	15.6	42.1	37.8	100.0
Total	**4.2**	**14.5**	**35.9**	**45.4**	**100.0**

Table 6: Percentage of serviced calls by type and month

Source: NSO Status Report

4.6 COVID-19 Impact

The COVID-19 pandemic impact was an unprecedented one and as the United Nations Population Fund stated in its Technical Brief on the Implications of COVID-19 on Census – "*National statistics Offices do not routinely have census contingency plans for global health emergencies – and there is little experience…*."[7].

Furthermore, the COVID-19 pandemic came at a time when Censuses were at an advanced stage of preparation. In fact, the Census modality and alternative data collection approaches could not be considered, due to the fact that to implement such approaches from scratch, it implied extensive planning and technical guidance and could not be carried out in the limited timeframes available.

The United Nations Population Fund had also warned about supply chain disruptions, which was stalling the procurement of ICT equipment (such as tablets), public anxiety about possible transmission of the virus, and the health risks to field staff. In view of the latter, the United Nations Population Fund stated that "*a simple postponement of the planned census approach is more prudent*." It also offered help with meeting anticipated needs for tablets, and its Headquarters offered help to capitalise on sharing and leasing tablets between countries.

The NAO noted that the NSO had no issues with the technological side or the procurement side. It had also been planning to provide CAWI and CATI options prior the COVID-19 pandemic struck and thus, COVID-19 only accelerated and reinforced the plans to go digital. The NAO however noted that the Census processes had to be delayed by one month, in consultation with the health authorities given the COVID-restrictions issued by the Public Health. The NSO also found difficulties in finding an adequate venue to hold Enumerators training where the necessary social distancing is maintained. The NAO was informed that such meetings had to be carried out in three sessions, so as to comply with social distancing regulations. The NSO also had to keep track of any Enumerators testing positive to COVID-19, during the Census process, to make the necessary arrangements to replace them.

Notwithstanding the above, the COVID-19 pandemic brought about a strong drive towards an online Census with less dependency on paper questionnaires and face to face interviews. The respondents' possible reluctance to receive Enumerators in their homes, out of fear of possible exposure to the transmission of the virus, could have been a contributing factor which promoted online participation and telephone interviews.

[7] https://www.unfpa.org/sites/default/files/resource-pdf/Census_COVID19_digital.pdf

4.7 Conclusions and Recommendations

As stated in Section 4.2, the NAO considers a 56% online submission rate as one of this project's success factors. However, the NAO recommends that the NSO analyses the demographics of online respondents by age and town/village. Such data can help the NSO understand the challenges of these respondents, and devise plans how to combat these challenges, in order to improve the percentage of online submissions further. Such plans can also be done in collaboration with other entities, which may be better geared towards increasing IT literacy amongst all strata of the population.

The NAO noted that the majority of serviced calls (35.9%) pertained to queries about the questionnaire and its contents. The NAO thus suggests that should another online survey be made, inbuilt help text is included with all data fields, so that the respondent would have the facility to get help on each question immediately, whilst answering the questionnaire itself.

The NAO strongly recommends that the NSO considers the use of administrative registers for Census data collection instead of issuing questionnaires. This data collection method has a number of benefits especially if it is the sole source for the compilation of Census data. However, one can only opt for such a method, if the format and quality of data in administrative registers, matches that required for the Census. This topic is covered in greater detail in Chapters five and six.

Chapter 5| Comparative Analysis of Census Costs

Based on Article 5 of Regulation (EC) No 763/2008 on Population and Housing Censuses which stipulates: "*... it is necessary for the collection of statistics to conform to the principles of... cost-effectiveness and statistical confidentiality.*", the NAO deems it imperative that the cost-effectiveness of such large-scale projects is analysed and evaluated.

The NAO had thus planned to evaluate the cost of conducting the Malta 2021 Census and compare it with that of other countries. However, the NAO only managed to get hold of the 2021 Census costs pertaining to the UK.

The NAO however observed that in 2013, the United Nations Economic Commission for Europe (UNECE) conducted an online survey among its member countries. This survey documented the 2010 round of Population and Housing Censuses and presented an overview of the main results of this survey including the provisional Census costs amongst 43 countries[8]. The NAO extracted the provisional costings of Censuses conducted in a selected number of European countries and compared such costings with the local scenario. The NAO also compared the costs of Censuses conducted using different data collection methods (Refer to Sections 5.4.1 and 5.4.2).

5.1 Cost of the 2011 Census

The NAO noted that the total cost of the Malta 2011 Census of population and housing was circa USD 2,053,167 with an approximate cost per capita of USD 4.93.

Malta has in 2011 carried out a traditional based census. A traditional Census refers to a Census in which *"members of the public are requested to respond to a Census questionnaire and where a field force of enumerators is involved in the field operation either delivering blank forms or collecting completed ones, or both."*[9]

The NAO delved into the UNECE study mentioned above and compared the cost of the Malta 2011 Census with that of other European countries who carried out a Census using the traditional data collection method used in the Malta 2011 Census. The NAO noted that the highest per capita costs were those of Ireland (USD 18.21) and Italy (USD 13.85) whilst the lowest per capita costs were those Bulgaria (USD 1.83), the Republic of Moldova (USD 2.15) and Romania (USD 2.93). The median[10] cost per capita was that of France at USD 6.22 per capita. As indicated in Figure 11, the cost per capita of the Malta Census 2011 (USD 4.93) is the sixth lowest and below the average cost per capita of these countries (USD 7.17).

[8] https://unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.41/2013/census_meeting/20_E_rev__4_.pdf
[9] https://unstats.un.org/unsd/demog/docs/symposium_12.htm
[10] Median values are less influenced by extreme values than average values.

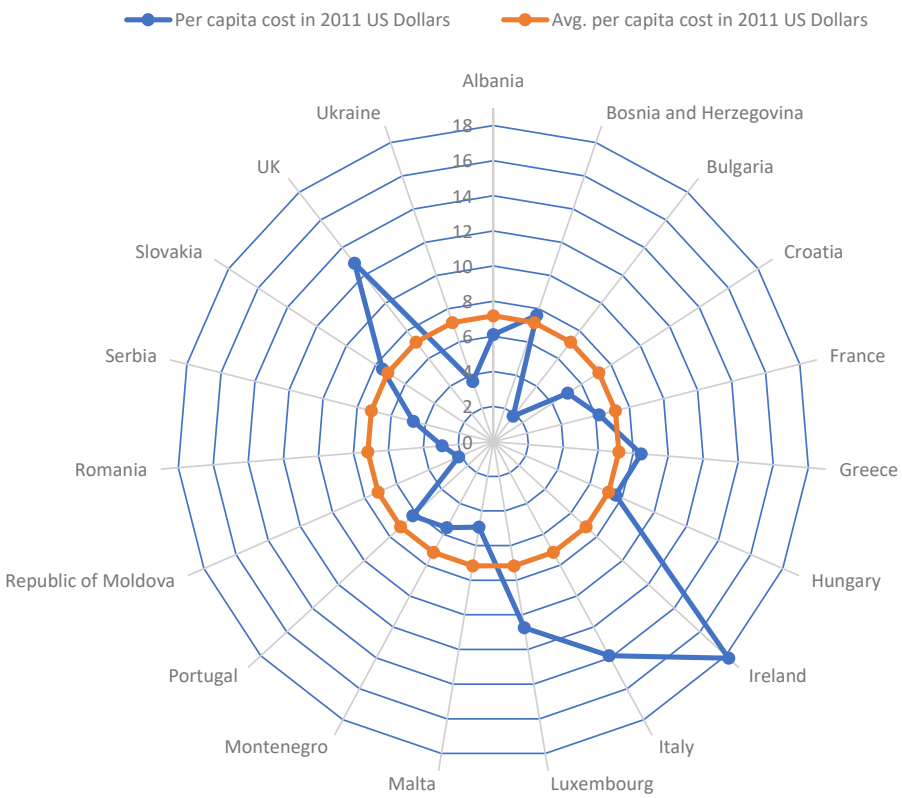


Figure 11: Cost Comparison of the 2011 Census

5.2 Overall Cost per Capita – 2011 and 2021 Census

The NAO noted that the total cost of the 2021 Census was of €3.101million. Considering that the population of Malta and Gozo is estimated to be about 519,562[11] persons the approximate cost per capita is of €5.97.

The NAO compared the latter with the total cost of the 2011 Malta Census and noted that the 2011 Census was carried out at a total cost of €1.5million which when considering that the population of Malta and Gozo at the time was 423,417, the approximate cost per capita was of €3.54.

Given the 10-year lapse since the last Census and the decision to opt for an online self-response survey which necessitated a major IT investment that included an investment of €365,200 in tablets that were given to each Enumerator. Whilst the NAO observed that the budget estimates provided by the NSO included an estimate of €505,000 covering "Cost of hardware and licences (including CAWI, CAPI, licences, Blaise Support)" and €10,000 for "Coding", the total estimated cost of developing the self-response survey software application was not available to this Office.

[11] Preliminary report- https://census2021.gov.mt/results/

The NAO also observed that the total number of employees working on the 2011 Census stood at 1108 and the total number of employees working on the Census in 2021 stood at 1,047 as per the table below.

	2011	2021
Number of Enumerators	1,021	990
Number of Supervisors	81	50
Number of District Managers	6	7
Totals	1,108	1,047

Table 7: Total Number of Employees working on the Census in 2011 and in 2021

5.3 Cost Comparison with other Countries vis-à-vis the 2021 Census

Whilst comparing the 2021 Census cost with that of other countries, the NAO noted that most other countries were still in the process of publishing their official costings and thus severely limiting the planned cost comparison exercise.

When looking at UK 2021 Census costs, the NAO, noted that the UK Office for National Statistics[12] stated that: "*The Census is part of a bigger modernisation programme in the Office for National Statistics which will bring controlled online access to ONS's data collections, and which will integrate other sources of data with ONS survey data to create new insights and new and quicker ways of sharing statistics. This modernisation is happening over an 11-year period, improving the way ONS collects, processes and shares its statistics. The cost of this modernisation, including all costs for the 2021 Census, over the 11 period is around £900million – less than £1.50 per person (in England and Wales) a year over 11 years*."

The NAO observed that the UK's 2021 census cost per capita of £1.50 is much less than the cost per capita of the Malta 2021 census of €5.97 (equivalent to about £5.24).

5.4 Cost Comparison Grouped by Census Method

The NAO noted that the study[13] conducted by the UNECE that was mentioned in Section 5.1, also listed the Census provisional costs of countries who in the 2010 round of Censuses opted for a combined Census method or a registered Census method.

The NAO delved into the above-mentioned study, and compared the costs of Census that were conducted in other European countries that unlike Malta, opted for the combined Census method or a register-based Census method.

[12] https://www.ons.gov.uk/aboutus/transparencyandgovernance/eedomofinformationfoi/2021censuscostsdatasharingfinesdatasecurityandquestions

[13] https://unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.41/2013/census_meeting/20_E_rev__4_.pdf

5.4.1 Combined Census Method

The NAO compared the provisional costs incurred to conduct the 2010 round of Censuses amongst seven European countries who opted for the combined Census method. It must be noted that three of these countries namely Estonia, Latvia and Lithuania carried out a full enumeration, whilst the other countries did not.

As indicated in Figure 12 below, Estonia and Germany had the highest per capita cost with USD 13.98 and USD 12.76, whilst the lowest per capita costs were those of Spain (USD 2.56) and Switzerland (USD 2.69). The median[14] per capita cost was that of Lithuania at USD 3.94.

As indicated in the chart below, the average cost per capita of the combined Census conducted in these countries was that of USD 6.38.

The NAO observes that the combined Census method per capita cost of USD 6.38 is similar to the traditional Census method per capita cost of USD 7.17 and both figures are above the per capita cost of the traditional Census held in Malta in 2011 (USD 4.93).

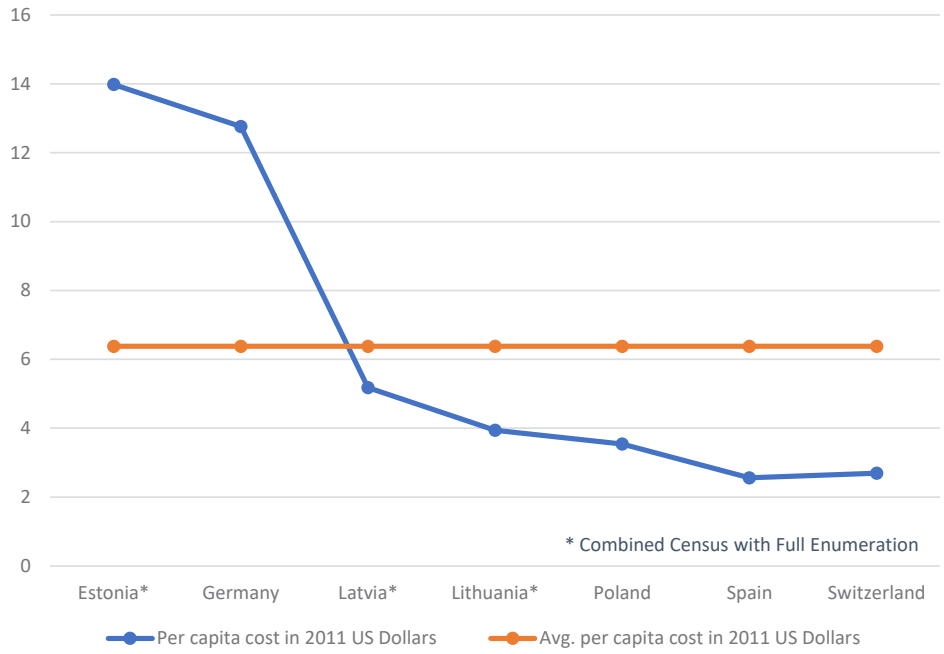


Figure 12: Cost Comparison - Combined Census

[14] Median values are less influenced by extreme values than average values.

5.4.2 Register-based Census Method

The NAO compared the provisional costs amongst seven European countries who opted for the Register-based Census method.

As indicated in Figure 13 below, Austria and Sweden had the highest cost per capita with USD 1.64 and USD 0.71, whilst the lowest cost per capita were those of Slovenia (USD 0.03) and Denmark (USD 0.07). The median cost per capita was that of Finland at USD 0.24.

As indicated in the chart below, the average cost per capita of the register-based census conducted in these countries was that of USD 0.47.

The NAO observed that the Register-based Census method cost per capita of USD 0.47 provided the best value for money and is much cheaper than the traditional Census method cost per capita of USD 7.17, or the combined Census method cost per capita of USD 6.38. It is also much cheaper than the cost per capita of the traditional Census held in Malta in 2011 (USD 4.93).

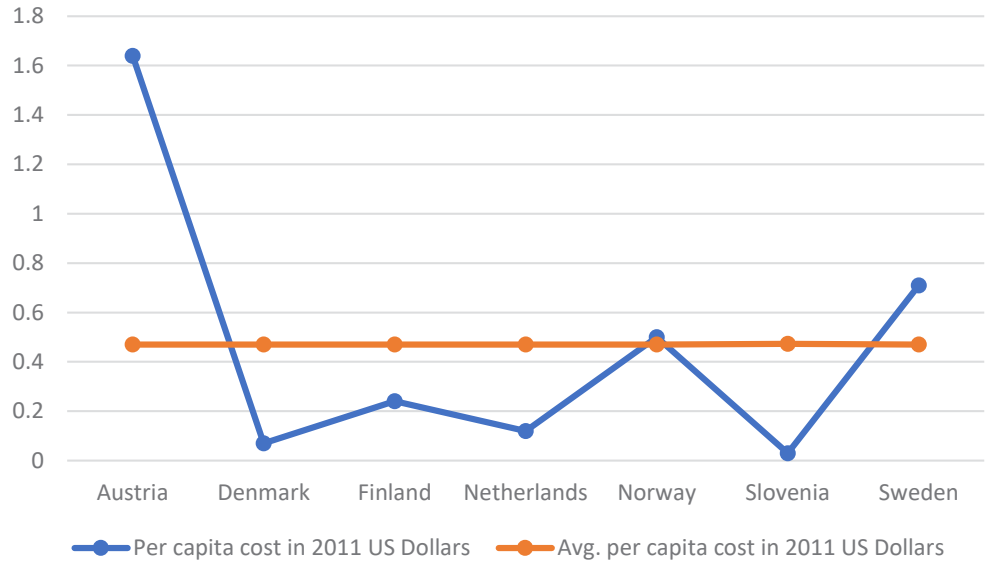


Figure 13: Cost Comparison - Register-Based Census

5.5 Conclusions and Recommendations

The NAO commends the NSO for the investment made in ICT infrastructure, which was not just useful for the 2021 Census data collection but will also be an asset for other similar nationwide surveys. The NAO however recommends that the NSO compiles a full breakdown of the cost for the implementation of the 2021 Census, which would cover all resources, IT hardware and software used for the exercise. Once this cost is calculated, the NSO should compare the 2021 per capita cost with the 2011 per capita cost and analyse the elements for the difference.

The NAO noted the relatively low 2021 Census per capita costs of other European countries, when using the Register-based data collection method (Refer to Section 5.4.2) as opposed to the other data collection methods. The NAO strongly recommends that the NSO considers the adoption of this data collection method for future Censuses. It is also recommended that initially an independent and comprehensive gap analysis is carried out on the current state of data registers to identify the changes required to match the required Census data fields. Furthermore, the NAO recommends the setting up of an inter-Ministerial committee to oversee the implementation of the changes and improve the cooperation from data sources.

Chapter 6| Lessons Learnt

The NAO noted the "*EU Census post-2021 programme paper*" issued by the Directorate for Social Statistics within the European Commission[15]. This paper presented a possible vision for the collection of population statistics after the 2010 round of Population and Housing Censuses and acknowledged the growing use of data from administrative sources. It also highlighted the user demands for more frequent and more timely data then that currently available from decennial Censuses. In this regard, the paper proposes the collection of annually updated data from the mid-2020s onwards.

As observed in Chapter five above, it is highly appropriate to move away from the traditional Census data collection method and introduce cost-effective Census methods that collect the data from other administrative registers/sources. This Census data collection method is generally referred to as a Register-based Census.

A Register-based Census "*is built around a set of Base registers that contain comprehensive data on the units that are to be described in the Population and Housing Census. These Statistical registers may include the data maintained in a Population register, a Register of buildings and dwellings, as well as data from a business register. Such Registers cover all people resident in the country, the buildings and dwellings in the country and all the business companies (including all the institutions in the public sector) and their establishments. All Statistical units can be linked to one another by means of the identification systems: persons can be linked to Household-dwelling units and to the dwellings and buildings in which they live, while employed persons can be linked to their employers. Similarly, all units can be located on the maps by using local area codes or map co-ordinates.*"[16]

6.1 Data Collected from Administrative Registers

The NAO noted that the NSO had made great efforts to move away from the traditional approach of collection Census data through a population survey. The NAO is informed that as from the 2011, Census administrative registers have been used, before, during or after the collection of Census data for verification and validation purposes. The NAO is also informed that in line with the Census Act (Chapter 118), administrative registers were also used to help identify residents according to the sign of life principle who may not have responded to the Census questionnaire, but were clearly living on the islands as per numerous administrative registers. The NAO noted that the NSO has used at least 11 administrative registers for the completion of the various stages of the 2021 Census.

The NAO also noted that in February 2020, the NSO issued a memorandum to the then Ministry for Finance and Financial Services highlighting the necessity of a Population register and Register-based Censuses.

[15] https://circabc.europa.eu/sd/a/69279cc4-b627-473b-ad8f-89c623de6567/DSSB-2016-Jun-%205%20EU%20Census%20post-2021.pdf
[16] https://ec.europa.eu/eurostat/cros/content/register-based-census_en

6.2 Population Register

The NAO noted that Malta does not have a Population register. Such register would facilitate the highly detailed annual population statistics as required by Eurostat.

The NAO observed that the NSO has compiled a very detailed document listing how this register is currently being compiled from seven different databases. This document also listed the shortcomings of each of these databases vis-à-vis the Population register.

The NAO also noted that the NSO issued a memorandum to the then Ministry for Finance and Financial Services (separate from the one mentioned in Section 6.1) making a case for a Population register for Malta.

6.3 Data Quality

The NAO is aware that adopting a Census data collection method that is based on administrative data using other data sources depends on the quality of the data obtained from these alternative sources. The NSO thus needs to ensure that it has access to comprehensive data registers that are of sufficient quality to allow it to undertake such an exercise.

Furthermore, data availability and coverage may also hamper NSO's intention to move towards Register-based Censuses. The NAO is aware that in order to fully benefit from the use of administrative sources, the NSO needs to have the possibility of linking the individual sources at record level.

6.4 Conclusions and Recommendations

The NAO commends the efforts made by the NSO to move towards having a Register-based Census. The NAO is aware that such Census depends on the quality, availability and completeness of the administrative registers. Such registers are not under the control of the NSO, and were originally created for diverse purposes. The NAO thus recommends that a inter-Ministerial committee is set up to oversee the move towards implementing a Register-based Census. Such taskforce should utilise the experience of the NSO personnel and facilitate the co-operation of Government departments and entities so as to help all parties involve understand the important role of registers, improve the quality of the relevant registers and assure that these would be coherent and adequate for Census purposes. The NAO also recommends that this committee oversees the implementation of a Population register.

Chapter 7| Management Comments

The Census of Population and Housing held every decade is a very complex exercise and every edition presents its own specific challenges. Because of its importance as a benchmark for a wide variety of statistics for the ten years following it, and because of the big amounts of financial, human and other resources invested in it, the NSO garners an all-round office-wide effort to ensure its success.

During the planning stages of the Census in 2020 and the first months of 2021, the NSO decided to introduce a number of innovations, and these mainly involved IT. In this the NSO was aligning itself with the practices of National Statistical Institutes throughout the European Union, which were conducting modern censuses in their countries. Two such innovations were Computer Aided Web Interviewing (CAWI) and Computer Aided Personal Interviewing (CAPI). The online completion option proved to be a success with respondents. Through the use of CAWI and CAPI, the NSO:

- strengthened the security of its data collection;
- eliminated data entry, thus reducing human error and effecting savings on payments to data entry operators; and
- significantly rationalised the use of paper.

As it happened, the technological advances introduced by the NSO in Census 2021 proved providential considering that the data collection coincided with a time when Malta was in the grip of the COVID-19 pandemic. In response to the situation, the NSO added Computer Aided Telephonic Interviewing (CATI) to its range of technological tools. The benefits of CATI were twofold: people who were averse to having interviewers in their homes could conduct the interviews telephonically and, as a result and crucially, the response to the Census was not impacted negatively.

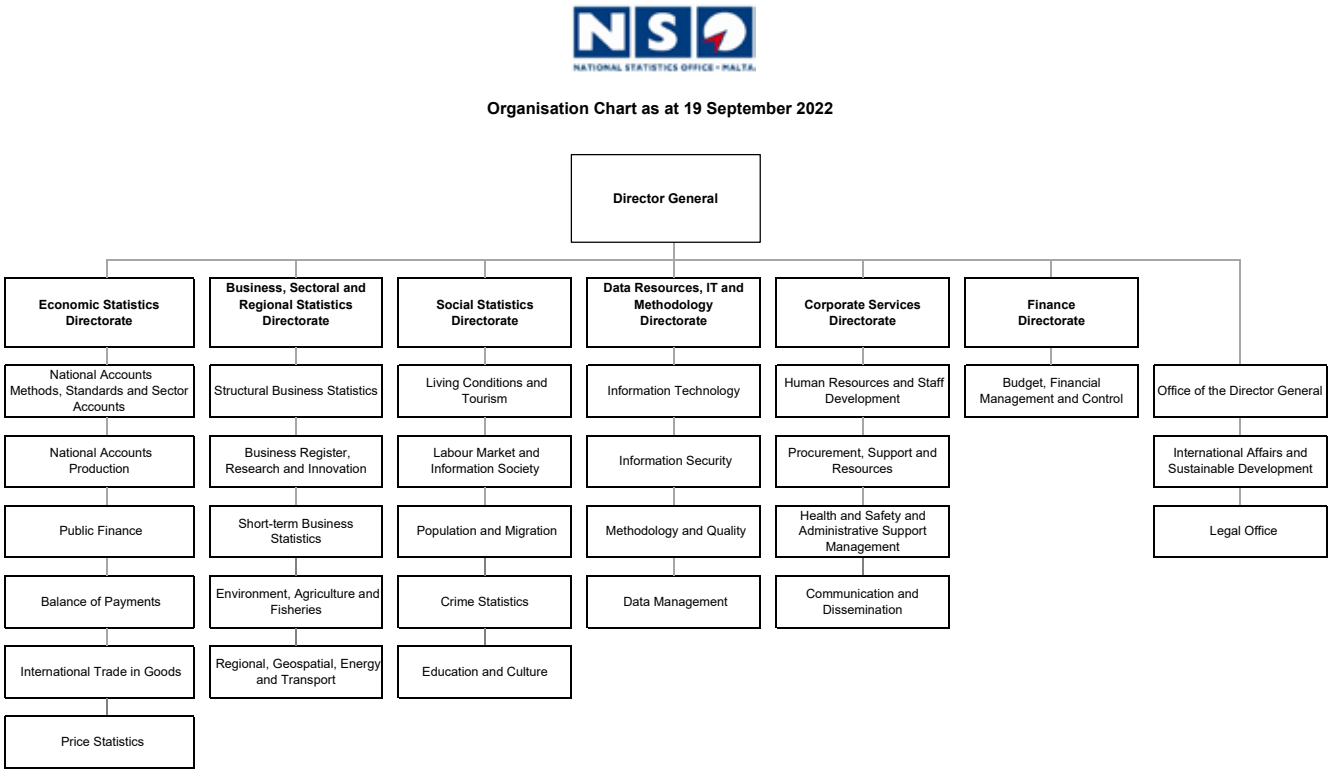
Sophisticated technology, however, was not used only to accommodate the circumstances of different people or to ensure response. For the first time, spatial mapping was introduced in Census 2021. The advantages of this innovation will come in evidence at the dissemination stage of the various Census reports. Geospatial dimensions will make possible the spatial analysis of data at the level of 1km squared grid. This will widen the use of Census data to levels not seen up to now, helping researchers in diverse sectors such as route setting, tracking transportations, and establishing correlations between people and services, among many others.

The NSO faced a considerable disadvantage when compared to its counterparts. Many National Statistical Institutes in the EU Member States had the option to collect the majority of the Census data from administrative registers and therefore did not carry out a traditional Census. This was not an option for the NSO. Registers in our country are not aligned to definitions underpinning Census methodology. Additionally, several of them exhibit limitations of quality, making it inadvisable to use them as a basis for the Census. In view of this, their use was limited to verification of certain aspects that emerged in the primary data collection.

Conclusion

The NSO is working actively to encourage more and better collaboration with administrative data sources including through amendments and upgrades to its governing legislation. These initiatives would involve work on registers to align them with statistical data needs. Apart from improving the quality of data, steps in this direction would enable the NSO to cut down on data collection costs and lessen the burden on respondents. Increased awareness, across the public service and public sector, of the need to upgrade administrative registers and make them suitable to be used for the purpose of official statistics, would be invaluable to the NSO and to Malta at the national level. Public entities, such as the National Audit Office by means of its recommendations, could support the NSO in the raising of awareness.

Annex A| Organisation Structure



Annex B| Specimen Letter

Numru ta' Referenza/Reference Number [redacted]

L – Okkupant/The Occupant
170
TRIQ [redacted]
BORMLA BML 1[redacted]7
13 ta' Settembru 2021

ĊENSIMENT TAL-POPOLAZZJONI U TAD-DJAR 2021

Għażiż/a Sinjur/a,

L-Uffiċċju Nazzjonali tal-Istatistika (NSO) qed iniedi ċ-Ċensiment tal-Popolazzjoni u tad-Djar li se jsir matul Ottubru u Novembru 2021. Dan jikkonsisti fl-għadd uffiċjali tal-popolazzjoni u tad-djar kollha f'Malta u Għawdex sa nofsillejl tal-21 ta' Novembru 2021. Għall-ewwel darba, se jkun possibbli li tipprovdi l-informazzjoni meħtieġa permezz ta' kwestjonarju li jimtela *online*.

Hawn taħt għandkom issibu d-dettalji meħtieġa sabiex taċċessaw din l-applikazzjoni permezz tal-link għas-sit elettroniku. Intom ġentilment mitluba timlew l-informazzjoni **għall-persuni kollha li jgħixu f' din ir-residenza**.

***Link* għas-Sit Eletroniku**	https://census2021online.gov.mt/
Numru ta' Referenza	[redacted]
Password:	[redacted]

Tista' timla u tibgħat il-kwestjonarju *online* sat-**28 ta' Novembru 2021. Il-kwestjonarju mhux se jibqa' iktar aċċessibbli wara din id-data.**

Jekk m'għandekx aċċess għall-internet jew mintix f'pożizzjoni li timla' l-kwestjonarju taċ-Ċensiment waħdek, tista' titlob l-għajnuna tal-enumeratur meta jżur/żżur id-dar tiegħek bejn **it-8 ta' Novembru 2021 u t-28 ta' Novembru 2021**. Tista' wkoll tikkuntattjana permezz tal-*freephone* 1710 jew billi tibgħat *e-mail* fuq census2021@gov.mt.

Il-parteċipazzjoni fiċ-Ċensiment hija obbligatorja u din l-informazzjoni qed tintalab skont l-Att taċ-Ċensiment ta' Malta tas-sena 1948 u l-Att tal-Protezzjoni u l-Privatezza tad-Data – Kap. 586 tal-Liġijiet ta' Malta li jimplimenta r-Regolament Ġenerali dwar il-Protezzjoni tad-Data (GDPR). L-Uffiċċju jassigura li t-tagħrif li jingħata jinżamm kunfidenzjali u jintuża għal skopijiet uffiċjali ta' statistika biss, skont l-artikli u d-derogi stipulati fil-liġijiet msemmija hawn fuq. L-Uffiċċju huwa obbligat li jħares l-identità tiegħek u l-ebda tagħrif personali jew informazzjoni li tista' twassal għall-identifikazzjoni ta' persuni jew entitajiet ma tingħata lil terzi persuni.

Nirringrazzjak bil-quddiem tal-parteċipazzjoni tiegħek f'dan iċ-Ċensiment.

Dejjem tagħkom,

Etienne Caruana
Uffiċjal taċ-Ċensiment

Annex C| COBIT Controls

COBIT defines IT activities in a generic process model within four domains[17]. These domains are Plan and Organise, Acquire and Implement, Deliver and Support, and Monitor and Evaluate as depicted in Figure 16. The domains map to IT's traditional responsibility areas of plan, build, run and monitor.

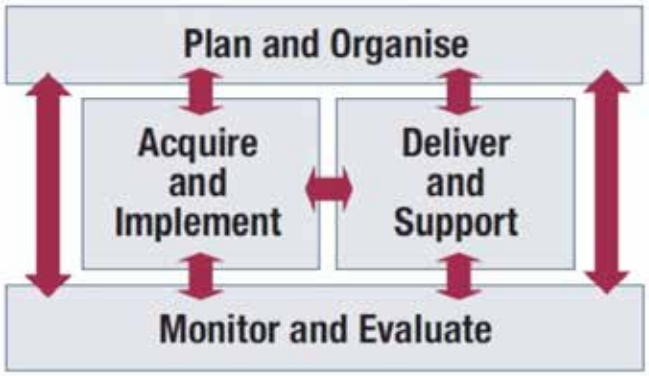


Figure 16: The Four integrated domains of COBIT

Plan and Organise

This domain covers strategy and tactics, and concerns the identification of the way IT can best contribute to the achievement of the business objectives.

Define a Strategic IT Plan

IT strategic planning is required to manage and direct all IT resources in line with the business strategy and priorities. The IT function and business stakeholders are responsible for ensuring that optimal value is realised from project and service portfolios. The strategic plan improves key stakeholders' understanding of IT opportunities and limitations, assesses current performance, identifies capacity and HR requirements, and clarifies the level of investment required. The business strategy and priorities are to be reflected in portfolios and executed by the IT tactical plan(s), which specifies concise objectives, action plans and tasks that are understood and accepted by both business and IT.

Assess and Manage IT Risks

A risk management framework is created and maintained. The framework documents a common and agreed-upon level of IT risks, mitigation strategies and residual risks. Any potential impact on the goals of the organisation, caused by an unplanned event, is identified, analysed and assessed. Risk mitigation strategies are adopted to minimise residual risk to an accepted level. The result of the assessment is understandable to the stakeholders and expressed in financial terms, to enable stakeholders to align risk to an acceptable level of tolerance.

[17] COBIT 4.1 Framework- http://www.isaca.org/Knowledge-Center/cobit/Documents/CoBit4.pdf

Acquire and Implement

To realise the IT strategy, IT solutions need to be identified, developed or acquired, as well as implemented and integrated into the business process.

Manage Changes

All changes, including emergency maintenance and patches, relating to infrastructure and applications within the production environment, are formally managed in a controlled manner. Changes (including those to procedures, processes, system and service parameters) are logged, assessed and authorised prior to implementation and reviewed against planned outcomes following implementation. This assures mitigation of the risks of negatively impacting the stability or integrity of the production environment.

Install and Accredit Solutions and Changes

New systems need to be made operational once development is complete. This requires proper testing in a dedicated environment with relevant test data, definition of rollout and migration instructions, release planning and actual promotion to production, and a post-implementation review. This assures that operational systems are in line with the agreed-upon expectations and outcomes.

Deliver and Support

This domain is concerned with the actual delivery of required services, which includes service delivery, management of security and continuity, service support for users, and management of data and operational facilities.

Define and Manage Service Levels

Effective communication between IT management and business customers regarding services required is enabled by a documented definition of, and agreement on, IT services and service levels. This process also includes monitoring and timely reporting to stakeholders on the accomplishment of service levels, and enables alignment between IT services and the related business requirements.

Manage Third-party Services

The need to assure that services provided by third-parties, (suppliers, vendors and partners) meet business requirements requires an effective third-party management process. This process is accomplished by clearly defining the roles, responsibilities and expectations in third-party agreements, as well as reviewing and monitoring such agreements for effectiveness and compliance. Effective management of third-party services minimises the business risk associated with non-performing suppliers.

Ensure Continuous Service

The need for providing continuous IT services requires developing, maintaining and testing IT continuity plans, utilising offsite back-up storage and providing periodic continuity plan training. An effective continuous service process minimises the probability and impact of a major IT service interruption on key business functions and processes.

Ensure Systems Security

The need to maintain the integrity of information and protect IT assets requires a security management process. This process includes establishing and maintaining IT security roles and responsibilities, policies, standards, and procedures. Security management also includes performing security monitoring and periodic testing, and implementing corrective actions for identified security weaknesses or incidents. Effective security management protects all IT assets to minimise the business impact of security vulnerabilities and incidents.

Manage the Physical Environment

Protection for computer equipment and personnel requires well-designed and well-managed physical facilities. The process of managing the physical environment includes defining the physical site requirements, selecting appropriate facilities, and designing effective processes for monitoring environmental factors and managing physical access. Effective management of the physical environment reduces business interruptions from damage to computer equipment and personnel.

Manage Operations

Complete and accurate processing of data requires effective management of data processing procedures and diligent maintenance of hardware. This process includes defining operating policies and procedures for effective management of scheduled processing, protecting sensitive output, monitoring infrastructure performance and ensuring preventive maintenance of hardware. An effective operation management helps maintain data integrity and reduces business delays and IT operating costs.

Monitor and Evaluate

All IT processes need to be regularly assessed over time for their quality and compliance with control requirements.

Provide IT Governance

Establishing an effective governance framework includes defining organisational structures, processes, leadership, roles and responsibilities to ensure that enterprise IT investments are aligned and delivered, in accordance with enterprise strategies and objectives.

2021-2022 (to date) Reports issued by NAO

NAO Annual Report and Financial Statements

July 2022	National Audit Office Annual Report and Financial Statements 2021

NAO Audit Reports

December 2021	Performance Audit: A Strategic Overview on the Correctional Services Agency's Operations at the Corradino Correctional Facility
December 2021	Report by the Auditor General on the Public Accounts 2020
December 2021	Report by the Auditor General on the workings of Local Government for the year 2020
December 2021	An audit of matters relating to the concession awarded to Vitals Global Healthcare by Government Part 2 | A review of the contractual framework
May 2022	Performance Audit: Assisting Individuals with Dementia and their Caregivers within the Community
May 2022	Joint Report on Management of Plastic Waste in Europe
May 2022	Ministry for Finance and Employment: An Analysis on Revenue Collection Financial Year 2020
June 2022	An evaluation of performance audits in the public sector: Common audit findings (2017 – 2020)
June 2022	Follow-up Audits Report by the National Audit Office Volume I 2022
July 2022	Performance Audit: Procuring the Public Transportation Service
October 2022	The COVID-19 pandemic - Business continuity within the public administration
October 2022	Performance Audit: A Follow-up on the 2018 Strategic Overview of Mount Carmel Hospital
November 2022	Follow-up Audits Report by the National Audit Office Volume II 2022
November 2022	Report by the Auditor General on the workings of Local Government for the year 2021
November 2022	Performance Audit: Care for the Elderly in Gozo