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Modern Means and Technology Used in
the Oman Census Programme[*]

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INTRODUCTION

1. The use of modern technology and new methodologies has been key to distinguishing characteristics of the 2003 General Census of Population, Housing and Establishments. While some of the methodologies employed were improvements over processes used in the 1993 Census, others were simply innovative techniques never used before in census-taking.

2. In fact the many new organisational, technical and procedural features of the 2003 Census are far too numerous and diverse to be all reviewed in this paper. However, the most notable feature that distinguished this Census from the previous undertaking concerns the application of modern technology during the various phases of the census programme. This effective use of technology was the defining quality of the census, which played a crucial role in the planning, organization and management of the various elements of the census.

3. Accordingly, the contents of this paper will focus on the various modern methods and technologies that were employed in the implementation of the Oman 2003-Census, besides other key features of this national undertaking.

4. It must be mentioned here that this paper's emphasis on technology is in no way aimed at undermining the importance and significance of the previous census. Those involved in the 1993 Census made the best possible use of available technology and expertise. Lessons learnt from that census enabled us to explore and embrace some of the modern methodologies that were used in the latest census.

5. However, it must be stressed that the modern technology used in the 2003 census was largely for experimental purposes. This paper will not address the overall impact of technology on the final outcome of the census, nor provide an assessment of the financial benefits of its use to the project.

6. Hand-Held Devices (HHD) used in counting the population and housing units in Muscat Governorate, the largest region in the Sultanate, were among the modern technologies and methods employed in the 2003 Census. These devices were the focus of a workshop, and their use is briefly highlighted in this paper.

I.   DEVICES AND MODERN TECHNOLOGY USED IN THE OMAN CENSUS

7. The mere provision of modern devices and technologies does not guarantee per se the successful organization, management and implementation of a major statistical operation, such as a census. It depends largely on the ability of those in charge to make the most of the capabilities offered by these devices and technologies, and put them to effective use. Computers, for example, are now at the disposal of organizations overseeing census operations anywhere in the world. However the real challenge is to make effective use of these machines to meet specific objectives of the Census programme. While listing some of the modern devices and technologies used in the Omani census, this paper will also outline the methodology and areas of their use. The following are the devices and main techniques employed in the 2003 Census:

a.   Satellites – aerial photos
b.   Geographical Information System (GIS)
c.   Global Positioning Systems (GPS)

d.   Computers and associated software and databases
e.   Internet
f.   Intranet
g.   Communication devices of all types:
   (i) Cell phone
  (ii) Fax technology
 (iii) Fixed line network
h.   Handheld Devices

8. The afore-mentioned equipment and technologies were applied in a variety of ways and areas. However, the most prominent applications were as follows:

A. In mapping:
a.   Inventory of population clusters
b.   Fixing the population clusters on the maps at their correct locations.
c.   Dividing the Sultanate into enumeration and supervision areas.
d.   Updating the lists of buildings and their enclosures (houses - establishments - households - individuals)

B. In organizing and managing the field system of the Census:
e.   Determining the components of the work areas
f.   Distributing works over the work areas.
g.   Training the staff involved in the enumeration process.

C. In the distribution, retrieval, storage and exchange of the records (keeping the questionnaires):
h.   Determining the required numbers of records for each block and enumeration area.
i.   Retrieval of records from the enumerators and computing the preliminary results.
j.   Receipt and storage of records from the field.
k.   Documenting the operations of the records exchange in the manual and electronic computation of data.

D. In communicating with the field staff and monitoring their performance – Intranet:
i.   Communications
j.   Following-up the work of the enumerators and monitoring their performance
k.   Following-up the preliminary results of the enumeration.
l.   Using the databases

E. In the census information programme

F. In the census of establishments

G. In the preparation of data

H. In the Population, Housing and Establishments Census in Muscat Governorate

A. Mapping programme

9. The mapping programme for the Census 2003 was drastically different from that of the previous census. The latest mapping not only produced a quantitatively better result, but were also qualitatively superior as well. Three basic characteristics distinguish the mapping programme for the 2003 Census from 1993 Census:

    a.   It was broader in scope
    b.   Modern techniques were used in its implementation
    c.   The resulting maps were used in many ways in the census programme

10. In preparation for the mapping programme, the Sultanate of Oman was divided into enumeration areas, which in turn were further broken down into supervision areas. As the maps were to serve as the basis and starting point for the whole census programme, we set out to do the following:

    a.   Prepare an inventory of all the population clusters on Omani territory.
    b.   Prepare the administrative divisions of the Sultanate (Governorates\Regions - Wilayats) and pinpoint the population clusters on the maps.
    c.   Divide the population clusters that are more than 50 housing units in number into Census Blocks.
    d.   Prepare maps of all these Blocks, define their borders and their key features and structures.
    e.   Use these Census Blocks to establish the enumeration and supervision areas.

11. However, in addition to updating the above, the mapping programme for the Second Census also included the following:

    a.   Numbering and categorizing the buildings and their enclosures in terms of houses, establishments, households and individual units within each Census Block, and fixing the Census Numbers on the walls of the entrances of buildings using metal plates.
    b.   Collecting some data about each listed building and preparing such data in order to obtain statistical indicators. This process is considered as a brief census of buildings in the Sultanate.
    c.   Collecting specific information about each population cluster in the first administrative census of its kind in the Sultanate.
    d.   Listing inhabited mountains and hills as distinct geographical regions, and identifying all population clusters located within them.

12. The results of these initiatives were beneficial spin-offs of the mapping works programme for 2003, although these were accomplished with some additional financial cost. Implementation of the mapping works programme involved the use of advanced systems, equipment and technologies that helped achieve qualitatively superior results. These mapping works were as follows:

a. Listing of the population clusters

13. Satellite images were used in updating the population clusters identified and listed during the 1993 Census. These findings were corroborated with field investigations carried out by the specialized surveys undertaken as part of the mapping programme. The clusters and farms showing up on the satellite images were verified on the ground by the field investigators and added to the list if they did not feature in the 1993 list. This helped in the preparation of a comprehensive and updated list of population clusters regardless of their size. The total number of such population clusters far exceeded the 1993 tally. The difference was not due to any shortcoming in the 1993 listing of population clusters. Rather, the reasons are many. The most important factor is that the updated list included many of the clusters that, although appearing in the 1993 list with distinct names, were bunched together with other clusters. With the aim of contributing to a comprehensive and representative census count, it was decided this time around to list all the clusters if they appeared distinct from other clusters and if they had a name of their own.

14. All the data collected about each population cluster was organized into a vital administrative database which was used in the various phases of the census programme. Moreover, the satellite images were used in the preparation of maps for all the administrative divisions of the Sultanate. This was done through the GIS, which is operated by the Geographical Information Systems Department at the Ministry of National Economy.

b. Pinpointing the population clusters on the maps in their correct locations

15. Global Positioning Systems (GPS) were used in reading and recording the coordinates of each location of the population clusters (elevation above sea level, northern and eastern coordinates). This was done in order to fix such clusters on the maps in their accurate positions. In 1993, the positioning of clusters on the map was done in an approximate manner. Later, it was found that many of the clusters were positioned far away from the actual locations on the ground.

c. Dividing the Sultanate into Enumeration and Supervision areas

16. The delineation of population clusters into blocks (or updating of the 1993 population cluster lists) and the eventual computerization of these details resulted in the creation of a GIS database of Census Blocks, among other aspects. Each block in the database was associated with the following information:

- Block Code, which was the code that determines its administrative affiliation: the Governorate\Region – Wilayat-Population Cluster – complex\Hilla – Block Number within the complex\Hilla.
- Reference Number: This was a unique number given to each block by the computer. With the help of this number, data about the block could be instantly retrieved when needed, including the Block code.
- Number of units in the Block: This refers to the number of buildings, establishments, houses, households, persons existing within its borders, from the inventory process conducted within the framework of the mapping works programme.

17. The process of creating enumeration areas was done as follows:

a.   A list was extracted for all Census Blocks in the Sultanate, itemized according to the Wilayat and clusters in each Wilayat, from the inventory data. This list included the following details for each Block:

    (i)   The full geographical administrative classification of the Block (i.e., the administrative and geographical identity codes).

    (ii)   Reference Number.

    (iii)   Number of each type of units in the Block.

b.   Leaving a blank area adjacent to each Block that was sufficient to write a five-digit figure.

c.   The mapping unit utilized such lists and information included therein in establishing the enumeration areas. In the space provided, the enumeration area number (for which each block is affiliated) was written.

d.   Data was entered appropriately, so that each Block bears, in addition to the geographical classification, the Enumeration Area Number to which each Block belongs.[1]

d. Updating the building lists and their enclosures

18. The lists of buildings and houses in each Block, which were obtained through the Mapping Works Programme, were used in dividing the Sultanate into enumeration areas. They were also useful tools for the Supervisors in effectively managing the work of each Enumerator in his\her assigned area. These lists enabled the Supervisor to verify that the Enumerator visited all the buildings in each Block within the assigned area, and that he collected the required data about all the households and persons residing therein.

19. However, in view of the time lapse between the inventory process and the actual enumeration process, it was necessary to update these lists so as to reflect the actual situation. It was also necessary to update these lists as close as possible to the enumeration date. Thus, the supervisors were assigned the task of visiting the buildings in the each block and revising the lists as necessary.

20. The updated lists were then handed over to the special coordinator at the office of Assistant Supervisor to ensure that the database was accordingly amended. The final amended lists were then delivered to the Crew Leaders.

21. It is clear that such coordination was near impossible without the aid of an intranet that enabled the Assistant Supervisor's Office to directly access the buildings database, make the necessary amendments and reprint the updated lists.

22. In the Muscat governorate, however, the updating of the list of buildings was done in a completely different manner. The lists were fed into Handheld Devices (HHD) which were then used for the updating process.

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[1] See page 34 in " The Training Book" in order to know how to determine the Enumeration Area Number and the functions of its components

B. Organization and management of the census field system

a. Determining the components of the work areas

23. After being entered in the database, the Enumeration Number, which consists of five digits, was used in sorting the Blocks and preparing the following list.[2]

> *Supervision areas*: By using the first and second digits of the Enumeration Area Number (from left)
> *Assistant supervisor areas*: By using the first three digits (from left)
> *Crew Leaders areas*: By using the first four digits (from left)
> *Enumeration areas*: By using all the five digits.

24. This operation was carried out immediately following the completion of the division into enumeration areas and their entry into the database. The result was thus:

25. One page was assigned for each Crew Leader area and features a list of the enumeration areas under his\her jurisdiction and the Blocks in each enumeration area, according to the following form:

> Governorate\Region………. Crew Leader Name:………………….
> Wilayat…………..Crew Leader's Area Number………….(4 digits)

Enumeration Area No.	Enumerator Name	Cluster No.	Cluster Name	Hilla No.	Reference No.	Block No.	Number of Houses	No. of Omani HH	Ni. Of Expatriate HH	Total Population

HH: Household

26. The pages of the Crew Leaders falling within the area of the Assistant Supervisor to whom they were assigned, were grouped and stapled together to form the components of the Assistant Supervisor's area. They were prefaced with a page that includes the following details:

> Assistant Supervisor's Area Number …………..(3 digits)
> Name of the Assistant Supervisor:…………………………..

27. The booklets of the Assistant Supervisors in the Supervisor's area were grouped and stapled together in a notebook with a cover page that features the following:

> Supervision Area Number:………………………(2 digits)
> Supervisor's Name:…………………………………
> Wilayat Name:…………………… Code:………………..

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[2] Referred to a lists of Work Area Blocks

b. Distribution of employees over the work areas:

28. After concluding the training course for each category of employees and fixing their names, the work areas numbers were assigned to these names. Accordingly, a database was established containing the names of all those working in the enumeration area with their corresponding work area number.

c. Training of the Enumerators

29. Training curricula summaries, in PowerPoint format, were recorded in CDs and distributed during the training sessions.

30. Additionally, a video was produced depicting an enumerator interviewing the head of a household. The objective was to familiarize the trainees with the ideal method of conducting an interview and the most appropriate approach for asking questions. The video was recorded on CDs and distributed to all the training courses for enumerators.

C. Distribution, retrieval, storage and exchange of records
(preserving the questionnaires)

a. Determining the required number of records for each Block and Enumeration area

31. To effectively carry out his work, the enumerator had many requirements (such as pencils, questionnaire forms, literature…etc.) Each enumerator was given a limited quantity of stationery and literature regardless of the size, nature and location of his assigned area. However, exceptions were made in the case of lists containing the population and housing questionnaires, as their number corresponded to the number of Blocks constituting the enumeration area, population and the number of households in each of them.

32. The records were designed in such a way that each record contained details of the houses and households in a full Block or part of a Block. Noting details of houses of more than one Block in the same record was not permitted. However, in order to reduce wastage, the records were prepared in two sizes. The first contained 20 forms, while the second had only 5 forms. It was therefore necessary to know the number of records needed in each Block. This number was determined with the help of the computer and making use of the geographical database and according to the criteria illustrated in the following table:

Size Category	No. of required records	
House\Household	20 forms' category	5 forms' category
5 or more	4	-
40-49	3	-
20-39	2	-
5-19	1	-
Less than 5	-	1

33. As a result of this exercise we listed the enumeration areas into those that required the 20-form and 5-form records. The required number of records were then added to the stationery allocated to each enumeration area and packed in a bag earmarked for the designated enumeration area.

34. It is worth to note that as a result of this exercise it was possible to determine in a very accurate way the required number of records. We were thus able to print the desired number of records and avoid waste.

b. Retrieval of records from the enumerators and extraction of the preliminary results

35. A hierarchical order dictated the process of retrieving the population and housing records, starting from the Enumerator to the Crew Leader to the Assistant Supervisor and then the Receipt Committees at the Census Administration. All this was done according to the following principles and steps:

a. The Crew Leader receives the records from the Enumerator after making sure that they not only account for all the units existing in the Block, but that the data collected were comprehensive as well. Any discrepancy in the coverage and the updated lists available with the Crew Leader had to be satisfactorily explained by the Enumerator before the records were handed over. At the time of accepting the records, the Crew Leader filled in the details pertaining to the Record Number in the Block and the total number of records in the Block in their designated columns on the front cover of the record.

b. The Assistant Supervisor collected the records from the Crew Leader and discharged him after ensuring that they fully covered all Blocks in the area assigned to the Crew Leader.

c. The Coordinator at the office of the Assistant Supervisor entered the details written on the front covers of the records which were as follows:

The geographical data that constitute the enumeration location of the population recorded in the summary of the contents of the record, which involves: number of houses – number of household – number of individuals by gender and nationality (Omani \ Expatriate)

By entering and preparing such data it was possible to obtain the following outputs:

Database of records and all associated preliminary results of the enumeration process (Number of houses - Number of Households – Number of Individuals (by gender and nationality) at all administrative and geographical levels, up to the level of the Block.

It is worth mentioning here that it took just a few days to obtain the preliminary results following the end of the enumeration process. This is due to a number of factors, the most important of which are the following:

- The effective design of the population and housing Census that served as a comprehensive administrative and geographical database.
- Equipping of the offices of the Assistant Supervisors with computers.
- The creation of an intranet, which enabled delivery of results to the operations room.

c. Receipt and storage of records

36. A database of records was used as a basis for receipt of records by the Taking Over Committees at the Central Administration in Muscat and for storage. This process was carried out as follows:

a. A sufficient number of plastic containers was prepared in order to preserve the records. Each container was designed to accommodate 20 records of 20-forms category.

b. Five movable cupboards on fixed rails were prepared. Eighteen slots were created on each side of the cupboard. The slot could accommodate 9 plastic containers.

c. Each of the plastic containers was given a unique five-digit number that determines the location of the container in the warehouse, from left to right as follows:

   (i) First digit: Cupboard number (from 1 to 5)
   (ii) Second digit: Cupboard side number (1 for right side, 2 for left side)
   (iii) Third and Fourth digits: the opening number on the cupboard side (one digit for the horizontal sequence and the other for the vertical sequence).
   (iv) Fifth digit: Serial number (or sequence) of the container in the slot (from 1 to 9).

d. Computer labels were created with the container numbers. Each label was affixed to the front of the box.

e. Computers were also used in preparing (20) copies of the Container Number on adhesive labels. A sixth digit was added on the right (from 1 to 20) indicating the serial number or the sequence of the record in the container.

f. When the Receipt Committees received the records, using the database of such records, one of these sticker labels was attached in the designated location on its cover. The label, as mentioned earlier, defines the container number in which the record is preserved and the sequence of this record inside the container.

d. Documenting the exchange of records in the manual and electronic data preparation

37. The documentation process of receiving and storing the records in the manner described above resulted in the creation of a new database of containers holding the records. The database indicates the numbers assigned to the containers and the contents of each container in terms of records, and the identity and contents of such records. This database has been used in the following fields:

a. Documenting the processes of handing over the containers to work groups that conduct office auditing, coding and entry, and returning the containers after completing such operations.

b. By using the databases of both "the records" and the "containers that contained the records" and documenting the handover and return processes it is possible at any time to obtain follow-up reports on the work of the data preparation process. This is

possible because the contents of each record of houses, households and individuals are also stored in the records database.

D. Communications with the field systems and control over its works - the Intranet

38. The activities involved in the enumeration phase were carried out by a field system consisting of four levels of workers, namely: the Supervisors, the Assistant Supervisors, the Crew Leaders and the Enumerators. The first and second levels of this system were assigned organizational, supervisory and control tasks. The field offices were provided with the corresponding staff at these levels. Each location was provided with the required office equipment, including a computer and printer.

39. At the Central Administration of the Census in Muscat, an operations room was established and provided with computers and various other office equipment and systems. All the computers in the field offices were linked to the operations room through a central server at the Ministry of National Economy. From these systems, an intranet was established, which was used as a communications tool between the Central Administration of the Census and the field offices. The intranet was also useful in other areas pertinent to the implementation, follow-up and control of a number of office and field activities. Listed here are some of the areas where the intranet was used:

a. Communications

40. The intranet was used on a 24-hour basis to ensure communication between the Census Administration and the various units, on the one hand, and the field offices, on the other. Through the intranet, circulars, instructions and responses were sent out from the Operations Room to the field offices. The Administration, through this intranet, also received queries, requests and reports from these offices. This was accomplished with the aid of systems and software that were easy to operate, while affording a great deal of functionality, flexibility and speed, and not least of all, absolute confidentiality.

b. Follow-up of enumerator's work and performance

41. As part of his or her duties, the enumerator was required to prepare a daily report providing a summary of the number of houses, households and individuals counted that day. The report was handed over to the Crew Leader, who in turn forwarded it to the office of the Assistant Supervisor. It was submitted either manually or by communicating its contents to the main server, using an Interactive Voice Recording (I.V.R) system. A dedicated communications channel permitted transmission of the contents of the report via the short messaging system (SMS). However, such channel was not used because of the availability of other communication avenues.

42. The daily production reports were usually entered into the network and monitored round-the-clock in the Operations Room. The monitoring was carried out according to a special system that allowed their display at the various geographical levels (up to Wilayat level), at any time, for any Census divisions, starting from the supervision area and up to the respective enumeration area. A cumulative study of the reports allowed the Census Administration to

know the percentage of units covered by the enumerators (houses\households) from the total units listed, and the information was included in the database, as explained earlier. These reports enabled the Census Administration to draw the attention of the Supervisors to areas where performance rates exceeded expectations, or conversely, were below the minimum acceptable limits.

c. Follow-up of the census preliminary results

43. The details on the cover of the records were entered into computers in the presence of the Assistant Supervisor upon receipt of these records from the Crew Leaders. These details included, as mentioned earlier, the summary of contents of the record in terms of houses, households and individuals (by gender and nationality). With the aid of the intranet, the Census Administration was able to access the preliminary results of the enumeration immediately after receipt and entry of the last record in the last enumeration area. This process enabled the immediate commencement of the evaluation and preparation of the preliminary results prior to their approval by the higher authorities and their eventual release. This was carried out simultaneously with the completion of the field works.

d. Use of databases

44. The use of the intranet provided access to the databases stored on the main server at the Ministry of National Economy. Key among these databases were the Commercial Register data, and those of the inventory of buildings and their contents. These databases were used in the Establishments Census as well as in the updating process of the building lists, which were discussed in an earlier part of this paper.

E. The Census Information Programme

45. The role of information dissemination in the success of the census and improving the comprehensiveness and accuracy of the data has become a well-established fact of the programme. An effective information programme was conducted in the 1993 Census as well. The programme primarily depended on radio and television as the medium for disseminating information to the public. These channels were the most effective at a time when satellite TV was less of a factor as it is today.

46. However, with dozens of satellite channels and broadcasters now competing for the attention of Omani audiences, it was very important to diversify information channels to get the census message across as aggressively as possible.

47. Hence those in charge of the Census looked at multiple avenues and approaches to reach all population categories, while utilising to the extent possible the latest technology to get the message across. In addition to well-known traditional means[3], the media campaign included the following additional approaches:

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[3] For further information on the methods used in terms of information means and tools in the Census Program please refer to the Information Plan and the progress reports prepared by the Census Information Unit.

a. Two school periods during the academic year 2003-2004 in all the pre-university education levels were allocated for enlightening the students about the importance and objectives of the Census and their role in making it a success. Special educational materials were prepared for these periods in the form of booklets compiled by a team of specialists in education affairs, information, academic curricula, psychology and the Census. The material was distributed to all students in printed booklets and presented in a simplified and attractive form.

b. A monthly bulletin was published featuring a selection of articles and information capsules on the progress of the census. The bulletin was distributed on a wide scale.

c. A census website was launched on the Internet. The website included information, news and insights relating to the Census in the Sultanate of Oman.

d. The Short Messaging System (SMS) was regularly used for sending messages in English to non-Arabic speaking people in the country.

48. In addition, a number of high-quality publications and information material were also produced.

F. Establishments Census

49. The Establishments Census (or inventory) is an ideal example of the modern techniques developed during the second Census in the Sultanate (2003). This census was characterized by many new procedures that were never employed in the previous census. These procedures may be summarised as follows:

a. The Ministry of Commerce and Industry (the Commercial Register) has a database for establishments that have obtained commercial registrations. Muscat Municipality also maintains its own database, which includes establishments granted municipal licenses after obtaining commercial registrations.

b. From these authorities, the Ministry of National Economy developed its own database and entered the first into the Census intranet so that it became available for the field offices. The second database was uploaded directly into Handheld Devices (HHD) that were used in the Establishments Census in Muscat Governorate.

c. At the time of conducting the Establishments Census in the Governorates and regions of the Sultanate (except Muscat Governorate) the Crew Leaders collected data about all establishments in each work area. This data was then handed over to the offices of the Assistant Supervisors so it could be fed into their computers.

d. Such an approach required the designing of an establishments' questionnaire in the form of a card for listing the details of one establishment. This enabled the delivery of the questionnaire forms completed by the Crew Leader to the Assistant Supervisor's office on a daily basis. It is worth mentioning here that in the previous census the data pertaining to the establishment was limited to only one line of the form (or a page) which was then called Establishments Census Register.

e. Data for the establishment that already has a Commercial Registration is entered after the data entry operator verifies the accuracy of the data about the establishment. Verification is done by comparing the details with the information stored in the database, which is brought to the computer screen by punching in the Commercial

Registration Number – one of the key details collected by the Crew Leader about that establishment

f.   However establishments that do not have a commercial registration, particularly non-economic establishments such as government schools, mosques, embassies, and so on (and a few establishments of an economic nature), the requisite data, although quite limited, is entered directly into the computer.

g.   The methodology of the implementation of the Establishments Census in Muscat Governorate, however, is discussed in a separate paper. It can be said that the Census was carried out in a way similar to the approach adopted in the other regions. The exception is that the Crew Leader retrieves the data of each establishment from the database stored in his HHD. Then the Crew Leader uses the Municipal Licence Number as the identifier to verify the establishment and approve the data. By the end of each day, the data is transferred to the computer.

G. Data preparation

50. Preparing the data of the 2003 Census was in no way different from the previous Census. The data were entered into computers and subjected to strict audit checks before they were classified. As with the first Census, most of the errors were eliminated automatically. Automatic audit procedures were already tested in preparation for their application during the data preparation phase. Automatic correction of errors greatly facilitated the speedy compilation of the results of the previous 1993 Census – an objective that was also achieved in the current Census.

H. The Census in Muscat Governorate

51. The enumeration methodology used in Muscat Governorate was completely new, both in relation to the previous Census or with regard to the enumeration process carried out in other regions of the Sultanate. In the Population and Housing Census the data were collected and entered in a small computer system. This system has been called by many names, but we chose to call it a Hand Held Device. Each of these Handheld Devices used in the census of Muscat Governorate was programmed by storing the contents of the census questionnaire so it appears sequentially on the screen and according to a certain procedure. Procedures for instant verification of the data was also programmed into the HDD, which was equipped to activate an alarm if any data inconsistent with the format was entered into the device.

52. With regard to the other operations, which involve updating the lists of the buildings and the Establishments Census, the same device was used. However a different methodology was adopted. The building lists (from the inventory database) and the establishments' lists (from the Municipal licenses database) were uploaded into the device. This was done in such a way to enable the user to confirm the validity of the stored data, and make amendments and additions if necessary. Thereafter, the data was transmitted or directly uploaded into the computer by the end of the day.

53. This approach to data collection eliminated, at least theoretically, the need for other traditional data processing steps, such as auditing, coding, and data entry, as are necessary when paper questionnaire forms (hard copy) are used.