Department of Economic and Social Affairs
Statistics Division

Handbook on Census Management for Population and Housing Censuses

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NOTE

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PREFACE

The United Nations has, over the years, issued a series of handbooks and technical reports intended to assist countries in carrying out population and housing censuses. These handbooks and reports have been reviewed from time to time to reflect new developments and emerging issues in census taking. The present handbook is part of a series of handbooks that have been developed to assist countries in their preparation for the 2000 and future rounds of censuses. In addition to this handbook, other handbooks being prepared include the following:

(*a*) *Handbook on a Geographic Information System and Digital Mapping for Population and Housing Censuses* (ST/ESA/STAT/SER.F/79);

(*b*) *Handbook on Population and Housing Census Editing* (ST/ESA/STAT/SER.F/82);

(*c*) *Guide for the Collection of Economic Characteristics in Population Censuses* (ST/ESA/STAT/SER.F/54 (Part III)).

The present handbook is an update of and complements the previous *Handbook of Population and Housing Censuses*, *Part I, Planning, Organization and Administration of Population and Housing Censuses (ST/ESA/STAT/SER.F/ 54(Part I))* published in 1992.[1]

The purpose of the present publication is to assist countries by providing a reference document that focuses on the management aspects of carrying out population and housing censuses. In particular, the objectives of the publication are to provide guidance to countries on:

(*a*) Structures that need to be put in place to manage the census planning and operational processes;

(*b*) Planning processes that need to be considered in establishing a census;

(*c*) Control and monitoring processes;

(*d*) The links between these structures and processes (and with other elements of the census system).

The publication is divided into six chapters. Its structure reflects as closely as possible the census cycle. The initial chapters discuss the management aspects concerning the planning and preparatory stages, followed by discussions on the operational stages (that is, field operations and processing), dissemination of census results and, finally, evaluation.

When preparing a publication on such an important and complex topic, it is difficult to judge how much detail should be included. Attempts have been made to be as comprehensive as possible without overloading the reader with too much detail, but at the same time reflecting current practices in census management. The material is based on countries' practices in managing a census.

However, it is difficult to prepare material that is inclusive of the wide range of countries' experiences. Countries should use the information in this publication that is relevant to their particular situation.

The international recommendations relating to a census are contained in the publication *Principles and Recommendations for Population and Housing Censuses* (ST/ESA/STAT/SER.M/67/Rev.1), published in 1998.[2] The objectives of the principles and recommendations are:

(*a*) To help in improving census operations and the utility of census results in national terms;

(*b*) To increase, to the extent possible, international comparability.

The following publications issued by the regional commissions will also provide useful guidance on census operations relevant to the countries of each region:

(*a*) Economic Commission for Europe, *Recommendations for the 2000 Censuses of Population and Housing in the ECE Region*, Statistical Standards and Studies, No 49;

(*b*) Economic and Social Commission for Asia and the Pacific, *Report of the Regional Working Group on the 1990 World Population and Housing Census Programme* (STAT/WPHCP/14);

(*c*) Economic Commission for Latin America and the Caribbean, *Informe Final del Seminario sobre Contenido y Diseño de la Boleta Censal, Rio de Janeiro, Brazil, 13 al 16 de marzo de 1989* (LC/L.508);

(*d*) Economic Commission for Africa, *Report of the Regional Working Group on Recommendations for the 2000 Round of Population and Housing Censuses in Africa* (ECA/STAT/WG/PHC/95/21);

(*e*) Economic and Social Commission for Western Asia, *Final Report and Recommendations of the Regional Seminar on Population and Housing Censuses in the ESCWA Region* (E/ESCWA/STAT/85/WG.1/2).

The present publication was drafted by the staff of the Census, Demography and Geography Branch and Technology Application Branch of the Australian Bureau of Statistics.

The Palestinian Central Bureau of Statistics has provided important contributions and inputs to the handbook, as have the National Statistical Office of Kyrgystan, the Cambodian Ministry of Planning, together with the National Institute of Statistics, the National Institute of Statistics of Mozambique and the Central Statistical Office of Zambia.

Other countries have provided examples of their census experiences, which have been included in the handbook.

NOTES

[1]United Nations publication, Sales No. E.92.XVII.8.

[2]United Nations publication, Sales No. E.98.XVII.8.

I. OVERALL CENSUS MANAGEMENT

A. THE IMPORTANCE OF RELEVANCE

1. *Introduction*

The census should produce statistics that are relevant to data users. This is the core statistical objective of undertaking a census. Every action in a census must be directed towards producing relevant output that meets the needs of users. There are several aspects to this attribute of relevance as outlined in the following sections.

2. *Relevance to user needs*

The most obvious stakeholders of the census are the people and organizations who use the output of the census to assist them to understand some aspect of the society from which the census information has been collected. Ensuring that the needs of this group of stakeholders are carefully considered is an essential element of census planning.

A great deal of information about the users' needs for information will be gathered in content consultations with the users and will be recognized in the form design.

A census is a particularly expensive exercise to undertake and creates a burden on respondents. Therefore, it is crucial to ensure that any unmet demand for data is kept to a minimum and that topics for which there is little demand are not included on the census form. Consulting with users of census data is a positive public relations undertaking and an efficient, transparent means of determining the demand for potential census topics.

The first step in the user consultation process is to determine the census agency's position on census content. Although the intention of the consultation process is to satisfy user requests as far as practical, it is necessary to first determine which topics are suitable for inclusion in the census. When assessing potential census topics, the following broad criteria could be used as a guide.

(*a*) Is the topic of major national importance?

(*b*) Is there a need for data on the topic for small groups in the population or for small geographic areas?

(*c*) Is the topic suitable for inclusion in the census?

(*d*) Are there sufficient resources available to collect and process the data for that topic?

(*e*) Does it allow for international comparability?

Once the census agency has determined its position on census content, an information paper can be prepared. The information paper can outline:

(*a*) The topics planned for inclusion in the forthcoming census;

(*b*) The topics planned for exclusion from the forthcoming census;

(*c*) Other topics, to assess user demand.

To assess the demand for data, the information paper should invite submissions from users on what topics should be included in the census. If feasible, the release of the information paper can be supported by seminars held with users. Seminars provide the census agency with an opportunity to meet the users of census data and to provide them with an indication of what topics can and cannot be realistically included in the census. In the majority of countries, other government ministries will be the major users of census data and these seminars provide an opportunity to educate the staff from these ministries about the uses and limitations of census data.

However, many other elements of the census also need to be considered in ensuring that the census is as relevant as possible to users. The most important aspects of these elements include:

(*a*) *Design of enumeration areas*

A key use of a census is to provide information for small geographic regions such as enumeration areas, villages or regions of similar characteristics within a province. The extent to which this use can be satisfied will be determined by, among many things, the design of the base areas (see chap. II, sect. C, for more detail);

(*b*) *Design of operational tasks*

Maintaining a focus on relevance to users is important when designing the operational tasks to be undertaken by all census workers. This applies to all staff, whether an enumerator deciding which type of form to use at a dwelling or a data processor considering how to resolve an edit failure;

(*c*) *Training of field staff*

This is especially important where a personal interview approach is used in collecting the information. However, even where self-enumeration is employed the actions and words of field staff can greatly influence the nature, and thus the relevance, of the information reported;

(*d*) *Census publicity campaign*

The need for a publicity campaign close to the time of the census to support the collection work is widely accepted. A key component of such a campaign is explaining to people how the information they provide will be used. For such a campaign to be successful the relevance of the collection to users' needs must be clear and straightforward;

(*e*) *Dissemination of data*

The dissemination programme must deliver relevant product and services to users.

3. *Public relations to reinforce relevance to ordinary population*

As well as the communications campaigns undertaken close to the collection period, it is possible to use other public relations activities throughout the period between censuses. Such campaigns can be focused on demonstrating to "ordinary people" that the census is relevant to them and should be supported. Examples of such activities could include:

(*a*) Major releases of data from the previous census;

(*b*) Seizing opportunities for case studies; for example, opening of new public buildings, such as schools and hospitals, where the need for the buildings has been determined by census data;

(*c*) Publicizing the development of census information in forms easily accessible to the people (e.g., summary books and pamphlets) and distributing them to places where they can be accessed by people (e.g., schools, libraries, municipal offices and village and administration centres).

4. *Relevance to overall national strategies*

As well as being a key element of a national statistical system a census can also provide opportunities to advance other objectives relevant to a country. While these should remain subsidiary to the statistical purposes of the census they can be important considerations in assessing the benefits and costs of the census to the country. It is probable that the range of additional benefits will differ markedly from country to country, depending on such factors as:

(*a*) The stage of economic development of the country;

(*b*) The quantity and quality of existing infrastructure within the country (e.g., is electricity widely available?);

(*c*) The extent to which population characteristics are evenly dispersed across the country (e.g., are there particular areas where unemployment of clerical workers is an issue?).

Examples of these other objectives could include:

(*a*) An opportunity to acquire funding for improving and increasing the stock of information technology equipment within the country;

(*b*) Providing employment in economically depressed areas of the country;

(*c*) An opportunity to train a large number of people in tasks such as data processing or census collection duties;

(*d*) Provision of improvement in the country's mapping capabilities, through the development of maps needed for the census.

5. *Relevance to other elements of national statistical systems*

Information from the census may be used in many elements of a country's statistical system in addition to the tabulations produced directly by the census. As well as the two areas described in more detail below, information from the census can be analysed to fill in gaps in many statistical series. For example, employment in sectors of the economy not covered by specific statistical enquiries or information about rent paid for housing.

(*a*) *Population estimates*

A common use of the results of the census is to provide a basis for estimates of the population of a country. Such estimates will be required for years when a census is not held and may also be used to adjust census results to overcome problems such as under-enumeration in the census.

In some countries large demographic surveys are conducted between censuses to update the population estimates.

As well as providing information of value for many policy and operational uses these estimates are frequently used to provide benchmarks for a household survey programme.

(*b*) *Household survey programme*

Most countries conduct sample surveys between censuses as part of their household survey programme. The data from these surveys are usually more complex than the basic data collected in the census and are used to expand on the characteristics of census topics (plus additional topics) and to measure change between censuses. The population estimates described above can provide benchmark data for measuring change through the survey programme.

Moreover, detailed small area counts from the census may be used directly in design of the sampling frame and selection of the sampled units.

While the survey programme may collect information different from that collected in the census, there are usually several topics that are common to both. Therefore, to maximize the use of data from both sources, it is important that there is standardization of concepts and definitions for these common topics. These common data items may include age, sex, family relationship, occupation and so on. Apart from data items, there should also be common definitions regarding geographic locations (e.g., definition of rural and urban).

The census can also provide the benefits of developing information technology and other infrastructure, and staff skills that can be utilized in the household survey programme.

1. *Introduction*

Census planning is the core process in linking the different phases of the census cycle. The figure below is one approach to showing the links between different major phases of the census cycle.

Planning can be regarded as the core of the census cycle and the process that is most critical to the completion of a successful census. The focus in the early stages of planning will be on setting strategic directions for the entire census programme. As can be seen in the above diagram, each phase of the census cycle is dependent on a preceding phase. The quality of the output from each phase has a direct effect on the success of the next phase and other phases downstream.

In practice, it is likely (and desirable) that all phases interact with one another through an ongoing evaluation process. For example, this occurs when the people undertaking the field operations phase observe something that will influence the interpretation of the output products and pass this knowledge to the dissemination phase team. This could also be regarded as the use of a "living plan" technique through which initial assumptions are continually updated throughout the census cycle. This is particularly important in countries that conduct ad hoc or irregular censuses and may not have access to evaluation reports from the previous census.

The aim of the planning process is to ensure not only that each phase is properly resourced and organized but also that the output of each phase is of sufficient quality for all subsequent phases and that all dependencies between the different phases are identified. Because of the long duration of the census cycle, planning should not remain static but be flexible to take into account changes that occur.

There are a number of issues that require careful consideration when planning a census. These are:

(*a*) Specifying the role of the census;

(*b*) The role of Government;

(*c*) Setting goals;

(*d*) Developing project plans;

(*e*) Monitoring project plans;

(*f*) Developing a budget.

2. *Specifying the role of the census*

Before determining the need for a census, it is important that there is an understanding of the role of the census both in terms of what is possible through the selected census enumeration process (see chap. 2, sect. A) and how the census itself fits into the overall statistical framework of the country.

Figure I.1. The census cycle
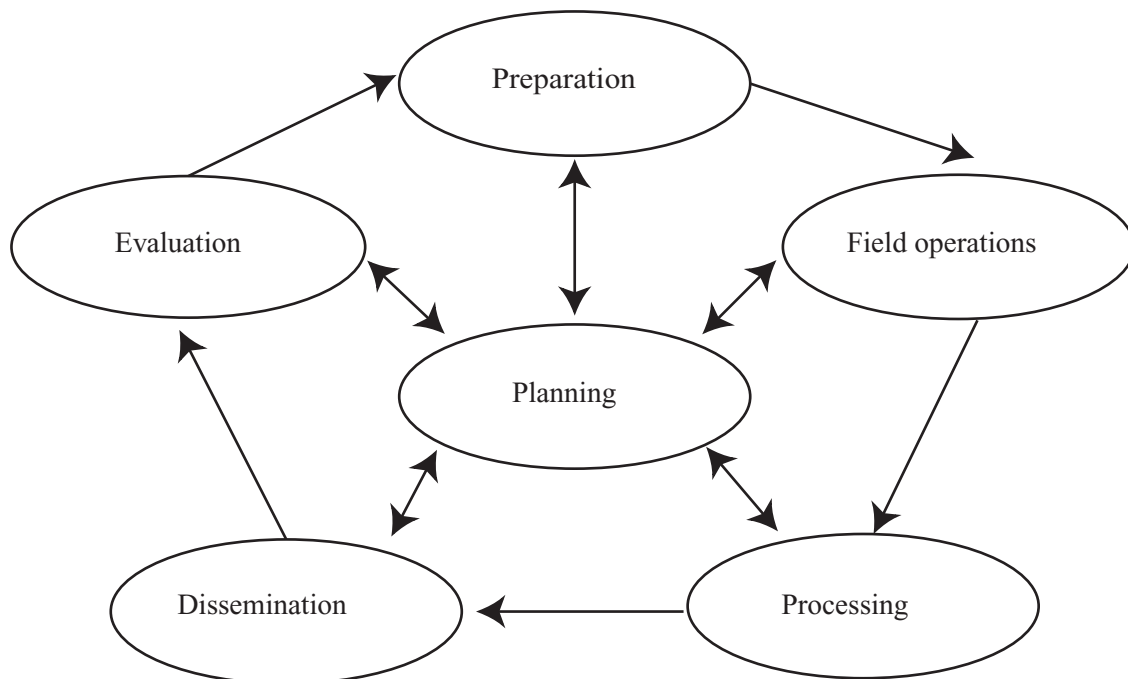
Because of the high profile of the census compared with other statistical activities, many users may view the census either as the sole source of statistics or the only reliable source of statistics about a particular topic. The key strength of a census compared with many other statistical collections is the ability to provide data for small geographic areas and for small population groups. It may be more cost-effective to collect data not required for these purposes using other statistical methodologies.

Census organizational structure for the Palestinian Central Bureau of Statistics

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                        ┌──────────────┐
                        │    High      │
                        │  committee   │
                        └──────┬───────┘
                               │
┌──────────────┐       ┌──────────────┐       ┌──────────────┐
│  Regional    │       │   National   │       │   National   │
│  publicity   ├───────┤   director   ├───────┤  committee   │
│  campaign    │       └──────┬───────┘       └──────┬───────┘
│  committee   │              │                      │
└──────┬───────┘              │            ┌─────────┴─────────┐
       │                      │     ┌──────────────┐   ┌──────────────┐
┌──────────────┐              │     │ Governorates │   │   Central    │
│  Publicity   │              │     │ subcommittee │   │  security    │
│  campaign    │              │     └──────────────┘   │  committee   │
│subcommittees │              │                        └──────────────┘
└──────────────┘              │
                              │
┌──────────────┐       ┌──────────────┐       ┌──────────────┐
│  Deputy and  │       │  Executive   │       │  Executive   │
│ assistants to├───────┤   director   ├───────┤  committee   │
│exec. director│       └──────┬───────┘       └──────────────┘
└──────────────┘              │
┌──────────────┐       ┌──────────────┐       ┌──────────────┐
│Administrative│       │ Governorates │       │    Data      │
│support staff ├───────┤   census     │       │ processing   │
└──────────────┘       │  director    │       │  director    │
                       └──────┬───────┘       └──────┬───────┘
                       ┌──────────────┐       ┌──────────────┐
                       │  Assistants  │       │ Supervisors  │
                       └──────┬───────┘       └──────┬───────┘
                       ┌──────────────┐       ┌──────────────┐
                       │ Supervisors  │       │ Editors and  │
                       └──────┬───────┘       │   coders     │
                                             └──────┬───────┘
                       ┌──────────────┐       ┌──────────────┐
                       │ Crew leaders │       │ Data keyers  │
                       └──────┬───────┘       │ supervisors  │
                                             └──────┬───────┘
                       ┌──────────────┐       ┌──────────────┐
                       │ Enumerators  │       │ Data keyers  │
                       └──────────────┘       └──────┬───────┘
                                             ┌──────────────┐
                                             │  Computer    │
                                             │   editors    │
                                             └──────────────┘
```

The prime role of a census is usually to provide an accurate count of the total population for each of the administrative regions of a country. Such counts are often required for equitable distribution of funds by Government and electoral distribution. The extent to which the census goes beyond a head count often depends on the demand for, and priority of, data for particular topics at a small area or small population group basis.

Whatever the method of enumeration used (self-enumerated or by an interviewer), the costs of doing so generally mean that the nature of the questions that can be asked on a census must be straightforward and readily understood by either the person completing the form or by an interviewer with only limited training. Therefore, the census is limited in providing useful data on complex issues. This limits the topics that may be suitable for collecting in a census.

There are other methodologies that may be used in conjunction with, or in place of, census collection to achieve the main aims of the census. These include sampling within the census itself (see sect. F below), sample surveys, civil population registers and other administrative sources. The advantages of each of these are considered below.

Sample surveys provide great flexibility in regard to topics. Interviewer-based surveys using trained staff allow topics to be explored in depth and may be the only reliable way to collect information about complex topics. Surveys are cost-effective and thus can generally be run more regularly than a full census but cannot provide small area and small population group data.

Population registers and administrative sources can provide a wealth of data for small areas but may be restricted in terms of defining small population groups. The reliability of the data from administrative sources is dependent on a high level of administrative organization that may not be present in many countries. Other problems include the fact that the data are collected for non-statistical purposes and the degree of consistency of classifications and processes and statistical rigour required for the purposes of the census may not be present.

The agency responsible for the census should ensure that these factors are well understood in planning for the census, in particular by those people and organizations who are data users.

Stakeholders external to the statistical agency

The key group of stakeholders are the end-users of the census data. These groups can either be current users of census data or potential users of census data. As has been explained in section A above, the needs of this group define the concept of 'relevance' that underlies all aspects of the census.

Current users of census data may have well-articulated needs and generally are in a position to influence the directions of census taking. However, their requirements need to be monitored as to whether the topics continue to be needed or whether the census remains the most effective method of collecting the data. Quite often, users will request that par-

ticular topics continue to be included in the census, as they have built their planning models around these data items. However, there may well exist better sources for these data items than the census or these data items may have ceased to have high social priority.

The census is a valuable resource that may be underutilized and potential users are the hardest to engage in the census process. This cannot be achieved through a single campaign as may be possible with current users. There is a need for an ongoing education and communication effort to develop continuing understanding of the nature of decisionmaking and the need for census data to support those decisions. A range of tools such as meetings, seminars and publicity material about the census data can be used on an ongoing basis (see chap. 3, sect. A).

It is likely that many of the goods and services required by the statistical agency to undertake the census (including transport facilities, telecommunications, advertising, printing, cartography and specialized information technology) will be acquired from outside the statistical agency. In some countries, these may be supplied as core functions of another government agency, while in others the functions will be acquired on the open market. In either case the organization that supplies this functionality will become a stakeholder in the census.

3. *The role of Government*

There are three areas where the Government and its administration will need to be considered in planning a census. These are:

(*a*) Providing a legal framework for the conduct of the census;

(*b*) Providing funding for the census;

(*c*) Providing logistical support for census activities.

(*a*) *Legal framework*

Some legal authority will be needed to carry out a census. This will vary considerably from country to country but the following may be covered by subsidiary legislation:

(*a*) The authority of the census agency to undertake census activities;

(*b*) Topics to be included in the census;

(*c*) The requirements of individuals to provide information;

(*d*) Provisions about confidentiality of information supplied by individuals;

(*e*) The role of other organizations (especially other government ministries) in census taking.

Some of these matters may be covered by legislation, while others may require formal government approval, without requiring legislation, prior to each census. The legal framework needs to be clearly understood and incorporated into census planning. Due allowance should be made for the significant elapsed time that may be required for these legal processes.

Special care should be given to fixing the date of the census. The census date is normally covered by legislation and agencies should be completely certain that the date chosen is realistic in that all planning and preparatory tasks can be completed by that date. Amending legislation to change the date of the census may prove to be difficult, if not impossible.

Ideally, the legal framework should allow for a great degree of operational flexibility so as to give the agency conducting the census the ability to continually improve methodologies and deal with problems as they arise. For example, the legal framework can be established to give the census agency the authority to carry out the census and to choose the topics to be incorporated on the census form. However, it should not prescribe the actual form design and question wording to be included on the form. If that were the case, agencies might find themselves locked into a particular form design that testing has shown needs changing.

Willing public cooperation is essential to the successful conduct of a census and will be assisted by non-legislated processes such as a publicity campaign (see chap. 3, sect. A). However, there is a need for the census legislation to impose penalties for non-compliance or obstruction. These should be rarely invoked and it would be desirable if offences could be treated using summary procedures and not be subject to lengthy judicial processes.

(*b*) *Funding*

In most countries, the Government provides specific funding for the census. The census is unlike many other activities of Government that receive ongoing and relatively predictable allocations. The census budget is highly cyclical, with relatively low levels of spending through the preparatory and dissemination phases. There is a large peak during the enumeration and processing phases. Governments need to be aware well in advance of when the peak expenditure is likely to occur so that this can be planned for.

The cyclical nature of census costs requires that the census budgets are planned well in advance and cover all known activities. Agreement by Government on the level of funding for the census is needed early in the cycle so that other aspects of census planning can proceed. Census managers will need to manage census funds and closely monitor the government commitment to the census to ensure that the agreed funds are actually available when needed. There have been many cases of Governments initially agreeing to a certain level of funding but eventually unable to meet those commitments owing to other fiscal pressures. This can have disastrous effects on census planning. In some countries, other government ministries may provide funding for particular topics (e.g., the Labour Ministry providing funding for labour force topics).

Establishing a legal framework

In the *Principles and Recommendations for Population and Housing Censuses,*[a] it is stated that:

"Legal authority for the census is required for fixing primary administrative responsibility, for obtaining the necessary funds, for determining the general scope and timing of the census, and for placing a legal obligation upon the public to cooperate and give truthful answers and a legal obligation upon the enumerator to record the responses faithfully. In addition, the confidentiality of the individual information should be strongly and clearly established in the census legislation and guaranteed by adequate sanctions so as to provide a basis for the confident cooperation of the public. In countries that lack permanent legal authority for the taking of periodic censuses, it is important to act early to establish ad hoc legal authority for the taking of periodic censuses, it is important to act early to establish ad hoc legal authority or, preferably, legislation calling for a system of periodic censuses."

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[a] *Principles and Recommendations for Population and Housing Censuses,* Revision 1 (United Nations publication, Sales No. E.98.XVIII.8), para. 1.57.

(*c*) *Logistical support*

Many countries draw heavily upon other government agencies in the preparation and conduct of the census. This support may be provided either as part of the ongoing work of these other agencies or may require the census agency to provide funding.

In many countries, teachers are used for enumeration. In these cases, it is vital that the census agency obtain the commitment and ongoing support of the minister responsible for the appropriate government agency responsible for teachers (e.g., the Department of Education) and senior staff within that agency.

Where the support is provided as part of the ongoing work programme of the agency, census managers need to ensure that these other agencies are aware of the requirements of the census. These agencies should have appropriate plans and have obtained the funding that will ensure that census goals can be met.

Some examples of other government agencies that may support census activities can include:

(*a*) Local or provincial Governments, which may permit or encourage staff of their agencies to work on the census or provide infrastructure or services in regional centres ;

(*b*) Local or provincial steering committees made up of staff from a variety of government agencies specifically set up to oversee census operations in their region;

(*c*) Other government agencies that supply specialist services such as form printing, mapping, transport services or media liaison.

For more details, see annex I, which contains an example from the Zambian census of 1990 that clearly outlines the composition and terms of reference of the National Census Committee.

4. *Setting goals*

Goals provide a framework within which the ongoing management of the census can proceed and decisions can be made. Without clear goals, it is difficult for staff to make decisions and take responsibility for those decisions, and it is easy for the overall census process to deviate from what was originally envisaged. Without them, decision-making becomes centralized and autocratic, which, because of the size and complexity of the process, will cause problems in implementation. The first step in setting goals is to establish the stakeholders and their requirements.

The term "stakeholder" is used to describe a group of people who will be affected by a specified activity. For the census, the most important stakeholders are those people who are either current or potential users of the census data, most of whom will be external to the statistical agency carrying out the census. Other stakeholders may be involved in the conduct of the census. These may be either external or internal stakeholders. Given the broad scope of the census, its importance in planning and the need to involve a considerable proportion of the population to complete the census questionnaire, the community as a whole is clearly a stakeholder in the census.

(*a*) *Stakeholders within the census programme*

The census operation in any country involves the movement of the census questionnaire (or the data from it) through a series of phases including, but not limited to, field operations, processing, dissemination and evaluation. In this sense, each phase is a key stakeholder of the one preceding it, with dissemination being a stakeholder of evaluation to close a "quality circle".

Identifying stakeholders is a useful starting point for identifying critical dependencies when planning the census. Good and effective communication with these stakeholders is essential to ensure that each phase of the census meets the needs of the others and that the resources of the statistical agency are used most effectively.

The stakeholder relationship is not just linear (or circular, as described in the census cycle diagram above), but also has consequential implications. For example, the following points describe some of the potential stakeholders for the field operations phase. This is not exhaustive but illustrates how stakeholders may be identified:

(*a*) Census evaluation. The success of the census enumeration operation has a considerable impact on data quality which is a prime concern of census evaluation. The census evaluation area is often responsible for analysis of census data to determine where data quality can be improved. This includes areas of the census form completed by census enumerators;

(*b*) Census processing. Census processing dependency on field operations is considerable. Some processing rules and procedures are partly determined by enumeration procedures and it is essential that good communication exists between the areas;

(*c*) Census dissemination. From a data quality point of view, census dissemination is dependent on the enumeration being complete and maintaining, if not improving, fundamental indicators such as underenumeration rates and response rates. Some census enumeration procedures may determine the nature and quality of particular data items;

(*d*) Other areas of the statistical agency, in particular the area responsible for inter censal population estimates.

Each phase also has "internal" stakeholders. For example, within the field operations phase, the packing and transport of materials into the field is a stakeholder of the printing process. The recruitment of field staff is a stakeholder of the process for determining salary rates and so on.

(*b*) *Other stakeholders within the statistical agency*

In many countries the statistical agency will have regional offices spread throughout the country. In these cases, the regional offices are a key stakeholder as they play a vital role in supporting the field operations phase in their particular region.

Clearly, there will be boundary issues, where some countries include all activities relating to the census within the census programme while others maintain separate units elsewhere within the statistical agency that perform functions on behalf of the census unit.

It could be expected that these functions would emphasize specialized skills for which it is not economic to recruit separate staff for the census project. Examples of these functions could include:

(*a*) Statistical methodology (design of follow-up samples, advice of quality monitoring sampling rates and so on);

(*b*) Information technology (evaluation of processing systems, hardware and software maintenance);

(*c*) Public relations (training and advice on public relations strategies and advertising campaigns).

There will also be stakeholders within the statistical agency who use the census results as part of their statistical operations. These could include:

(*a*) Statistical analysts preparing material by further analysis of the census results. These groups could include national accountants incorporating information on household income or housing stock into the national accounts;

(*b*) Client services, sales and marketing units identifying and satisfying external clients' needs;

(*c*) The area responsible for household surveys using census small area counts to update sample frames.

(*c*) *The community*

The community at large may be expected to have only an occasional interest in the census that generally peaks around the time of the carrying out of the census, or when initial data from the census are released. Public communications activities that focus on the benefits of the census at the time of census enumeration and those that provide for wide publicity of significant results at data release are ways of engaging public interest.

While the community at large does not have a direct input into the planning of the census, the need for continued cooperation of the public should be kept in mind throughout the process. Key areas of public concern are around the issues of confidentiality and privacy, the sensitivity of particular questions and the amount of time required to supply the information on the census form or to the census enumerator.

Ideally, the confidentiality of information provided on the census by individuals will be protected by law. Census records should only be used for statistical purposes and not for general administration. This means that other government agencies should not be able to access individual census records and that the records are protected from scrutiny by courts or other judicial processes.

Questions on the census must be publicly justifiable and not be too intrusive. People may be reluctant to provide reliable answers or to provide answers at all if there is no perceived benefit. The same situation applies for intrusive questions.

Data quality declines with the length of time taken to complete the questionnaire. While the time that might be taken may not be apparent in interview situations, the size of a questionnaire booklet may be an immediate deterrent in a self-enumeration census.

The needs and requirements of stakeholders should be used to establish the goals of the census. The needs of census data users have the highest priority. However, they must be balanced against the cost, data quality considerations and the logistics of undertaking the census as assessed by operational staff, and what may be required to maintain public cooperation and confidence.

The goals of the census generally revolve around;

(*a*) The topics to be collected;

(*b*) Confidentiality;

(*c*) Timeliness of data release;

(*d*) Data quality;

(*e*) The nature of the output;

(*f*) Trade-off between what topics can be collected and costs;

(*g*) The total cost of the census.

These goals interact with one another, thus the goals should state where the priorities lie. For example, there may be a trade-off between what topics can be collected and the associated costs.

Once key goals are established for the census they need to be communicated to the staff who should be encouraged to devise goals and strategies compatible with the overall goals for the part of the census project on which they are working. For example, the key goal of maintaining the confidentiality of information supplied by individuals will require strategies to achieve this in almost all phases of the census, from enumeration to dissemination.

5. *Developing project plans*

Once the goals have been established and strategies identified to implement them, more detailed planning begins. The undertaking of a census can be regarded as a single project. However, given the size and complexity of the census, it can be broken down into a series of related projects that are dependent on one another (see table I.1). To achieve a comprehensive list of projects a simple framework into which tasks will be listed and sorted should be developed. This framework should be hierarchical and something similar will be found in most project management texts or software. For the purpose of this handbook, the following basic structure is used:

(*a*) **Projects**. The total set of tasks needed to achieve a specific goal;

(*b*) **Phases**. The major project components;

(*c*) **Activities.** The phase components;

(*d*) **Tasks**. The smallest identifiable amount of work leading to a deliverable;

(*e*) **Milestones**. Specific points in time at which key outcomes are expected and which measure a project's progress.

Given the basic framework, the job becomes one of identifying each level, starting at the top and working down. It will often take a number of iterations to get it right. For example, something may be identified initially as an activity but becomes a phase after the project is considered in more detail, or because it increases in priority or complexity once the project plans become clearer. More often than not the original project plan will change owing to unforeseen circumstances.

As the levels in the framework are filled with detail, people can be assigned responsibility, and reporting and review arrangements established. Assigning responsibility in this way is the first step in giving staff ownership of the process.

(*a*) *Projects*

Identifying and scheduling the various projects of the total census cycle provides the basis for planning. Initially, this should be done at the highest level of the census cycle (e.g., planning, preparation, enumeration, processing, dissemination and evaluation) and then further developed into the different phases that make up each of these projects. These phases can then be further broken down to activities and finally tasks to establish resource estimates, assign tasks and responsibilities and confirm dependencies and timing of interrelated tasks.

(*b*) *Phases*

As an example, the census project 3. Field operations, shown in the project table below (table I.1), can be broken down into several phases. A possible list of phases is given in the following table but is only provided as a guide. It will vary from country to country depending on the type of census, size, and so on.

Once the phases have been identified and agreed, someone is assigned overall responsibility for each phase. One person may be responsible for several major phases, the important point being that each major phase is represented within the census management structure.

Also at this point, it is useful to establish the broad timeframe of each phase. This helps to clarify the relationships between them but also provides guidance when identifying and scheduling activities and then tasks.

Identified milestones (see sect. (*e*) below) are useful in establishing the end dates for phases. For example, if it is known that printing must be completed by a certain date to allow sufficient time for materials to be distributed, then that date would become the end date for phase 3.07 Materials, as shown in table I.2.

Table I.1. Project Definition

Project	Includes
1. Planning	Setting strategic directions for the entire census programme and developing project plans.
2. Preparation	Establishing the basis of enumeration, form design and testing, mapping, and printing the census forms.
3. Field operations	Recruiting and training field staff, public relations campaigns, form distribution and return.
4. Data processing	Recruiting and training data processors, selecting and managing premises, processing forms.
5. Dissemination	User consultation, product development, marketing and sales strategies.
6. Evaluation	All evaluation plans and processes.

Phases do overlap and so start and finish dates at this level will also overlap. It is recommended that techniques such as simple flow chart diagrams be used to chart phases and identify dependencies. These techniques are preferred rather than adopting more complex project management techniques such as network analysis since the overhead in maintaining and managing such networks can be extremely high.

(*c*) *Activities*

Once phases have been identified and agreed, the next step is to break down each phase into component activities. This is a similar process to identifying phases but begins to focus on more detail. Fewer staff would be involved and there would be more consideration of issues such as timing, resources, stakeholders and outputs.

Table I.2. Phase Definition

No.	Phases	Includes
3.01	Methods and procedure	Development of all enumeration and administrative procedures. Includes determining how enumerators and supervisors will conduct the census, as well as the procedures for recruitment and payment of temporary field staff.
3.02	Test program	Development and implementation of all tests. As a major activity, this brings together all aspects of the enumeration, on a small scale, and can act effectively as a quality assurance measure on the operation in addition to the specific goals of each test.
3.03	Field mapping	Design of enumeration areas and preparation of maps.
3.04	Enumeration field systems	Any computer system and/or forms, control books, etc. that are used to manage the census enumeration in the field. Includes the management information system. Can be seen as taking the methods and procedures output and putting it into practice to manage the enumeration.
3.05	Documentation	Developing and writing all documentation associated with the enumeration. Enumerators' manual (handbook), supervisors' manual, etc.
3.06	Training	Development of training packages for each level of staff.
3.07	Materials	Development of specifications and contracts to acquire all materials to be used in the field. Prime example is the printing of the census form. Includes production of manuals and training materials, etc.
3.08	Delivery and return tasks	Includes all activities associated with the bulk delivery of forms and materials into the field and the return of materials to the processing centre.
3.09	Evaluation	All evaluation plans and processes.

Using the example given above, table I.3 shows the activities that may be identified in the phase of 3.03 Field mapping.

Each identified activity is assigned an activity leader who is responsible for identifying all the tasks associated with the activity, liaison with other activity leaders, as necessary, and preparing detailed schedules and plans.

(d) *Tasks*

The last step is to identify specific tasks. By this stage many tasks will have been identified as a result of developing phases and activities, and it is now a case of inserting the tasks into the appropriate activity.

However, it is still useful to go through a process similar to that undertaken with phases and activities, to ensure that every possible task is identified at this stage, and does not come as a surprise further down the track.

Using the same example developed above, table I.4 shows the tasks that may be identified for the activity Enumeration area design in the phase of Field mapping.

The list in table I.4 is not exhaustive but is used to illustrate the idea of breaking down activities into tasks. Responsibility for each task would be assigned, and items such as start/finish dates, resources and outputs (e.g., a manual or computer process) identified.

For a more detailed and comprehensive model, see annex II, which contains a model census project timetable provided by the Australian Bureau of Statistics.

Identifying and scheduling tasks (i.e.,, filling the framework with detail) cannot be done in an ad hoc manner. There needs to be a planning process to ensure that all tasks are identified in an orderly way and consistent with the overall management of the census operation. The use of a framework such as the one described above provides a good and methodical basis for this objective.

As mentioned above, each project, phase, activity and task would have someone responsible for it. However, there is also a need for coordination and communication between the various activities and this is where identifying and scheduling tasks is linked with the census management structure (see sect. D below). The census management team needs to agree on how progress will be reported for each of the major activities and to what level of detail for the various steering and/or planning committees that have been established to provide advice on aspects of census management (see sect. D).

At the project and task level, project leaders need to ensure that their dependencies and successors are known and liaison established. For example, it does no good to have clearly identified and scheduled the mapping tasks above if the map production will be too late for the maps to go into the field.

Table I.3. List of activities

No	Phase		Activity
3.03	Field mapping	3.03.01	Enumeration area design
		3.03.02	Enumeration area file
		3.03.03	Management area design
		3.03.04	Map production
		3.03.05	Enumerator record book preparation

Table I.4.   List of tasks

No	Activity		Tasks
3.03.01	Enumeration area design	3.03.01.01	Review previous census methods, procedures and outcomes.
		3.03.01.02	Establish or review enumeration area design principles and criteria.
		3.03.01.03	Prepare enumeration area design manual.
		3.03.01.04	Establish enumeration area update methods, procedures and processes.
		3.03.01.05	Test enumeration area design processes.
		3.03.01.06	Implement and monitor enumeration area design.
		3.03.01.07	Evaluate enumeration area design.

(*e*) *Milestones*

A milestone is a point in time that identifies when significant points of the project should have been reached. Milestones can equate to any part of the project although they are generally associated with the completion of a set of project deliverables. Completion of all the tasks in an activity may be considered a milestone, or the completion of an entire phase. The use of milestones provides focal dates for the project team.

(*f*) *Issues*

There are issues associated with each activity and task that need to be taken into account in project planning. Obvious issues are timing and resources. Less obvious issues include risk management and goals. As part of the planning process, it is useful to identify the issues associated with activities and adopt a consistent approach in listing them for all activities. Different project management approaches will offer different ways of achieving this objective.

One method is to use an issues table, one of which is prepared for each activity. The issues table simply lists a number of generic issues that each activity leader considers against his or her activity. The purpose of this table is to ensure that issues such as evaluation and testing are not forgotten and to provide a basic and uniform set of information about the project available to all staff.

Table I.5 is a sample issues table with descriptions of the type of information that might be recorded. The last column is presented as a list of questions that a typical project leader might ask about a particular issue as it relates to the project. The table may be a simple form on paper or it may be done in a computer system. In some cases, the information for each issue may be recorded in the table itself or the table may simply be used to tell readers where the information about that issue may be found. It is flexible.

Completing an activity table for each activity is substantially a one-time exercise. A complete set of activity tables acts as a ready reference for the entire operation, as well as an index to where more detailed information can be found.

(*g*) *Risk management*

Risks are events that could occur and in some way have a negative impact on the success of the census. An example risk event may be that sufficient enumerators for a particular geographic area cannot be recruited. The risk event might not occur, but risks with significant likelihood should be managed explicitly by developing fully detailed plans parallel to the census plan on the basis that the risk will eventuate. There may be more than one parallel plan for a particular risk, depending on possible times of risk actualization.

Risk management is essential because of the importance of the census and the fact that it is an infrequent exercise. The success and/or failure of the census may depend on the implementation of the plans associated with these risks if they eventuate.

Table I.5. Activity issues

No	Item Name	Description	Questions
1.	Overview	Describe enough background to the activity for people to quickly gather where it fits in.	How would I describe this activity to someone in 2 or 3 sentences?
2.	Approval	Note if there has been, or should be, any formal approval for this activity.	Does this activity need to be approved by anyone?
3.	Goals/objectives	Describe the goals of the activity.	What is the purpose of this activity? Why do it? Is it important? How does this activity add value to what we are doing?
4.	Deliverables/output	What the end result of the activity is. This may be a specification document, a manual, a computer system, etc. They may be inputs to other activities.	What is actually produced by this activity?
5.	Schedule/dates	Start and finish dates as well as any key dates along the way. This may simply be a file that progress is shown in or it may be a separate document.	What do people need to know about the timing or scheduling of this activity? Are there any critical dates involved?
6.	Stakeholders	People relationships. The people or areas, including outside the agency, are important to this activity. They may be dependent on this activity or vice versa.	Who would I need to involve in planning, developing or implementing this activity? Who is the client?
7.	Dependencies	Process relationships. The activities or tasks, including other areas, depend on this activity or vice versa.	What inputs do I need? Where do the outputs of this activity go?
8.	Key tasks	Describe the key tasks that make up this activity.	What tasks have to be done for the activity to be completed?
9.	Risks	Describe the potential risks, their likelihood and contingency plans.	What can go wrong and how likely is it? What are the critical success factors?
10.	Specifications	These may be technical specifications as for an information technology application or a description of what is involved in this activity. Will depend very much on the nature of the activity.	What do I have to specify in order for the activity to get done? What would I have to tell someone about how to go about it?

Table I.5.   Activity issues *(continued)*

No	Item Name	Description	Questions
11.	Resources	Staffing, budgets, costs, etc. Staffing costs refer to people working on the activity and do not have to be exact.	How much is this activity costing in terms of people and money?
12.	Training	Training that may be required to enable this activity to be done.	What skills would someone need to do this activity? For example, software (PageMaker, Freelance, etc.), acceptance testing, negotiation and procurement.
13.	Performance measures	The performance measures against which the success of this activity will be measured.	How will I know if this activity has been successful?
14.	Management information	Information that can be extracted from the activity to inform people about progress, etc. and also to provide data for analysis. (number of people paid, number of urban enumeration areas, etc.).	What information from this activity will help people know how things are going or assist in analysing the activity later?
15.	Testing	The testing plan for the activity.	How will I test this activity to be confident that it will work or that the right outcomes will be achieved?
16.	Evaluation	The evaluation plan for the activity.	How will this activity be evaluated? How will other items in this table contribute to the evaluation? How has previous feedback been dealt with?
17.	Reporting	Information about the level and detail for reporting on this activity. Name and location of relevant project management software file.	What do I have to report, and how often, so that people know the status of this activity?
18.	Documentation	Describe what documentation exists about this activity. This may be other items in the table such as specifications, etc.	What would I tell someone who wanted to learn about this activity to read?
19.	Service agreement	Details of any service agreement associated with this activity.	If other persons are doing some work on this activity for me, what agreement should I have in place with them?
20.	Closure	How the activity is closed. What occurs when the activity is finished.	How do I know when this activity is finished? Who needs to be told?

6. *Monitoring project plans*

Monitoring the census project plans as described above and managing the information flows is an important part of census planning. It is imperative that the overall project plan is monitored closely and that appropriate feedback is delivered to all levels of management. More often than not the original project plan will change owing to unforeseen circumstances (e.g., delays in arrival of equipment and technical difficulties) or the identification of additional tasks.

It is therefore important that there is a feedback loop that compares actual results with the plan and assesses the impact of any deviations to target dates and costs. It is very important that these feedback mechanisms are based on good communication practices.

The results should be reviewed on a regular basis remembering that if these reviews are done too frequently the overhead becomes high. However, if done too infrequently, corrective actions may not be taken promptly enough.

As stated above, the project plans comprise projects, phases, activities, tasks and milestones.

The most important components to track are:

(*a*) The calendar time for completing a task;

(*b*) Resource usage per task;

(*c*) Cost per task;

(*d*) Milestones.

This can be done using a Gantt chart that graphically displays schedule-related information. In the typical Gantt chart, activities or other project elements are listed down the left side of the chart, dates are shown across the top and activity durations are shown as date-placed horizontal bars. There are a variety of off-the-shelf software packages that can be used to produce Gantt charts. An example is shown below.

For a more descriptive example of a census project Gantt chart, which details all the relevant steps that can be taken to ensure the effective monitoring of the census project, see annex III, in which an example of a Gantt chart from the Australian Bureau of Statistics is set out.

(*a*) *What to review*

Status information

Status information is typically recorded at periodic meetings attended by all key project participants. The information normally includes:

(*a*) Status of tasks (not started, started, or completed);

(*b*) status of important milestones;

(*c*) Progress (Percentage completed, or, preferably, estimated time to complete);

(*d*) Actual start and end dates.

Figure I.2.   Gantt Chart
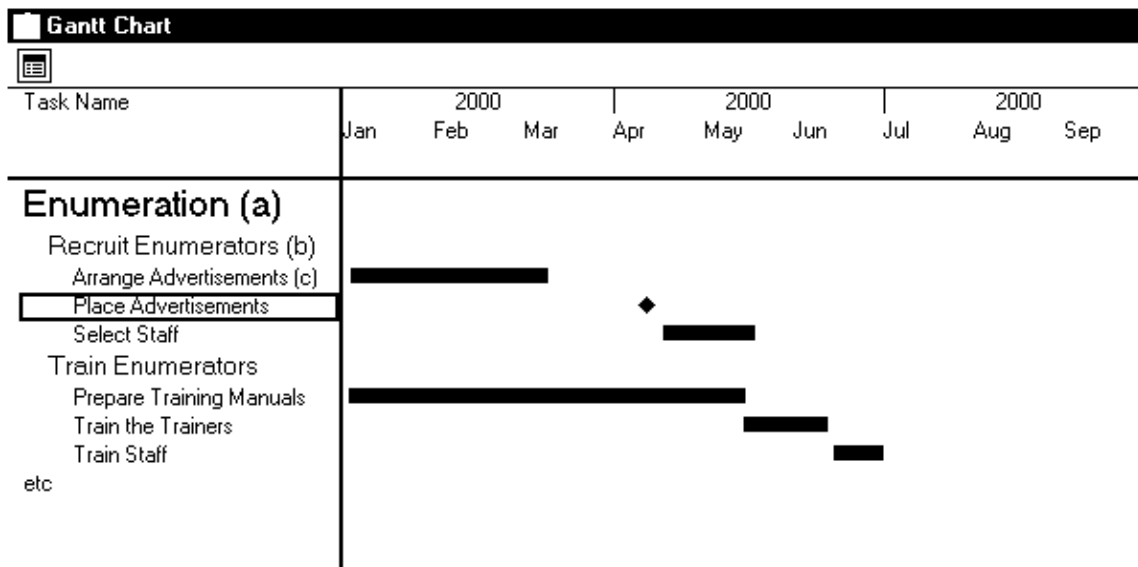
(a) Phase .

(b)   Activity.

(c) Task – milestone.

Analysis of variations

After recording status information, the impact of any deviations on project schedule, cost and resources should be analysed. In particular, special attention should be given to:

(*a*) Slippage of critical tasks leading up to milestones;

(*b*) Critically late tasks, indicating that the estimated time to complete is later than the planned finish date;

(*c*) An overcommitment of resources in the remainder of the project;

(*d*) Too many tasks appearing to be "nearly complete", otherwise known as the "99 per cent complete" syndrome. Managers must be able to realistically estimate time to completion;

(*e*) Rebaselining. If it is estimated that the completion date of a task cannot be met, then the task must be extended on the Gantt chart and in other documentation. This must be a highly visible process, with rebaselined tasks clearly identified in the Gantt chart. Originally expected completion dates should remain on the chart.

(*b*) *What to report and to whom*

The Gantt chart, which is generally a clear means of communication, can be used as the main reporting vehicle. Different levels of management will require differing amounts of detail on project plans. A generic management structure is shown in section D of the present chapter. Listed below are some of the levels outlined in that section and the amounts of detail on project plans they may require.

Project team

The project team is responsible for the completion of project tasks at the agreed timetable and acceptable levels of quality. Therefore, they will need reports in the finest detail that show the progress of each individual task. The project team should agree on what needs to be monitored and the frequency of reviews that should be conducted through regular meetings. These regular meetings can provide a formal mechanism through which reviews are conducted. However, it is important that the project team does not rely solely on these meetings to monitor progress. Maintaining regular contact and open communication channels in their day-to-day activities with all stakeholders in their own project team, and other dependent project teams, is critical to successful project monitoring.

Project manager

Project managers are ultimately responsible for all tasks defined in the project plans and are accountable for delivering target outcomes and meeting the project budget and delivery schedule. Therefore, they will need reports at all levels of the project plans (i.e., phase, activity and task). They will generally use reports at the phase and activity level for their day-to-day management of the project but they should also be able to get down to the task level if necessary.

Executive officer

One of the roles of the executive officers is to oversee the programme through to the generation of target outcomes. Therefore they may only be interested in data at a level higher than task or activity and only require concise status reports that answer the questions: "Are we ahead or behind schedule? By how much?" The executive officers require clear, succinct information showing just where the project stands and what actions, if any, are required of them.

7. *Developing a budget*

As mentioned earlier, the total budget for census operations needs to be established early to enable other planning to go forward. The census is highly cyclical, with resource requirements peaking in the enumeration and processing years. Also, countries with short census cycles (e.g., five-year intervals) may have some phases (e.g., evaluation for the current census and planning for the next one) overlapping in some years and resources will need to be allocated from different census budgets. An example of a census budget cycle is illustrated in figure I.3.

In this particular example, the census is held in 2000/01, with peak expenditure comprised mainly of salary costs for enumerators and data processors. The increase in the previous year is mainly attributable to the cost of printing census forms and equipment purchases. However, it should be noted that there is ongoing expenditure in the other years to cater for the planning, preparatory and dissemination phases.

In developing a census budget, sufficient resources need to be allocated to each of the different phases (i.e., planning, preparation, field operations, processing, dissemination and evaluation). Funds allocated and used in an effective manner on planning and preparation will result in savings in efficient enumeration and processing operations. The resource needs of the dissemination phase need to be realistically assessed and quarantined from the impacts of other census operations. Whatever may have been the effectiveness of the enumeration and processing operations, the users will judge the census on the ability to deliver the data. Failure to deliver census data on time and in the way desired by users will reflect on the census programme as a whole.

There are various ways of estimating budgets:

(*a*) Budgets may be based on the same allocations received for the previous census, brought up to current prices by adjusting for:

(i) Inflators for increased costs (e.g., salary increases),

(ii) Deflators for efficiency gains (e.g., implementation of new technology),

(iii) Policy changes,

(iv) Population increases.

Figure I.3. Census budget cycle: expected expenditure patterns
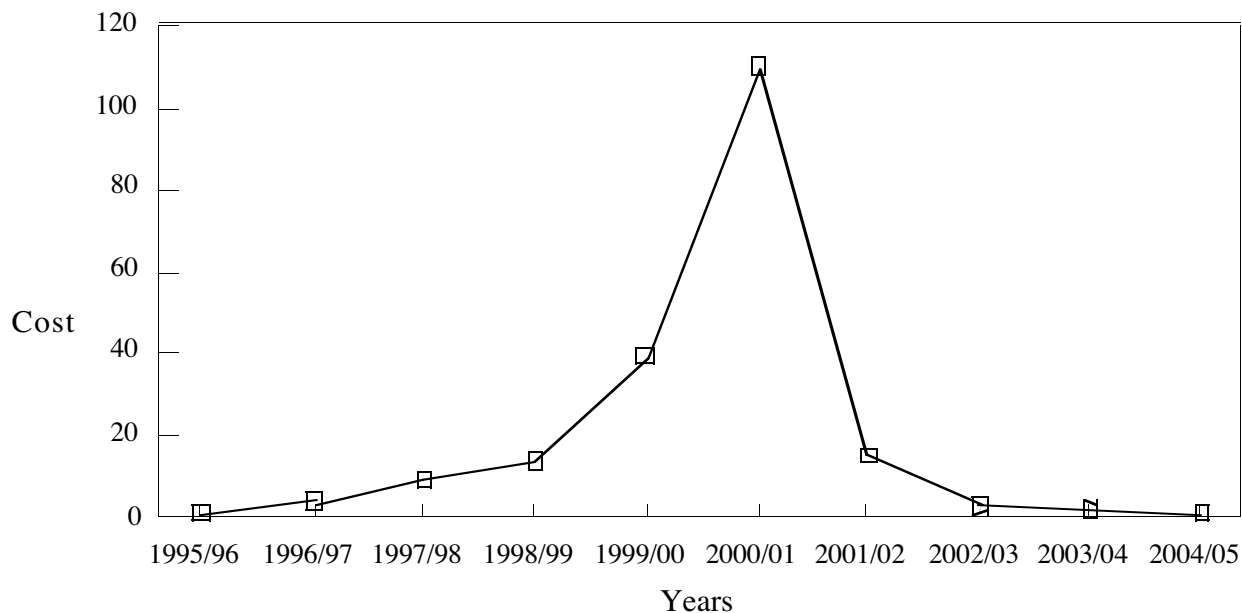
(*b*) Budgets may be based on the previous expenditure pattern, again adjusted as above;

(*c*) Budgets may be zero based using costing models to establish the requirements for each of the phases.

Usually, the largest component of the census budget is salary costs. Costs for field enumerators and data-processing staff make up a significant proportion of the overall salary costs. Therefore, special attention should be given when calculating the salary costs associated with these two activities. The methods for calculating these costs are covered in more detail in chapter 3, section B, for enumerators, and chapter 4, section C, for data-processing staff.

Once the budget has been established, funds should be allocated to particular financial years in the census cycle. This should then be broken down into the different projects within the overall census programme (e.g., planning, enumeration and processing) and itemized showing the various categories of expenditure.

Monitoring the budget

Once funding is received, it is necessary to monitor expenditure against funding for the current and future years. It is recommended that, while budgets may be compiled on a yearly basis, they be monitored on a quarterly or even a monthly basis, with projections of the total expenditure for the current financial year.

Each project's performance should be monitored against budgeted funds. Monthly reports should be produced for each project, showing the annual budget, expenditure to date and estimates of expenditure for the rest of the current financial year and future years in the census cycle.

It is important that a process of estimating expenditure in future years is undertaken on a regular basis. This provides the forum for the project managers to review plans for the current and future years of the cycle and to bid for changes to resource levels.

It is recommended that forward estimates be prepared and reviewed on a yearly basis for all years of the census cycle and submitted to the project board for consideration. When preparing forward estimates, project leaders should review projected expenditure thoroughly and provide full justification for any variations they are seeking.

The forward estimates process can provide the facility where:

(*a*) Managers can bid for increases or indicate savings in resources over time and/or reallocate expenditure between different financial years or items;

(*b*) Bids can be considered by senior census management, taking all bids for all years into account at one time.

The estimates provide a formal mechanism for senior management to be aware of shortfalls in funding or surplus funding and for management to consider any significant changes in planned resource use.

Table I.6 gives an example of the items that can be included in a census budget.

In the majority of countries, the largest costs in the census are those associated with the enumeration activity and salary for data-processing staff. Table I.7 shows the approximate breakdown of costs by major items. This breakdown will vary between countries and depend on such factors as labour costs but is included to give managers an indication of what the major cost items are.

As stated in the *Principles and Recommendations*,

"No universal system of census budgeting and cost control can be suggested since financial practices vary greatly among countries. However, a few generally accepted principles can be noted. Effective planning and control of the various census operations are not possible without a very careful financial estimate of the cost of each census operation, including all of its components, no matter how small.

"The census plan as executed will certainly change in a number of respects after the making of the original calculations. Consequently, a perfect correspondence between the estimates and the final costs is not to be expected. Indeed, the development of the census budget is usually an incremental process in which rough initial estimates are replaced by more detailed and precise statements of resource requirements. Throughout the period of census taking and compilation of census results, the budget will have to be re-examined and performance compared with plans. With detailed information on expenditure, the governmental and census authorities will be better able to exercise control over keeping the development of census operations within the census budget as well as to assess and control the effectiveness and efficiency of these operations. This information is also very useful for studying possible (Principles and Recommendations for Population and Housing Censures (paragraph 1.59 and 1.63.)), improvements in census techniques and census methodology."

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[a]*Principles and Recommendations for Population and Housing Censuses*, paras. 1.59 and 1.63.

Table I.6.   Items included in a census budget

Item	Includes
Salaries	Salaries for both permanent staff from the census agency, and temporary field operations and data-processing staff. These are calculated separately and usually shown as separate items in spreadsheets. They should include any allowances for overtime and/or superannuating payments if appropriate.
Travel and subsistence	All fares and per diem costs.
Vehicles	Cost of purchase and/or hire of cars, boats or aircraft.
Office consumables	Stationary, folders pens. Etc.
printing Questionnaire	All printing costs (paper, printing) associated with the census questionnaire.
Manuals	All instructional manuals.
Mapping	
Data maintenance	Costs associated with maintaining and updating map data.
Equipment	Computer hardware, etc.
Development and	Software development costs.
Printing	Map printing.
Form packing and transport	Distribution and return of census forms and associated material for field operations.
Enumerator equipment	Satchels, pens, clipboards.
Public relations	Publicity costs (e.g., pamphlets, posters).
Training	Production of training aides (e.g., videos).
Consultants/contractors	Cost of external consultants providing advice and/or services.
Publications	Printing and development costs of publications containing census results.
Product development	Development costs for census output products.
Telephone and postage	Ongoing telephone and postal costs.
Storage	Storage costs for census forms and maps.
Security	Costs associated with securing census forms and data.
Taxes	Any applicable government taxes.
Furniture	Office furniture.
Equipment purchases	
Office machines	Faxes, photocopiers, etc.
Computers	Computers required for data processing and census agency staff.
Software licences	Cost of purchasing off-the-shelf software.
Software development	Cost of developing census-specific software.
Office lease	Any rental costs of buildings required for data processing, etc.
Office running costs	Fuel, electricity, cleaning, etc.
Office equipment expenses	Cost of equipping offices.
Travel	Cost associated with the travel of census personnel.

1. *Introduction*

In the census context, there are four attributes of quality assurance:

(*a*) Relevance;

(*b*) Cost;

(*c*) Timeliness;

(*d*) Data quality (or accuracy).

The essential quality attribute of relevance of census output, and how to assure it, has been discussed in section A above. Clearly, meeting targets for cost, timeliness and accuracy will be hollow achievements if there is not a high degree of national relevance in what the census produces. These three attributes (cost, timeliness and accuracy) are essentially trade-offs. Higher accuracy can be obtained for higher cost and poorer timeliness and so on. Quality is relative, and in the end is based on what is acceptable, or fit for the purpose, rather than a concept of absolute perfection.

Quality is the outcome of processes, and deficiencies in quality (for example, delays in processing) are usually the result of deficiencies in process rather than the actions of individuals working in that process. The key to quality assurance and improvement is to be able to regularly measure the cost, timeliness and accuracy of a given process so that the process can be improved when a fall in quality is indicated. The focus of quality assurance is to prevent errors from reoccurring, to detect errors easily and inform the workers so that they do not continue. This simple feedback loop is represented in figure I.4.

Being iterative, the quality circle is particularly applicable to tasks that are highly repetitive such as the processing phase of the census. However, the general principle applies to all processes. For example, there is less opportunity to evaluate performance, identify problems and implement corrective actions in phases such as enumeration owing to time constraints, the once-only nature of some of the processes and communication issues. However, it still can be established with careful planning and documentation in advance of the census.

It is important that a complete evaluation takes place at the end of each phase of the census. This should be done particularly for phases such as enumeration, so that the organizational learning inherent in the quality circle is carried forward to the next census.

Since people play a key role in most census processes, they are in a good position to identify problems with quality and provide solutions. Quality is therefore not just the outcome of mechanistic applications of predetermined measures but relies on a combination of:

(*a*) Established, documented processes;

(*b*) Systems to monitor the outcomes of these processes;

(*c*) Active encouragement by management to involve staff undertaking the processes in identifying and resolving deficiencies with quality.

While elements of the quality circle, such as mechanisms to monitor quality, may have some superficial resemblance to some of the elements of traditional quality control approaches, they are quite different. Traditional quality control is based on correction of error after the event, whereas the emphasis of the quality circle is on improving the process that caused the "error", which may be any of the cost, timeliness or accuracy attributes falling below specified levels. A simple error correction process may suffer from any of the following:

(*a*) It adds significantly to the cost of the operation;

(*b*) Errors in the inspection process can fail to detect true errors or falsely identify errors;

(*c*) The correction process can introduce errors into the data;

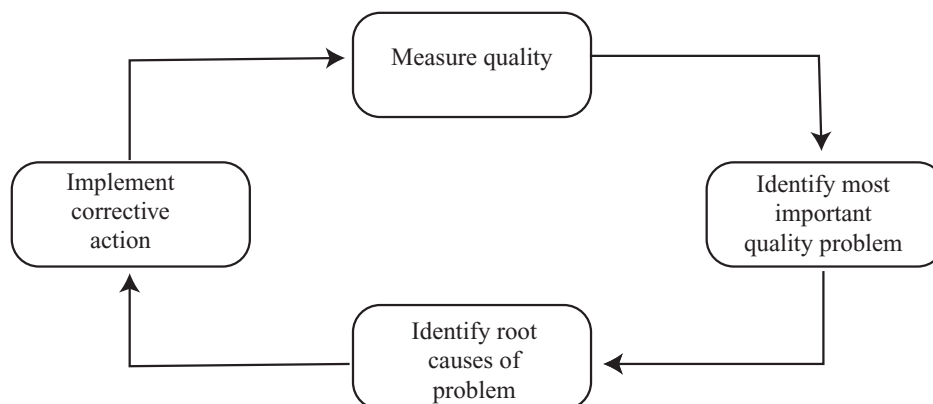**Figure I.4. Quality assurance circle**

Table I.7. Percentage of costs spent on items

Item	Australia	Kyrgyzstan	Kazakhstan	Cambodia
Salaries enumerators	24	16.3	29.06	
Data processing	15	4.8	2.45	
Census agency staff	14	15.5	2.95	25.3(for data processing and enumerators)
Hardware and software for data processing	6	34.6	2.05	26.3
Form printing	3	6	5.38	
Mapping	3	2.8	1.17	2.6
Office equipment	3	3.5	0.86	1.3
Building costs	3	1.5		
Transport and per diem payments		12.8	19.9	6
Other costs	29	2.2	36.2	38.5

(*d*) Operators take less responsibility for the quality of their work, believing it to be the responsibility of the inspectors;

(*e*) Where a sample of units are inspected, the quality of data is only ensured for those units that are inspected.

The emphasis should be on process improvement rather than correction. Therefore an important aspect of quality management may not be to correct errors detected through the quality monitoring process unless they are of a severe nature or are generally applicable. For example, a generally applicable error could be a systems error that miscodes every occurrence of a common event. Resources are thus better focused on improving processes and thus overall quality. An example of how quality assurance can be applied to the census can be found in annex IV, which shows the steps taken by the Australian Bureau of Statistics to apply a quality management strategy to the 1996 census.

2. *The role of managers*

Managers have a vital role in establishing quality. The biggest challenge to managers is first to establish a culture within the census agency that has a focus on quality issues and to obtain the commitment of staff to strive to achieve high-quality goals. At the same time, managers need to be aware that to achieve high-quality outcomes they need to give their staff responsibility to achieve these outcomes. Managers who do not delegate responsibility will find it difficult, if not impossible, to establish teams that strive for high-quality outcomes.

Managers must ensure that staff understand the philosophy behind the approach to quality. As mentioned above, staff involvement is a vital ingredient to quality improvement. Therefore, an environment needs to be established where staff contributions are expected.

The second part of their role is to ensure that clients' expectations are known and that these expectations are built into planning objectives and into the systems that are to deliver them.

Thirdly, processes need to be documented and understood by the staff implementing them. Systems and processes for implementing the quality circle also need to be documented and put in place. Questions such as how quality is going to be measured, who is involved in identifying root causes of problems with quality, and how the process improvements are going to be implemented need to be answered. These will vary greatly depending on the nature of the process. Appropriate quality assurance techniques for each phase of the census are summarized below and dealt with in greater detail in other sections of the handbook.

The greatest test of management commitment to genuine quality improvement will occur in how management approaches problem solving. Staff will monitor management responses closely and adjust their own behaviour accordingly. Staff will act in accordance with how they see managers behave rather than what they hear managers saying.

Managers who always react to problems by seeking out people to blame, or who establish systems that focus disproportionately on the merits or demerits of individuals at

the expense of the team, are sending messages that are contrary to the thrust of quality improvement. An environment where the emphasis is on fault-finding, rather than on finding solutions to problems, or on excessive competition, will assure that staff cease to be part of the solution and become part of the problem. Managers need to take upon themselves the responsibility for problems, as they are ultimately responsible for the systems that caused the problems. They should not seek to transfer the problems to lower-level staff.

However, even in the best managed processes, there are circumstances where individuals can be justifiably blamed for impacting on quality. These may be individuals who are incapable of performing their duties, deliberately flaunt procedures or even deliberately sabotage the process. These individuals need to be dealt with by management and in some circumstances their employment should be terminated. Managers must deal quickly with these cases and act in a consistent manner. By doing so, managers will demonstrate to all other staff their commitment to quality.

To be successful, it is necessary to create a culture in which everyone has the opportunity to contribute to quality improvement. Most of the staff engaged in census operational work undertake routine tasks, and it is up to management to help them see the bigger picture, to motivate them and to encourage them to assume ownership of their work. This can be done by promoting a commitment to quality improvement and by adopting a consistent approach to management.

3. *Quality improvement and the census*

The quality circle can be applied to the entire census cycle with:

(*a*) Performance in the previous phase being evaluated at any given level of detail;

(*b*) Problems with quality ranked in order of importance;

(*c*) Root causes identified and corrective action implemented.

The dependencies in the census cycle are represented in figure I.5.

It is worth noting that it is equally feasible to invert all the arrows in the diagram and read it in reverse order without significantly changing the outcome in terms of quality. Also, it is possible to start at any point in the diagram and achieve the same result.

The following sections outline the way in which the concept of a quality circle is superimposed over the census cycle. Much of the discussion on form design, enumeration, processing and dissemination is in terms of relevance and accuracy. However, these are subject to constraints of time and cost that may be established prior to commencing the census cycle. These are discussed briefly below and in greater detail in the relevant sections of the handbook.

(*a*) Topic selection

The first step in managing the quality of the product (i.e., the statistics to be produced) is to ensure that the product will be relevant. The key process is extensive consultation with actual and potential users of census information. The key success factor in this process is full, frank and open communication with users and all areas concerned with the census (in particular, subject matter and classification experts).

As should be expected, users are reluctant to propose their needs for a future census until they have been able to assess the extent to which their current needs have been satisfied by the output from the previous census. This should be seen as an evaluation process feeding into the current cycle - the first step of quality management.

(*b*) Form Design and Testing

The next quality management task concerns the testing of each census question and the testing of the design of the form. Again, the quality circle approach is used, with the results of each test being analysed and evaluated before being fed into further design and testing.

The following areas are the key internal stakeholders of the form design process and their requirements need to be taken into account:

(*a*) The dissemination team, to ensure that the questions asked will deliver the data to meet the needs of users;

(*b*) The subject matter specialist team;

(*c*) The team responsible for development of the processing system. For example, positioning of text and delineation of response areas will be dependent on data capture and the processing methodology to be adopted. It is critical that there is ongoing coordination between the form design and processing areas;

(*d*) The field operations team, which is responsible for training the enumeration workforce and printing the form.

(*c*) Field operations

The quality management process continues throughout the design of the census field operations. These are tested, as far as possible, in conjunction with form designs testing.

The key internal client of field operations is processing. However, field operations can also impinge on other areas such as dissemination and classification and subject matter areas where certain concepts such as what constitutes a dwelling is implemented during the field operations phase.

Several components of field operations can be subject to specific quality circle mechanisms as these are likely to take some time and involve iterative processes. These components include:

(*a*) The demarcation of enumeration areas;

(*b*) The map production;

(*c*) Form printing, where a sample of forms is rigorously tested for adherence to standards.

Quality monitoring should be established for each of these components and mechanisms put in place to ensure that the outcomes of the monitoring are used to improve processes.

Figure I.5. Quality circle dependency chart

```
                    ┌─────────────────────┐
                    │     Evaluation      │
                    │  1. Data quality    │
                    │  2. Process         │
                    │  3. Products/services│
                    └─────────────────────┘
        ┌──────────────┐              ┌──────────────┐
        │ Dissemination│              │Topic selection│
        └──────────────┘              └──────────────┘
                    ┌─────────────────┐
                    │  Classification  │
                    │   and subject    │
                    │     matter       │
                    │   specialists    │
                    └─────────────────┘
        ┌──────────────┐              ┌──────────────┐
        │Data processing│             │  Form design  │
        └──────────────┘              │  and testing  │
                                      └──────────────┘
                    ┌─────────────────┐
                    │ Field operations │
                    └─────────────────┘
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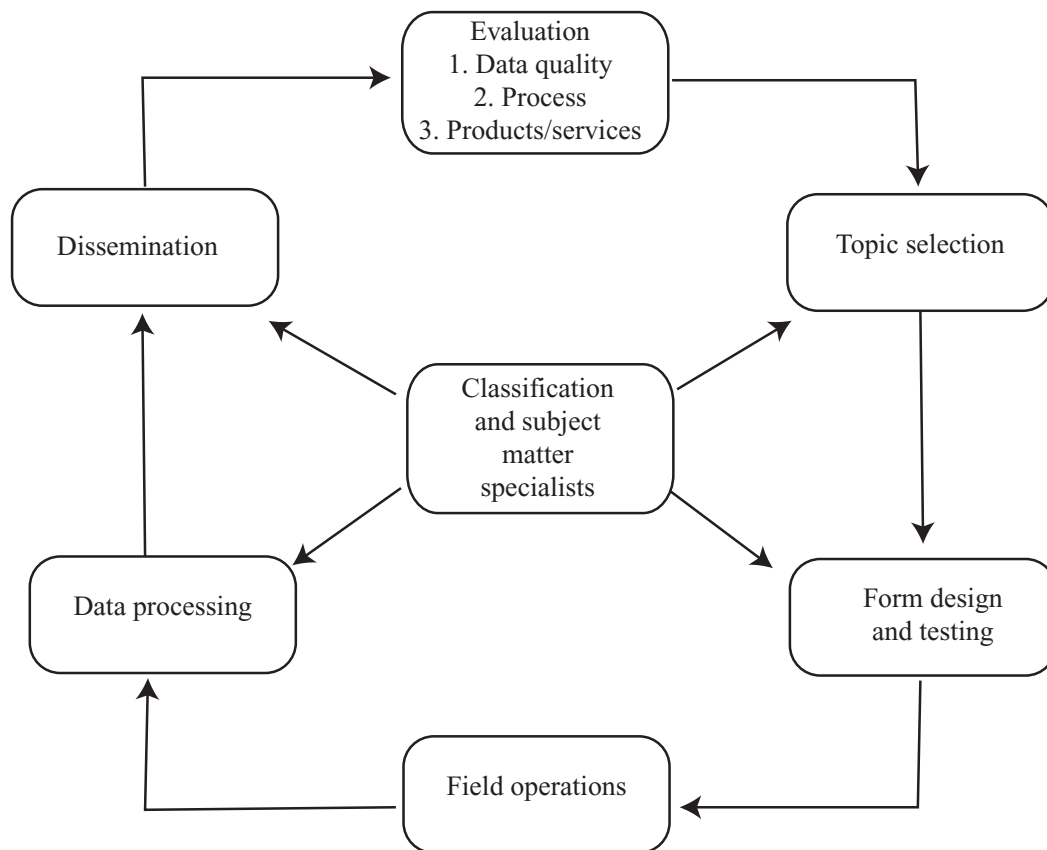
It is more difficult to implement the quality circle during actual enumeration, owing to the very tight time constraints. However, this can be achieved by:

(*a*) Clearly establishing the aims of the field operations phase;

(*b*) Applying thoroughly documented procedures;

(*c*) Ensuring that the enumerators understand their role through appropriate training and providing inspection of corrupted forms;

(*d*) Providing opportunities for field staff to be observed operating on the job so that feedback can be given and re-training undertaken.

However, it has to be acknowledged that during the actual carrying out of the enumeration this approach tends to identify "problem enumerators" rather than systemic or process errors. This means that evaluation following collection is vital. The evaluation should attempt to capture the experiences and suggestions of a range of enumerators and other field staff so that improvements can be made to the subsequent census.

A general overview of the quality of enumeration can be obtained through:

(*a*) The use of techniques such as post-enumeration surveys to gauge the level of under-enumeration of people and dwellings;

(*b*) Feedback from field staff;

(*c*) Measures of the quality of any coding undertaken by field staff;

(*d*) Mechanisms that may be in place to handle queries from the public.

The effectiveness of the public communication strategy may be assessed by the amount of press coverage (positive and negative) of the census and follow-up surveys to test the reaction to particular advertising.

(*d*) *Processing*

The key clients of processing are the dissemination area and the areas of the country's statistical agency responsible for maintaining standard classifications and those with specialist subject matter knowledge.

The dissemination area depends on the processing team to obtain data in an agreed format, and compiled to agreed quality standards. This is necessary so that the data can be used in dissemination systems.

Since the census is part of an overall national statistical system, data from the census are likely to be used in conjunction with data from other collections. Thus the classification and subject matter specialist areas, which are responsible for those other collections, need to be satisfied that the coding, editing and other data transformation processes are conceptually sound and deliver data of acceptable quality.

Extensive testing of processing systems must be undertaken in advance of the census. Coding processes and training packages need to be prepared and tested using the type of staff likely to be involved in the operations. The processing phase gives the fullest scope for the use of quality improvement techniques, as many of the processes in this phase are repetitive and take a reasonable amount of time. This enables the quality circle to go through much iteration. It is vital that structures are put in place not only to monitor quality but also to involve processing staff in the identification of problems with quality and in proposing solutions.

It is generally not possible for processing to improve the accuracy of census data. At best, processes such as editing may reduce some inconsistencies within the data. However, in the end the data coming from the processing system will not be of any better quality than the information supplied on census forms. Much effort can be expended in correcting apparently inconsistent or inaccurate census data with no real improvement in the fitness for the purpose of the data. It may be a better strategy to educate users to accept slight inconsistencies in census data, rather than developing highly complex procedures that may introduce other errors and impose heavy costs in terms of delay in release of the data, and cost to the community.

(*e*) *Dissemination*

Census dissemination can easily be overlooked in the chain of providing a quality outcome for the census as management attention is diverted to the costly and risky enumeration and processing operations. The dissemination area is responsible for the timely delivery of products and services to the census data users. Therefore insufficient planning and resources for this phase can have the effect of delaying the release of the data and thus compromising the overall achievement of the census objectives. The dissemination phase should also be regarded as an ongoing process that will service the needs of users over a long period of time.

Management of the quality in census dissemination is driven by concerns to (*a*) deliver relevant products and services while (*b*) maintaining accuracy of the data, and (*c*) timeliness and predicability of data release within agreed cost constraints.

The first of these objectives is to provide relevant products and services. This can only be done by reviewing the experiences of the previous census products and services and by user consultation processes with both current and potential users of census data.

The second objective is to ensure that the data supplied from the processing system is accurately transformed into output products. A quality assurance strategy to ensure that data tabulations and transformations are carried out accurately needs to be documented and followed. The quality circle approach to these processes needs to be applied and any gaps identified and corrected through extensive testing prior to the census and ongoing process improvement during the dissemination phase.

The third quality objective for dissemination is the timely and predictable release of data from the census. While this is the responsibility of all phases of the census programme, special responsibility resides with the dissemination area. The dissemination area needs to be realistic about release dates and ensure that these are communicated to clients early so as to manage client expectations. The involvement of staff actually responsible for the dissemination phase in devising these dates is recommended where this is possible. Dissemination systems and processes need to be available, documented and tested prior to the release of data from the processing phase.

(*f*) *Evaluation*

In the present chapter, evaluation has been considered as the last stage in the census cycle. However, it is also possible to consider the evaluation of one census cycle as being the first step in the following census cycle. Similarly, evaluation of one process within a census cycle could be the first stage in the next process of the same census cycle.

All aspects of the census programme should be evaluated. The strengths and weaknesses of each task should be identified and action points proposed for future census managers.

Evaluation of the accuracy of the census data should also be undertaken, to the extent possible, by comparing the census results with similar data from other sources. These sources can include surveys in a similar time-frame or previous census results. The purposes of evaluating the accuracy of the data are to inform users of the quality of the current census data and to assist in future improvements. Future improvement may be achieved by (a) improving processes and (b) establishing performance benchmarks against which the quality of the data from subsequent censuses can be measured.

Evaluation of data accuracy may have two parts. Preliminary evaluation will enable the identification of any problem areas that have not been previously detected through the quality management processes in earlier phases of the census. More extensive evaluation should be undertaken on data items where problems have been identified or where new questions or processes have been attempted.

The results of the evaluations should be made available to census data users.

1. *Introduction*

In the majority of countries, the area responsible for the census will be part of that country's statistical agency. Therefore, the management structures that can be put in place for the census will largely depend on the established management structures in the statistical agency. There are many references available on this subject and it is impossible to discuss the full range of options available in a handbook such as this.

For the purposes of this handbook, a generic structure is discussed that can be adapted by countries to suit their own particular circumstances.

2. *Generic management structure*

Censuses of the population of a country are not taken frequently. In fact, for many countries they are only taken once in 10 years. As a consequence, there is a need for a well developed management process to ensure that information acquired in one census is utilized to the fullest extent possible in future censuses. Also, there are some management issues that are specific to a project with a long lead time. To address these issues it should be expected that the management team leading the development of a census will change over the course of the planning and preparation phases that comprise the census development process (see sect. B for a description of the census cycle).

In the earliest stage, the principal activity will be identifying possible options for the various aspects of taking the census. It could be expected that at this time the team structure will be based around a small group of experienced and relatively senior staff. The team should be managed by a person experienced in addressing strategic issues and with some experience in census taking.

A generic structure of the area responsible for the census, defined in the present handbook as the census agency, is illustrated in figure I.5 and I.6. The roles and responsibilities of each level in the generic structure are also discussed.

The solid lines show lines of reporting, while the dotted lines show the flow of advice from a project board and various committees.

Figure I.6.   Top-level management structure
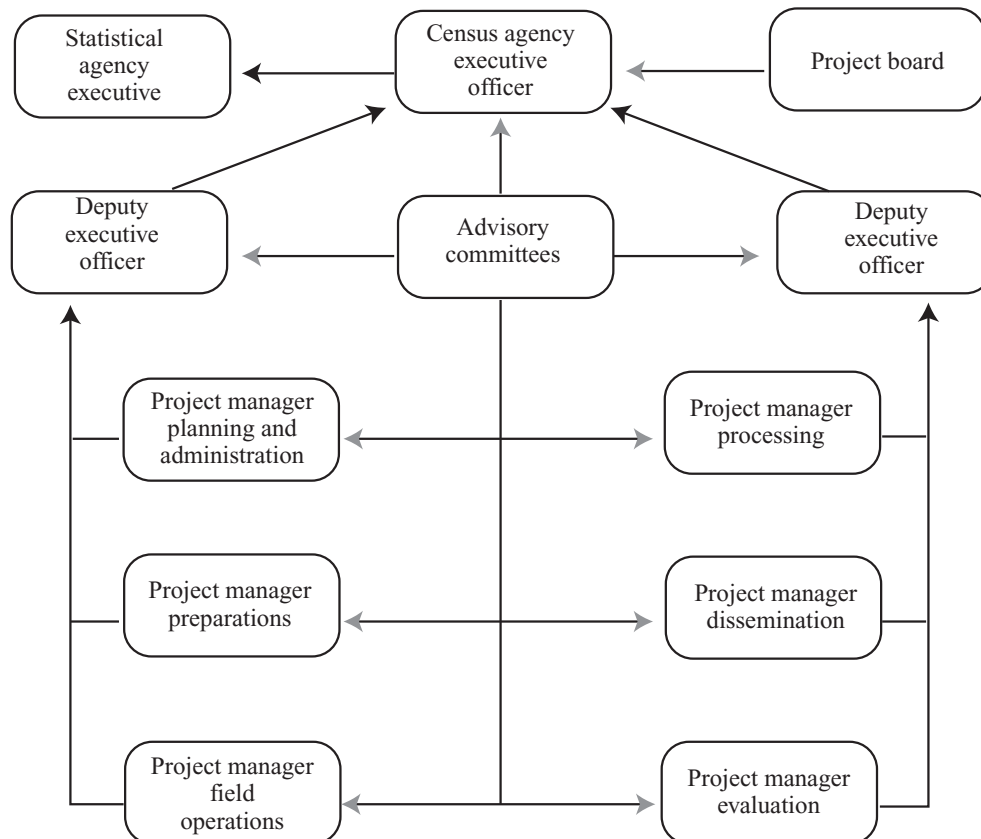
The number of staff employed in each area of the diagram above will vary over the census cycle as different project teams are established in each phase. Also, the numbers of levels in the management structure may also change throughout the census cycle. For example, there may only be one project manager responsible for both processing and dissemination in the early stages of planning.

However, an important point to note is that each phase of the census cycle (as defined in sect. B) is represented in the management structure.

There will also be other areas within the statistical agency that will have an input into the census project that are not represented in the diagram above. For example, these could include the areas responsible for information technology and classifications, or regional offices where they exist.

(a) *Census agency executive officer*

The executive officer is the person responsible for the census within the executive structure of the statistical agency. This person has ultimate line management responsibility for all aspects of the census and takes responsibility for the eventual delivery of census goals. The executive officer will usually report to the statistical agency executive.

The responsibilities of the executive officer can be defined as:

(a) Establishing strategic directions for the census programme;

(b) Setting expectations and outcomes;

(c) Taking on responsibility for assessing and ratifying the census programme's feasibility and achievement of outcomes;

(d) Ensuring that the census programme's scope aligns with the requirements of the stakeholder groups;

(e) Providing those directly involved in the census with guidance on strategic issues;

(f) Ensuring that effort and expenditure are appropriate to stakeholder expectations;

(g) Keeping the census programme's scope under control as emerging issues force changes to be considered;

(h) Reconciling differences in opinion and approach between stakeholders and resolving disputes arising from them;

(i) Communicating expectations and critical decisions to the executive management of the statistical agency;

(j) Allocating project resources;

(k) Addressing any issue that has major implications for the census programme.

(b) *Deputy executive officers*

The number of staff at this level largely depends on a particular country's circumstances and the size of the census project. These officers report directly to the executive officer and can be responsible for several of the phases in the census cycle.

Their responsibilities can be defined as assisting the executive officer in all areas of responsibility included in the list above. Deputy executive offiers are a key link in the communications chain between project managers and the census agency executive and other areas within the statistical agency. Their role is more "hands on" than the executive officer and they are more closely involved with the day-to-day activities of the project teams.

(c) *Project managers*

In this structure, a project manager has been allocated to each phase of the census. Project managers are responsible for several project teams that will be established for each phase. They should schedule and monitor all activity of project team members and they should be separately identified in the work plan.

The responsibilities of the project managers can be defined as:

(a) Developing and maintaining project plan(s);

(b) Managing and monitoring project activity through the use of detailed plans and schedules;

(c) Reporting to the deputy executive officers as required;

(d) Managing stakeholder expectations;

(e) Liaising with all project stakeholders;

(f) Fostering communication among all project stakeholders;

(g) Negotiating the resolution of technical issues;

(h) Completing the project on time and to budget;

(i) Ensuring the quality of the deliverables.

(d) *Project teams*

As options for the various strategic issues are established, the management structure should be refined so that series of project teams become established in parallel, each looking after broad areas of responsibility.

The top-level management structure (figure I.6) can be further broken down for each project leader as shown in figure I.7.

Each project team should be responsible for maintaining contact, at appropriate levels, with external stakeholders, including other areas of the census team, other areas of the national statistical agency and stakeholders external to the agency (e.g., other government agencies).

The project teams are responsible for:

(a) Completion of project tasks to the agreed timetable;

(b) Completion of project tasks to agreed and accepted levels of quality;

(c) Peer group reviews of project outputs.

Figure I.7.   Project team structure
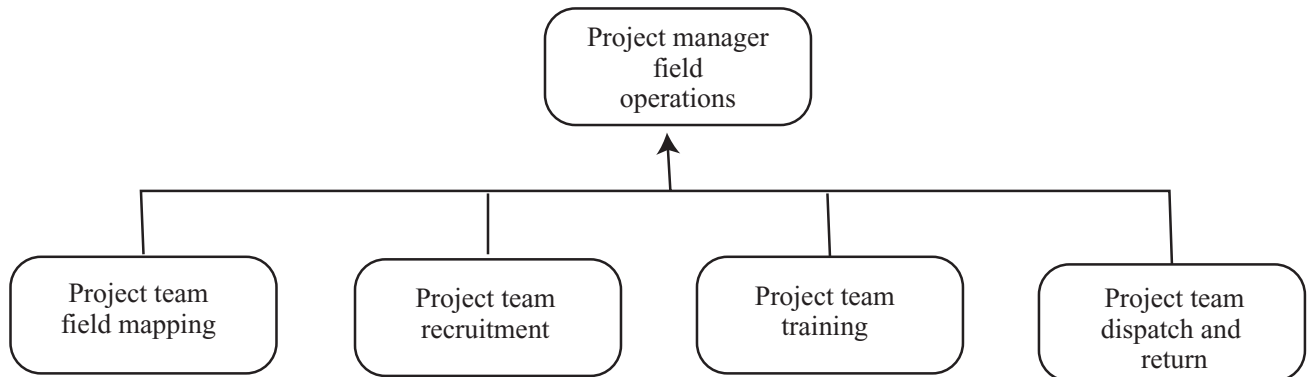
To ensure that there is the greatest possible scope for the coordination of activities between the various project teams, it is recommended that these teams be co-located. If this is not possible for some reason (for example, location of stakeholders with particular expertise or requirements remote from the main census development site), allowance must be made for sufficient communications and face-to face meetings between members of the various project teams.

As the development work progresses, it should be expected that the development project teams will increase in size, as the level of detail involved in their work increases. Eventually, these teams are likely to form the basis of the core management teams undertaking the operational aspects of the census, and the structure of the project teams should incorporate an element to facilitate this evolution.

(*e*) *Project board*

This board is a high-level group, comprising representatives of major stakeholders in the census programme, and other areas within the statistical agency. The project board may be chaired by the census agency executive officer.

The project board should be seen as an advisory body that provides advice to the executive officer on strategic directions and issues. In the early stages of census planning, it is vital to coordinate the disparate activities of the programme and recognize interdependencies. This will be greatly facilitated by the formation of a review body such as a project board.

Representatives on the board from other areas of the statistical agency may also be able to provide high-level specialist advice to the executive officer. These representatives could be from specialist areas such as information technology.

Once the operational phases begin, the role of the project board will be largely complete. However, the board can have an ongoing role in identifying strategic directions for the next census.

(*f*) *Use of advisory committees*

The project board is only one of a number of mechanisms that managers of a census can utilize to gain, through a formal process, access to levels of expertise and experience augmenting those of the team. It is to be emphasized that this is the key role of such committees. They cannot be seen as absolving the census managers from their responsibility to manage the operation.

In many cases, the formal systems development methodology adopted by the agency will indicate the review and advisory boards that should be involved. It is suggested that the following groups are essential to ensure that the development process considers all key issues:

(*a*) An **information technology review panel**, to ensure that the most effective use is made of technology, without requiring the development team to be fully conversant with all aspects of this area;

(*b*) One or more **system user review groups**, to ensure that the views of the people who will operate the system are considered;

(*c*) One or more **client advisory groups** to provide advice on the need for statistical output in specific areas. These panels are particularly useful as a means of addressing emerging areas of concern;

(*d*) Other **technical advisory panels**, where required (for example, a panel of methodologists may be helpful in determining sampling rates; a panel of specialists on employment conditions may be useful if the area of pay and conditions is complex).

Again, the most use should be made of these committees in the planning and preparation phases and not in the operational phases. This is because their main role is to provide advice on strategic issues or particular technical issues. It is unlikely that such committees will be able to respond quickly enough to resolve issues of detail that may arise during the brief and intense operational stages of the census.

(*g*) *Differences between development and operational phases*

While the top-level management structure is established in principle for the entire census cycle, the extent to which all parts of the structure are actually established will vary over the cycle. It is important to note that the detailed management structures and approach will be quite different for the operational phases of the census as compared to the development phases.

The development phases comprise planning and preparation and detailed management structures are suited to these phases. The operational phases comprise field operations, processing and dissemination. These require different management approaches because the nature of the workforces and the tasks performed are quite different. These are discussed in the following sections.

3. *Management of the operational aspects*

During the operational phase, the census programme will be concerned with operational management, driven by output from monitoring systems established in the development phase.

During the operational phase, the generic structure will be expanded to cater for managing these operations. As an example, the field operations management structure could be expanded, as indicated in figure I.8.

Details of the management of the three main operational phases of the census (i.e., field operations, processing and dissemination) are given in the relevant chapters of the present publication. It is, however, worth considering key elements of the specific structures required in an overall sense.

(*a*) *Field operations phase*

A key element of the field operation management structure is that it will inevitably be geographically dispersed. This is needed to provide the local knowledge required to ensure a high-quality enumeration and to ensure ready access to managerial advice and oversight for enumerators.

It is not possible to be prescriptive about the way in which this is achieved since the resources available to countries will differ greatly. Depending on the communication facilities and other infrastructure available in a country, it is common for the basic management structure to involve three or four layers of management in the field operations workforce, as follows:

(*a*) Regional manager;

(*b*) Deputy regional manager;

(*c*) Supervisor;

(*d*) Enumerator.

The first and second levels could be combined if it is possible to obtain the communications and logistical objectives with three groups. It is desirable to minimize the number of vertical stages in the hierarchy as described above in order to facilitate direct communication between enumeration staff and more senior managers and to ensure that each level of staff is encouraged to accept responsibility for their own work rather than relying on actions of layers of supervisory staff to cover up for errors.

It is equally important to maximize communication between management units to ensure consistent adoption of best practices in all areas.

Typically, the field workforce will comprise mainly staff engaged for the specific task at hand. To ensure objectives are met they will require management support from permanent staff of the census agency. This element of management can be provided effectively through regional offices where they exist. In other cases, it may be possible to use other management structures (for example, those of the education department, where it is considered effective in terms of national objectives to utilize teachers as the enumerators).

In most countries, there will also be special sub-groups of the population that require particular management actions to ensure a successful enumeration. For example, these groups may comprise members of a specific cultural group (e.g., an indigenous minority), or people with some form of disability (e.g., visual impairment or poor reading skills) or who live in specific situations (e.g., a nomadic minority group). In each case, a specific strategy will be required incorporating the necessary management structures.

(*b*) *Processing phase*

The success of the census processing phase is determined largely by the structures established to manage the operation. The structures that can be put in place at each processing centre is discussed in chapter 4, section C.

However, if the processing is conducted at a number of decentralized sites, an additional management layer will be needed. In a decentralized scenario there is a strong need for overall national coordination of operational and quality assurance aspects of the processing task. Therefore, national managers will need to be engaged who are responsible for these two aspects of processing.

(*c*) *Dissemination phase*

A number of options are possible for the management structure of the dissemination phase of the census. The overriding requirements are that there should be:

(*a*) A great deal of attention paid to coordination with the enumeration and processing systems;

(*b*) Due attention given to the use of standard classifications across the entire range of outputs;

(*c*) A process that is based on a clearly spelt out set of user objectives;

Figure I.8. Field operations management structure

```
          ┌─────────────────┐
          │ Project manager │
          │ field operations│
          └─────────────────┘
                   ▲
                   │
          ┌─────────────────┐         ┌─────────────────┐
          │ Regional office │◄────────│                 │
          │   operations    │         │ Other regional  │
          │   management    │         │  office staff   │
          └─────────────────┘         └─────────────────┘
                   ▲
                   │
          ┌─────────────────┐
          │ Regional/Deputy │
          │    regional     │
          │    managers     │
          └─────────────────┘
                   ▲
                   │
          ┌─────────────────┐
          │   Supervisors   │
          └─────────────────┘
                   ▲
                   │
          ┌─────────────────┐
          │   Enumerators   │
          └─────────────────┘
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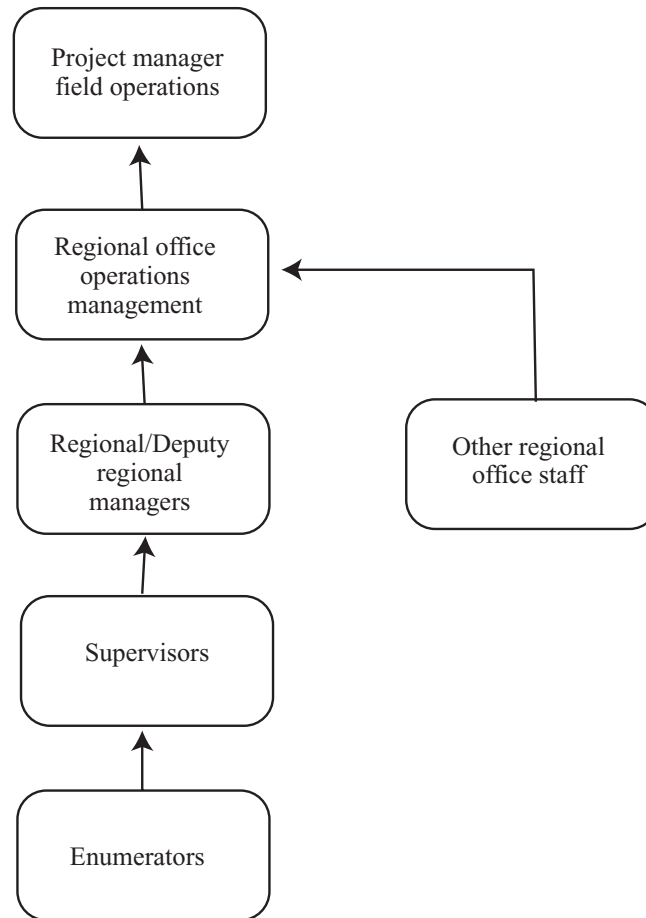
(*d*) *Project management tools to manage timetables and other deliverables*

It is recommended that, when preparing output products, teams be established that are given responsibility for developing particular products over the entire product development cycle. The alternate approach, which is not recommended, is an assembly line process where different teams are responsible for different aspects of the product development.

The recommended team-based approach will give the team members ownership of the products and ensure a consistent approach to the development of particular products. Defining the boundaries of a team's responsibility is best undertaken in consideration of the level of complexity of the outputs envisaged. A different approach may be required in countries in which most users do not have access to computers, or where great importance is attached to providing output to local groups, as compared with countries with sophisticated data-handling systems where most information is passed electronically (e.g., through the Internet or by compact disc).

Where the outputs required are relatively simple, a suggested approach is to structure the teams on the basis of principal topics covered by a team. For example, one team could be responsible for basic demographic output and another for labour force topics and so on.

If the outputs are relatively complex, or require more advanced use of technology, it could be more appropriate to base the teams on individual products or product lines. Thus one team could focus on hard-copy printed publications and a second on electronic products.

E. Software and hardware evaluation and acquisition

1. *Introduction*

Fundamental to the acquisition of hardware and software is understanding the purpose to which it will be put and how the purpose fits into the overall census plan. Fully un-

Census management structure chart for the Cambodia census of 1998

National Committee for the General
Population Census of Cambodia

Ministry of Planning
Technical Committee

Provincial Census Committee

Director of Census

Census Office
Phnom Penh

Region/field

Regional officer

Assistant regional
officer

Province director
Province census officer

District chief
District census officer

1. Administrative Division

2. Planning and Monitoring
   Division
3. Cartography Division

4. Logistics Division

5. Printing Division

6. Analysis and Research
   Division
7. Data-Processing Division

Commune chief
Commune census officer

Supervisor
1 for 4 enumerators

Enumerator

derstanding the system requirements will make the acquisition decision and the trade-off between functionality and cost easier to establish.

For example, when developing the data-processing system, decisions on factors such as the data capture method to be used, what editing and processing will be applied to the data and how the data will be stored and disseminated need to be made. These decisions must be made early enough so that sufficient time is available for the evaluation and acquisition of software and hardware.

The budget available to the project is also a vital factor in making decisions about hardware and software. Costs of employing data-entry staff and the level of the computing infrastructure are also important considerations. For a low-budget project, it may not be feasible to acquire and deploy sophisticated state-of the-art equipment, but the use of less ambitious information technology may offer overall savings as well as greatly increase the utility of the output from the census.

Before agencies commence the formal processes of evaluating and acquiring software and hardware, they should take the opportunity to research and investigate other organizations' experiences with similar systems. During this period, it may also be possible to acquire versions of software and/or hardware that can be used for testing purposes. This will allow agencies to become familiar with, and better understand, the potential and/or limitations of particular systems. This experience can be valuable when developing evaluation criteria as outlined in the sections below.

2. *Evaluating software*

Before acquiring and installing software, there are many issues that need to be considered and it is necessary to evaluate the software against set criteria. Which criteria are critical will depend on what the software is being used for and how complex the function and the software are. The most important criterion is to ensure that an application can be developed that meets the required specifications.

Other possible criteria include whether:

(*a*) The software is easy to learn and use;

(*b*) It is an integrated tool that provides a common approach;

(*c*) There is an easy development environment for user interfaces;

(*d*) There is an easy-to-use programmemer development environment (workbench), including configuration management, testing and debugging facilities incorporating breakpoints and step-through capabilities;

(*e*) The software has the ability to display required objects such as form images, if applicable;

(*f*) The software has strategic value to the organization responsible for the census, or other elements of the national information technology infrastructure;

(*g*) The software is compatible with current industry trends;

(*h*) There is current expertise in the product in the organization or externally:

(i)   Are internal or external staff experienced with the products readily available?

(ii)   What level of training and support is required?

(iii)   What support is provided by the supplier?

(*i*) There is evidence of the current strength and longer-term viability of the supplier;

(*j*) The software will be sourced locally or internationally;

(*k*) It is a well-recognized and used business with well-known products:

(i)   Is the product compatible with current industry trends?

(ii)   Is the supplier financially secure?

The test process for evaluating software should include at least the following steps:

(*a*) Obtain test copies;

(*b*) Develop test prototypes, and test data packs to prove or disprove the software's ability to satisfy key functionality requirements;

(*c*) Detail implications on and for the organization's computing environment;

(*d*) Get access to reference sites and demonstrations relating to the supplier and its products and gauge user satisfaction. This can be augmented with access to bulletin boards and discussion sites, if Internet access is available;

(*e*) If it is a strategic product, ensure that there is a viable support mechanism and that the information quality and responsiveness are acceptable;

(*f*) Conduct tests according to previously established criteria;

(*g*) Assess and document upgrade policy;

(*h*) Determine full costing;

(*i*) Produce a report on the evaluation process.

3. *Acquiring software*

Software for census use in association with selected hardware can be acquired in a number of ways, such as:

(*a*) Purchasing complete off-the-shelf packages that require no further development;

(*b*) Purchasing packages that can be further developed for census-specific activities;

(*c*) Contracting out the provision of specific functionality for parts of systems;

(*d*) Contracting for externally developed software for complete systems;

(*e*) Obtaining free software such as IMPS (see below).

Table I.8 provides an example of some of the software applications that may be used for census data processing. The software packages were evaluated according to their performance against the following criteria:

(*a*) Country size;

(*b*) Data entry;

(*c*) Editing;

(*d*) Fast tabulation;

(*e*) Tabulation;

(*f*) Camera ready.

(*a*) *Package software*

The use of package software, as opposed to developing task-specific software, has become an established practice in many areas of the information systems industry. The major reasons for this are:

(*a*) The reduced risk, cost and time-frame associated with the implementation of proved solutions to recognized business needs;

(*b*) The reduced overhead involved in maintaining the resulting system by procuring packages from vendors committed to their ongoing maintenance.

Although the rationale for using package software is clear, many agencies have been disappointed with the results of package implementations. The most frequently encountered problems are:

(*a*) A mismatch between package functionality and agency requirements;

(*b*) The level of customization required to ensure successful implementation;

(*c*) Inflexibility of the package to meet the changing needs of the agency;

(*d*) The level of maintenance required;

(*e*) An inadequate level of vendor support;

(*f*) Poor vendor choice;

(*g*) The amount of effort required to interface a package to existing systems.

The above problems are almost always attributable to an inadequate analysis of business needs, or a poor procedure for the evaluation and selection of a package, or both.

Off-the-shelf packages would usually be acquired through direct negotiation with suppliers, after an evaluation study has been conducted to determine that these products will fulfil the stated requirements. There is a need to consider whether a site licence is required or whether individual licences would be more appropriate. With software acquisition, there is usually room for negotiation, and discounts may be available for higher-volume purchases. A licence arrangement to allow many concurrent users should be considered as this is usually a cheaper alternative, since fewer licences need to be purchased than the total number of possible users. There are other variants worth pursuing such as differential pricing, that is, limited developers' licences and unlimited licences for run-time access.

(*b*) *Contracting out specific functionality for parts of systems*

Externally developed application-specific software must be tightly specified, developed and controlled and therefore should be subject to contracted conditions that are closely monitored. This is usually based on a formal request for tender or statement of requirements and may be linked to the acquisition of hardware. It is also essential to have good contract management practices in place, otherwise many of the benefits established in the planning processes will be lost in the execution.

(*c*) *Contracting out complete software systems*

A simpler but perhaps more expensive method is to contract out specific functionality for specialized software. Broad requirements might be specified as "the requirement to deliver captured data from every form", which leaves contractors to acquire and develop software themselves. While this is a simpler method for the organization, it will most likely be more expensive and means that communication with the contractor has to be very good to ensure adequate detailed specifications. It also means the organization has less control over the process.

4. *Developing software applications in-house*

If there is no suitable software available off-the-shelf, it might be feasible to develop the required software in-house. The decision to take this action will depend on a number of factors, for example:

(*a*) The budget available;

(*b*) The technical skills available in the organization and the ability to retain those skills (a growing problem in the information technology industry);

(*c*) The timetable for development;

(*d*) The complexity of the required software.

Whether software is developed in-house or contracted out, the same strict control over development issues (e.g., standards, tools used, training of staff and adherence to timetables) must be exercised.

A Regional Approach for Census Data Processing

In order to share the available expertise in a group of countries and facilitate more cost-effective training a common approach for census data processing can be adopted by a set of countries that have shared experiences in census taking. The small Pacific Islands for their 2000 round of censuses have adopted an example of this common approach. They have agreed to the use of harmonized software for data processing (IMPS). This led to the development of a regional network to facilitate regional training and the exchange of expertise among countries.

5. *Evaluating hardware needs*

The requirements for evaluating hardware will depend on the nature of the hardware, its complexity and any links with existing hardware or software. Strict evaluation criteria need to be drawn up before the hardware is acquired for evaluation. Many of these criteria will be the same as the ones set out in section 2 above. Before the evaluation takes place, specifications must have been drawn up to describe clearly the requirements for the hardware, and suitable hardware acquired on the basis of a tender or direct purchase, if there is only one possible supplier.

An evaluation team should be set up to carry out the evaluation. The numbers of people involved in this team will depend on the complexity of the hardware, the number of different hardware configurations to be evaluated and the resources available. The members of the evaluation team must have the necessary knowledge to be able to make a valid, consistent and unbiased assessment of the equipment—from both a technical skills perspective and the ability to manage an objective evaluation process over time. Technology often changes at a fast rate and there is the possibility that updated or new hardware may become available after the evaluation has been completed. It is important to remember that, despite what performance promises may be made by vendors, any decision to implement this new hardware must be based on another full evaluation. It should not be taken for granted that updated hardware will necessarily perform better or be more suited to the particular census application.

The evaluation should encompass a number of phases to ensure that the hardware is thoroughly assessed, and it is important to test the operation of the equipment in the environment in which it is to be used, thus being sure that it will perform properly in the production environment.

Initial capital cost is only part of the total cost of the hardware to the agency. It is one factor, but not the only, or necessarily most important, factor in evaluating hardware. There is a relationship between savings and risk, which means that cheaper equipment has the potential to cost more in the long term if user requirements are not met or the equipment needs replacement before it has done the required job.

Product quality is another issue. Some hardware systems can be put together using a number of different off-the-shelf components, but this requires extensive testing, including systems integration testing involving all components, and assurances that the supply of like products can be guaranteed over time.

The establishment of a set of standards for deliverables and a rigorous change management process is essential regardless of whether one has a single supplier with a proprietary "box" or whether the build of the box is done in a modular fashion.

An important point to note when evaluating hardware is the period of warranty offered by the vendor. It is desirable that the warranty cover the time needed to carry out the census.

6. *Acquiring hardware*

Hardware is usually acquired on a similar basis as that for acquiring software. Where the hardware is new technology for the organization, there will normally be a tender process to ensure that the hardware is the best solution, technology-wise and financially, for the organization. The request for tender must be compiled carefully, with due regard to the legal requirements of the organization and government policies, including ethical and probity considerations. If there is an existing system of panels of suppliers for specific types of hardware, and these are relevant to the requirements of the organization, then they should be used to purchase or lease the hardware required. Ethical and probity issues are of paramount importance in any acquisition process and if not handled properly can be the cause of delays or other problems.

A detailed specification of requirements must be done before the tender document is released or panel suppliers are contacted. This specification will be required to form the basis of the evaluation criteria (see section 5 above).

It is important to evaluate the real requirements of the organization and to acquire hardware that is appropriate for the job. There may be pressure to buy older technology to save money, but this can be counter-productive if there is a need to upgrade other components. On the other hand, it is important not to pay too much for hardware by buying equipment that delivers more performance and functionality than is required. Careful planning is required to gain the most benefit from hardware purchases.

There are some basic rules that should be followed for acquisitions:

(*a*) Use requests for proposals or requests for tender to control the process;

(*b*) Try to keep proposals simple;

(*c*) Purchase only what is required, but as much as possible to encourage competitiveness in the evaluation process;

(*d*) Shortlist ruthlessly, focusing on the best technical solution and overall value for money;

(*e*) Negotiate the warranty period;

(*f*) Negotiate free training to be provided by the vendor;

(*g*) Consider the level of local maintenance support available;

(*h*) Consider the advantages and disadvantages of purchasing locally compared to internationally;

(*i*) Avoid being under any obligation to a vendor;

(*k*) Consider ethics and probity issues at all stages**.**

Annex 5 shows a framework that can be used to obtain an accurate estimate of the equipment and manpower needed to capture and process the census information using both manual data entry and scanner technology.

Table I.8. Census data processing software applications

Software	Country size	Data entry	Editing	Fast tabulation	Tabulation	Camera ready
IMPS [a]	Small, medium or large	Excellent	Excellent, but needs to have qualified EDP staff	Excellent	Excellent, but needs to have qualified EDP staff	Excellent
XTABLE/PCEdit	Small, medium or large	Good	Fair	Excellent	Good	Fair
BLAISE [b]	Small, medium	Excellent, but no double entry	Excellent	Excellent	Good	Poor
ISSA [c]	Small, medium	Excellent	Excellent	Good	Good	Poor
EPI-INFO [d]	Small	Good	Fair	Good	Not applicable	Poor
WinR+ [e]	Small. or medium	Not applicable	Not applicable	Excellent	Good	No
PC-AXIS	Small, medium or large	Not applicable	Not applicable	Excellent	Good	Good

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Source: C. Ellis, "Census data processing Strategies" Seminar on Strategies for the 2000 Round of Censuses in the Pacific, Nadi, Fiji, 8-12 December 1997. (PAC/SEM/97/6).

[a] Integrated microcomputer processing system.
[b] Survey processing system.
[c] Integrated system for survey analysis.
[d] Epidemiology computer software.
[e] Windows retrieval of data for small areas by microcomputer.

F. Use of sampling

1. *Introduction*

Sampling can be used in different phases of the census. These include;

(*a*) In tests conducted before the census (e.g., pre-tests and pilot tests);

(*b*) During the census itself (i.e., using short and long forms);

(*c*) In quality control operations, such as for printing and reviewing questionnaires.

(*d*) After the census, to produce preliminary estimates before tabulations are prepared and in the post-enumeration survey.

Using correct sampling methodologies is critical for all of the activities mentioned above. It is beyond the scope of the present handbook to discuss in detail the sampling methodologies that can be adopted. Countries that use sampling should ensure that they seek expert advice on the methodologies to be used.

However, some general issues that managers may need to consider regarding sampling are discussed below.

2. *Tests before the census*

Generally, the testing programme before the census will involve sampling particular areas and a proportion of enumeration areas within those areas. For the majority of tests, it is important that as far as possible the sample selected is representative of the country as a whole. For example, this will require that areas in both urban and rural localities are selected. Tests that are conducted for specific purposes (e.g., to test enumeration procedures for particular population groups) will need a sample selected that contains a high proportion of people in that particular population group.

3. *During the census*

Sampling during the census is undertaken where it is desired to reduce the costs of the census. Generally, this is achieved by asking a restricted set of questions of the entire population (usually the basic demographic questions on a short form), with only some proportion of households (usually about 10 per cent) asked the full range of questions (long form). During the past three censuses taken in the United States of America, the sampling rate varied between 15 and 20 per cent. In the 1980 census, there was a 17 per cent sampling rate; during the 1990 census, it was 20 per cent.

Cost savings are generally no more than 20 per cent of the total cost of the census, as the main cost of the census is in finding the households and the households within the enumeration areas. The major savings is in salaries for processing staff. In an interviewer-based census, savings can also be made for enumeration costs because of the reduced time needed to interview the majority of households.

However, careful consideration should be given before using a short and long form approach. The major purpose of carrying out a census in the first place is to provide data for the smallest geographic areas and for small population groups; sampling within a census is usually only considered where the demand for the sampled data is mainly for larger geographic regions. For example, the United States Bureau of the Census does it for block groups, which is a relatively small area. The marginal savings have to be weighed carefully against the loss of reliable data.

It is recommended that countries with smaller populations do not adopt a short and long form approach.

4. *After the census*

Sampling can be used after the census to produce preliminary estimates before tabulations are prepared and in the post-enumeration survey.

Some countries have initially processed a sample of enumeration areas to enable them to produce preliminary results before the bulk of the processing is completed. While this method will enable an early release of data, it adds unnecessary complications to the processing of data and diverts resources away from the task of producing final data (see chap. V, sect. A).

The post-enumeration survey must be representative of the entire country and of all population groups (see chap. VI). The sample selected may vary, with a small sample allowing a national undercount figure to be calculated or a larger sample allowing an undercount figure to be calculated by region. The size of the sample selected will largely depend on the resources available to the census agency.

G. Selecting and managing external consultants and outsoucing

1. *Introduction*

In many countries, the use of external consultants (including consultants provided through international development programmes) and outsourcing has increased greatly in recent years. The use of such an approach to resourcing a census could be considered as a possible part of the total development of systems and facilities for census use. Traditionally a number of countries have used other government agencies for form printing and the provision of mapping services.

However, outsourcing to other government agencies and/or private vendors for both information technology and non-information technology projects has increased, along with the use of external consultants. The principles involved in managing these external consultants or the outsourcing vendors are the same in all cases regardless of whether they are another government agency or a private vendor. Whether or not a project is information technology-based, the desired result is the same, that is, that a successful census outcome is achieved, with all requirements being met for an agreed cost to an agreed timetable.

Whether external consultants and/or outsourcing is used depends on the requirements of the organization (including requirements for confidentiality and security), whether the required skills are available in-house and whether projects can be outsourced cost-effectively. Outsourcing decisions should be made within the context of a larger organizational plan that identifies choices between both hiring and training staff or using external service providers to augment or replace resources for specific projects. There is not a clear-cut distinction between hiring consultants, the use of external service providers or outsourcing; quite often a system will contain elements of all of these working together with in-house resources.

The agency may have limited skills of the type needed for the implementation of a particular specialized system, or information technology may not be a core part of the business. If this is the case, a solution in which a greater proportion of the work is undertaken by resources outside the census agency could be considered. Instead of simply acquiring hardware and software with which to assemble a processing system, a total solution would be requested, with the successful tenderer taking responsibility for all information technology aspects of the processing system.

In many countries, bilateral agreements allow for the use of international consultants as technical advisers. In these cases, census managers should take advantage of the opportunity to assist in capacity-building within the census agency.

In some countries, tenders committees have been formed which consist of the Ministry of Finance and a general control association, as well as the Statistical Office. The committee is usually responsible for calling tenders, requirements and conditions, evaluation of tenders and selecting the most suitable ones.

2. *Differing objectives*

It is inevitable that any external resource provider will have additional or different objectives from those of the census agency. For example:

(*a*) A specialist mapping service provider may be more interested in producing maps to the highest standards of cartography than in offering a service that allows enumerators to locate dwellings effectively;

(*b*) A private sector business will be obligated to provide a return to shareholders rather than satisfying the public policy needs that drive government agencies.

As a result of these differing objectives, in all cases where external resources are employed, careful control is needed to ensure that the selected external provider delivers a cost-effective solution that meets the census agency's needs. The use of external service providers should be carefully specified, planned and monitored.

3. *Specification*

Successful outsourcing initially requires the census agency to have a clear understanding of the requirements, as these have to be unambiguously specified to the service providers. If the agency cannot express its expectations and pri-

orities clearly to service providers, the service providers cannot be expected to achieve them. It is also necessary to ensure that any legal documents (e.g., conditions of tender) are fully understood by all parties.

The way in which this specification is passed on to the external providers will, to some extent, be determined by the laws, rules and procedures that apply in a country. However, a detailed written specification should be set out to serve as a benchmark against which performance can be measured later in the process.

Annex VI contains an example from the Australian Bureau of Statistics of a table of contents of a model contract and the issues that can be covered in writing a contract.

Preparation of specification

During the preparation of a specification for outsourcing or an external service provision, about half of the time should be used in establishing the objectives of the project, the outcome to be achieved and the procedures to be followed in attaining that outcome. The standards to which outcomes are to be achieved must also be specified (e.g., for a data-entry operation, an allowable proportion of erroneous keystrokes could be specified).

The next largest amount of time should be spent on documenting precise price and payment terms (where goods and/or services are to be purchased).

The specification must be designed to allow for requirements changing over the life of the project. This should include a clear method through which changes are agreed and approved by both the census agency and the service provider.

Within this overall framework the specification should:

(*a*) Clearly state the scope of the project;

(*b*) Identify the deliverables and the associated schedule of dates for completion of each deliverable (i.e., milestones);

(*c*) Identify key personnel by name and qualifications, and set out rules for their replacement, where necessary;

(*d*) Clearly define invoicing and payment specifications, as well as time-frames and methods for payment of penalties;

(*e*) Set out training programmes and documentation requirements.

4. *Monitoring the outsourced project*

It is important that outsourced projects are carefully monitored against the specification. This monitoring must include early identification of problems (milestones are important in this process).

Particular care should be taken where the outsourced work is being developed and/or undertaken at a site remote from the location of the census office.

Regularly scheduled meetings (or other communications such as telephone conferences or videoconferences) between census agency and service provider staff are essential for managing external relationships and ensuring that expected contract results are achieved. Compliance with scheduled completion should be specified as a contract requirement,

with listings of key attendees from all parties specified in the contract. The frequency of the meetings should be specified along with responsibility for recording and publishing decisions made or items agreed to.

It is considered essential that a system of cascading meetings be established, with project team staff meeting their counterparts frequently for routine monitoring. Reports, on an exceptional basis (i.e., restricted to the important issues on which decisions are required), would be made to less frequent meetings of more senior staff.

This is a key area, which might be neglected if not considered early enough in the proceedings. Even if the requirements are clearly specified, it is still possible for problems to arise in the delivery process, with the potential for the outcomes to be achieved late or not at all.

Clear and open communication is a critical success factor in this element of managing a census. Care should be taken to ensure that all negotiations with external providers are done with a degree of common sense and appreciation of all viewpoints and constraints, as well as rigorous contract preparation.

While many forms of the specifications will include penalties for failure to meet deadlines or quality standards, these are rarely effective in a census context. What is required is a census held successfully on a date specified months or, in many cases, years in advance, not cash from penalty payments. Attention to detail in the specification documents is a major step towards achieving this. It is also important to develop and manage a good working relationship between the service providers and the census agency.

II. PREPARATORY TASKS

1. *Introduction*

Establishing the basis of the enumeration provides a framework for proceeding with more detailed planning for field operations. Basic issues that should be addressed include:

(*a*) Responsibility for the census enumeration;

(*b*) Key goals;

(*c*) Key stakeholders;

(*d*) Type of enumeration (including population to be enumerated);

(*e*) Method of enumeration;

(*f*) Timing of enumeration;

(*g*) Census referece time;

(*h*) Duration of enumeration;

(*i*) Critical dates;

(*j*) Other major constraints;

(*k*) Performance indicators.

Each of these issues is discussed in detail in the sections below.

2. *Responsibility for the census enumeration*

The responsibility for the census enumeration must be determined as part of the planning phase of the census. Evaluations and recommendations relating to the previous census should be reviewed when determining the enumeration responsibilities.

In most countries, the statistical office will be responsible for census enumeration and will establish a separate census agency within the office.

However, in some countries, a separate agency will be established and a "census commissioner" appointed who may report directly to a government minister (e.g., the Minister for Planning). A high-level inter-agency committee may also be established to coordinate activities between various government agencies. In many countries, the established administrative structure, both centrally and in regions, is also used to coordinate and undertake census enumeration.

In a census agency, the management of the census enumeration will usually have two structures. One is internal to the census agency, while the other is a temporary structure set up specifically for the field operation. The role and responsibilities of each structure and how they relate and communicate with each other need to be taken into account.

Key factors to consider when establishing roles and responsibility include the following:

(*a*) The structure of the census agency itself. Is it centralized or decentralized? If there is more than one office, what is the relationship between these offices and how do they relate to the statistical geography of the country? (see sect. C below);

(*b*) Which agency will undertake the enumeration? For example, this could be the census agency or some other government agency that may be better placed, with some core and experienced staff and/or infrastructure already in place;

(*c*) The number of permanent staff in the statistical agency who will be involved in the enumeration phase and on what basis. At a minimum (and taking account of the size of the office), there should be a permanent census unit, including staff responsible for enumeration, established at least three years before the census. There may be a need to recruit additional staff, apart from temporary field staff, into the census agency specifically for the duration of the enumeration phase.

In the majority of countries, there is a central statistical office and regional offices located throughout the country. The relationship between, and functions of, these offices vary from country to country. In some cases, a regional office may be responsible for all statistical activities in that part of the country. In other cases, a regional office may be responsible for some economic and/or social collections for the entire country, while the central office determines statistical priorities and standards. In yet other cases, a regional office may be responsible for processing, while another regional office is responsible for dissemination. There is no preferred arrangement, but planning for the census should aim at taking advantage of existing office infrastructure. It is also important to note that the scale of the census offers high return in terms of economies of scale and use of standardized procedures.

Depending on the structure of a country's statistical agency, responsibility for the operational aspects of census enumeration may devolve to the head of each regional office. In this case, the central office usually undertakes the development of procedures and arranges acquisition of materials for use by the regional offices during the enumeration period. In this situation, the central office provides a key support role to regional offices during the enumeration period. Planning should take this into account in deciding what form the support will take and how it will be organized.

3. *Key goals*

Initial planning for a census will have established broad goals (see chap. I, sect. B). Planning for the census enumeration should consider how it will contribute to achieving the broad census goals and whether there are specific ones related to enumeration.

Goals can be limited to a few important items or structured to cover several aspects of the census enumeration. For some items, goals can be derived from asking questions similar to those relevant to management information data requirements (see chap. III, sect. E). The following example about training illustrates this.

For a variety of reasons, training of enumerators may be more important in some countries than in others. Assuming that training is very important, the question "Have all field staff been trained?" may be used to establish the goal that all field staff will be trained before the census enumeration begins. Reporting the status or level of completion of field staff training would contribute to assessing the success of this goal.

The following is a list of some broad topics for consideration as goals for the census enumeration. It is not an exhaustive list and some topics may not apply in some countries:

(*a*) Full coverage. Census enumeration procedures need to be designed to ensure that full coverage of the population is achieved, while adhering to budget and timetable considerations;

(*b*) Confidentiality. Procedures are designed to ensure confidentiality of census data. Examples of measures that can be taken to ensure confidentiality include enumerators wearing identification passes and privacy envelopes being provided for people who request them and names and addresses not being stored in computer files;

(*c*) Census publicity. Publicity and associated census inquiry services are conducted to heighten public awareness regarding the census. The goal is to have the public well informed about the need for, importance of, and benefits from a census. Thus, emphasis would be placed on key aspects such as the benefit of the census to the community and confidentiality and privacy. A good public relations campaign will also contribute to response rates and data quality;

(*d*) Non-compliance. Minimizing non-compliance should be considered a key goal of the census enumeration;

(*e*) Cost-effectiveness. All enumeration processes and procedures are developed with a view to maximizing cost-effectiveness;

(*f*) Recruitment and training of field staff. An important goal for census enumeration is that the most efficient procedures and processes are established to recruit and train a high-quality field workforce;

(*g*) Accountability. All materials should be accounted for. This can be reflected in a goal that all census forms are received at the processing centres and that there are no reports of lost census materials in the field;

(*h*) Availability of instruments (e.g., maps) necessary for enumeration;

(*i*) Involvement and cooperation of local leaders;

(*j*) Consistency of procedures across all regions within the country;

(*k*) Special enumeration. In some countries, the enumeration of particular sub-groups of the population can be more physically, culturally or politically difficult than that of the mainstream population. Where sub-groups are identified for special enumeration, a goal could be to ensure that procedures are in place and special strategies devised to ensure their inclusion in the census.

There are many other potential goals that may apply to particular countries. During the planning phase of the enumeration, the important question to ask is "What outcomes are we aiming at as a result of the enumeration"?

The goals could be expressed as absolute numbers. For example:

(*a*) A gross undercount rate of x per cent or less;

(*b*) A cost per capita of 'y' units of currency;

(*c*) Relative to a benchmark of x per cent, reduction in underenumeration relative to the previous census.

4. *Key stakeholders*

The issue of stakeholders is covered in detail in chapter I, section B. For the census enumeration, the key stakeholder is the processing area. While the quality of completed questionnaires will ultimately be reflected in the quality of census output, the more immediate impact will be during census processing. When developing census enumeration, decisions about procedures, and assumptions that will have an effect on how the questionnaire is completed, should be discussed with the processing area. This will help ensure that processing systems can be completed, tested and implemented once questionnaires begin arriving from the field. Last-minute changes to processing systems and procedures because of misunderstandings about what is happening in the field can be costly and take time to correct.

5. *Type of enumeration*

Describing the total population of a country and its geographical distribution within the country are common and essential elements of all censuses. However, the definition of what constitutes the population of an area varies from country to country and largely depends on the requirements of users. The total population may be defined to include or exclude foreigners in the country and its own nationals in other countries. It may or may not include certain population groups within the country.

While the definitions of total population vary among countries, those definitions are nevertheless categorized under either of the two principal concepts commonly adopted for a census enumeration, namely:

(*a*) Place of enumeration (de facto);

(*b*) Place of usual residence (*de jure*).

To avoid confusion, and thus errors, it is important that the same principle is adopted across the entire country.

(*a*) *Place of enumeration* (de facto)

This category includes all persons physically found present in a country on the date or time of the census. The total population will comprise all persons present in the country when the census is taken and enumerated at the place where they are at census time, regardless of their usual place of residence. In practice, and for operational convenience, the concept is applied to the place where the person slept on the night preceding census day or was present at a defined census hour.

The procedures for enumerating people who may be travelling or away at work during the night preceding the census day must be specified. The practice generally adopted is to enumerate persons who may have been travelling throughout the night preceding census day at the place where they are found at a reasonably early hour on the morning of census day.

Enumeration staff located at railway and bus stations, ports, ferry terminals and airports will enumerate such persons at daybreak, after making sure that they have not been enumerated at an earlier travel stop. Where a self-enumeration form is used, census managers may arrange for census forms to be delivered to the point of departure and collected at the point of arrival.

Persons at work on the night preceding census day are generally enumerated in the place where they would otherwise have slept but for having been away at work.

(*b*) *Place of usual residence* (de jure)

This includes all usual residents. All persons present at their place of usual residence will be enumerated, as well as those who may be temporarily absent from their place of usual residence, irrespective of where they are at the time of the census. Enumeration is carried out on the basis of place of usual residence, irrespective of whether the person is, or is not, present at that place at census time.

The place of usual residence is where a person usually resides and may or may not be the person's place of domicile or permanent residence. The latter terms are usually defined in the laws of most countries. They do not necessarily correspond to the concept of place of usual residence which, as employed in the census, is based on conventional usage and relates to census time rather than other periods.

Although most people will have no difficulty in stating their place of usual residence, there may be some confusion in certain cases. The following and similar cases should be provided for in the enumeration procedures:

(*a*) Persons who maintain more than one residence;

(*b*) Students who stay in hostels;

(*c*) Persons who sleep away from their homes during the week for work-related reasons and only return home for a few days at the end of the week;

(*d*) Defence and other personnel who live in official accommodations but continue to maintain residences.

Precautions will have to be taken to avoid such people being counted twice, particularly in cases where the residences or places of stay are located in different enumeration areas. The procedures will also have to provide for such cases as:

(*a*) Persons who are out of the country temporarily and likely to return;

(*b*) Persons within the country who are at places other than their usual residence for a brief period and are likely to return to their usual place of residence before the expiry of the enumeration period.

In these cases, it is usual to prescribe clear time limits of presence in, or absence from, a particular place to determine the place that should be treated as that of usual residence.

Care should also be taken that people in these situations are enumerated consistently so as to avoid some of these people being treated one way and others in a different way. This could give rise to inequities in distribution of resources; for example, if students in one area are recorded as being residents of that area but in another area students in the same situation are recorded against their parents' address.

(*c*) *Obtaining both place of enumeration and usual residence*

If obtaining both populations is desired, the questionnaire will have to distinguish between the following persons with reference to census day:

(*a*) Usually resident and actually present;

(*b*) Usually resident but temporarily absent;

(*c*) Not usually resident but present in the household.

Information will also have to be obtained about the usual residence of those who are only temporarily present for coding to their place of usual residence. The collection of such complete information, especially if an interviewer method is used, has implications with regard to the workload placed on the enumerators and supervisors.

Special care should be taken if both place of enumeration and place of usual residence are obtained, otherwise potential problems with double counting may occur.

If a self-enumeration method is used, particular care should be taken in conveying the concepts to both the enumerators and the public. The possibility of collecting such complete information will have to be a matter of judgement for each country.

The general practice has been to adopt either of the two enumeration methods, with some variations. The enumeration method may be modified from the models described above to reduce conceptual problems for the enumerator and the public. For example, it may be prescribed that if a person is away from his or her place of usual residence for a certain period before the census, and is not expected to return before the census, enumeration will be conducted at

the place where the person is found at the time of the census. To deal with such variations, careful instructions and adequate training will be needed.

(*d*) *Population groups*

Though there is general agreement on the definitions of de facto and *de jure* populations, in practice, countries rarely achieve either type of enumeration fully. In the application of the concepts, differing principles are adopted with regard to the inclusion or exclusion in the total population of certain groups. These groups include the following:

(*a*) Nomads;

(*b*) Persons living in areas to which access is difficult;

(*c*) Defence and diplomatic personnel of the country, and their families, located outside the country;

(*d*) Merchant seamen and fishermen resident in the country but at sea at the time of the census (including those who have no place of residence other than their quarters aboard ship), and workers on offshore oil rigs;

(*e*) Civilian residents temporarily in another country as seasonal workers;

(*f*) Civilian residents who cross the border daily to work in another country;

(*g*) Civilian residents other than those above who are working in another country;

(*h*) Civilian residents other than those above who are temporarily absent from the country;

(*i*) Foreign defence and diplomatic personnel and their families who may be located in the country;

(*j*) Civilian aliens temporarily in the country as seasonal workers;

(*k*) Civilian aliens who cross a frontier daily to work in the country;

(*l*) Civilian aliens other than those above who are working in the country;

(*m*) Civilian aliens (including refugees) other than those above who are temporarily in the country;

(*n*) Transients on ships in harbour at the time of the census.

Some of the groups are closely related. However, the groups have been listed separately to emphasize that their enumeration will have to be provided for by special procedures or instructions. In some cases, it will have to be decided whether to include them in the total population.

The treatment of these groups is not uniform. The inclusion or exclusion of some of the groups in the enumeration has generally been governed by past practice, or by an administrative view of who should legitimately constitute part of a country's population. Each country will have reasons for such differential treatment. However, it is recommended that census documentation indicate which groups constitute the population and which groups are excluded, rather than simply describing the count as place of enumeration or place of usual residence. Such information will be very useful in comparing population size and characteristics among countries and will also help in arriving at appropriate decisions in the succeeding censuses in the same country.

The importance of a standardized definition of the total population to be applied from census to census must be emphasized. At the same time, the difficulties in arriving at a common definition, insofar as those difficulties arise from the differential treatment of the groups referred to earlier, must be recognized. Any serious variations from one census to another will considerably reduce the utility of the data, render the study of population trends difficult and introduce serious errors in population estimations and projections. This will have follow-on impacts on policies formed from the previous results.

Variations among countries in the concept or definition of what constitutes total population have great significance in estimations and monitoring of world population. The absence of uniform treatment of the groups under consideration could result in some of those groups being completely omitted or double counted in the estimation of the world population. This distortion, the magnitude of which is unknown, may be growing because of the increase in population of all or some of these groups and the large international movements that have become apparent in recent years. The implicit assumption of a few decades ago that the differential treatment of these groups did not have any significant effect on the total population is no longer valid.

It would be desirable to achieve some degree of uniformity in the definition of total population and in the corresponding principles of enumeration of the groups under consideration.

(*i*) *Exclusion of groups in the population*

Operational realities must be taken into consideration while defining any groups that should not be enumerated. A special case exists with diplomatic personnel, who are generally readily identified and can be briefed by the relevant agencies on the rules of the census and how to respond. Identifying people in other categories to be excluded during enumeration will involve some degree of probing, and the enumerators may not always be capable of eliciting the correct information.

It may be better to structure the questionnaire so as to obtain the information necessary for classification into or out of an exclusion group and resolve these issues in the processing phase. If this procedure is adopted, the enumeration will include virtually all persons present in the country at census time.

For groups not included in the total population (e.g., short-term overseas visitors), it is recommended that a clear indication be provided of the population size of such groups. If those groups have not been enumerated (as may be the case for the excluded groups), they should be listed and estimates of their size provided from administrative records or other sources.

(ii) Inclusion of residents in other countries

It is strongly recommended that the residents of a country who are located in other countries on a long-term basis be excluded from the definition of total population. This is because inclusion of this group is contrary to the census definition.

However, in practice, some countries have included this group in their total population. Inclusion of this group has generally been based on special circumstances that may prevail in the country, such as in countries with small populations, of which a substantial proportion live abroad.

If inclusion of such groups is required, the accurate determination of the number of their nationals in other countries will be the most important and difficult issue. Two possible methods of collecting this information are:

(*a*) Enumeration through the country's own diplomatic representatives in the host country;

(*b*) Collection from the members of their families who are being enumerated in the source country.

The quality of information collected by either method is likely to be relatively poor. It is suggested that the data sought by such means be included on separate forms and limited to a few basic questions on key demographic information (e.g., name, sex, age, relationship to head of household and duration of absence from the country).

If the practice of including nationals living in other countries in the total population is adopted, it is recommended that the total population enumerated within the country and the total number of nationals living in other countries be presented separately. The procedure adopted for determining nationals living in other countries should also be clearly stated.

(iii) Enumeration of the defence forces

The procedures for the enumeration, and the presentation of data for this group, are matters that need special attention when planning enumeration.

In some countries, defence personnel are enumerated but the results are aggregated in a way so that these personnel cannot be identified from the published data. In particular, most countries present the data in a way that prevents the identification and location of defence camps and concentrations of troops. This is often a matter of state policy and security.

Appropriate enumeration and tabulation procedures will have to be developed for this purpose by each country. It is beyond the scope of the present manual to specify the full range of possible procedures. However, the probability of identifying current locations of forces is reduced under a usual residence census. This will require careful management of the actual enumeration task to ensure that people are able to report their usual residence when enumerated in barracks or defence camps. Caution should also be exercised to avoid the risk of double counting defence personnel in a usual residence census.

6. *Method of enumeration*

The decision regarding the method of enumeration should be taken in the early stages of census planning because of the wide-ranging influences this decision has. The method adopted will influence the following:

(*a*) Budget;

(*b*) Organizational structure;

(*c*) Type of questionnaire and its content;

(*d*) Training programme;

(*e*) Content and scope of the publicity campaigns;

(*f*) System of management of records.

There are three main methods of enumeration:

(*a*) Interviewer (canvasser);

(*b*) Self-enumeration (householder);

(*c*) Use of pre-existing administrative records.

A combination of all three, or any two of the three can also be used in one census.

Reminder questionnaire

In some Arab countries, for example, a reminder questionnaire is distributed to each household before the census enumeration. Households are asked to fill in the questionnaire on the night of the census reference day. The questionnaire contains a few questions such as full name, date of birth and personal identification number. The purpose is to facilitate the task of the enumerator, on the one hand, and to give householder the time to fill in initial information from formal documents. A face-to-face interview is then conducted for each household.

The administrative method is mainly restricted to countries in northern Europe. In view of its restricted application, it is not considered further in this chapter.

(a) Interviewer method

In the interviewer method, the questionnaires are completed by an enumerator who conducts necessary field inquiries, usually by interview, about each housing unit and about each person who is a member of the household. The enumerator then records the information on the census form. Owing to cost and time constraints, a representative adult member of each household usually reports for all members of the household.

The records are always in the possession of the enumerator and are not handed over to the household.

This method has been adopted in most developing countries. It has the following advantages:

(a) Enumerators can be well trained in the concepts, instructions and procedures;

(b) If there are sufficient numbers of enumerators and supervisors, the enumeration can be completed in a short time;

(c) In areas of relatively low literacy, the meaning and purpose of the census questions can be better conveyed to the people by oral communication rather than through printed material. Such direct interviews by the enumerators elicit prompt replies, and cases of reluctance to cooperate can generally be settled during the course of the enumeration itself;

(d) Within an enumeration area, the information is likely to have fairly uniform quality and consistency;

(e) More complex questions can be included in the census than would otherwise be possible.

(b) Self-enumeration method

Most developed countries have adopted the self-enumeration method. In this method, the information about the housing unit and the members of the household are recorded on the questionnaire by one or more members of the household. The questionnaires, along with the instructions, are distributed to every household in advance of the census date and received back after completion. The questionnaires can be distributed to the households by the enumerator personally and collected after a fixed period of time. The enumerator may merely act as the agent for distribution and collection or, depending on the circumstances in each country, may also assist in completing the forms.

In some cases, the questionnaires and the instructions are handed over to the households by the enumerator, with a request that they be completed and kept ready for verification. The enumerator will, in a second round, collect the forms, verify the entries and correct them, if necessary, through personal inquiries. In some countries, the verification process is rigorous, while in others the forms are only scanned to ensure that complete pages have not been omitted by accident.

In some cases, the forms are mailed to households on the basis of mailing lists and received back through the mail. In this mail-out/mail-back procedure, the role of the enumerator is limited. However, there will be cases of non-response or incomplete response, in which case the enumerator may have to intervene to obtain full information. Such gaps could also be filled through telephone inquiries, where the facilities are efficient and widely available. The public communications strategy (see chap. III, sect. A) will also play a significant role in providing explanatory material to the respondents.

The identification and location particulars of the household are generally recorded on the questionnaires prior to being handed over to the household. The responsibility for completing the questionnaire in the self-enumeration method is that of the head, or some other responsible member, of the household. This method can be adopted, with the expectation of reliable results at substantially lower costs than the interviewer method, in countries where:

(a) Literacy is near universal;

(b) Educational levels are relatively high;

(c) Communication systems are widespread and efficient.

The self-enumeration method is also conducive to greater involvement of other members of the household in the enumeration process. This is because it encourages consultations among family members, which should yield more accurate and comprehensive information regarding the individual members of a household.

Mail-out/mail-back systems

Such systems are usually a subset of the self-enumeration approach. However, they often become combination methods (see below) through the use of interviewers to follow up cases of non-response to the mail system.

Countries that have used mail-out/mail-back methods have indicated that significant further savings can accrue if the postal and/or address register systems for mail-out are adequate. The preparation and maintenance of such a mail directory is difficult and expensive.

A method that involves a mail-back approach has the particular disadvantage of census materials being beyond the control of the statistical agency for a key part of the operation. This highlights the importance of some particular issues, including the following:

(a) Determining delivery strategies, which must be considered carefully in initial planning (see chap. I, sect. B);

(b) How to monitor effectively which households have mailed back their census forms;

(c) The relationship with, and reliability of, the country's postal services;

(d) Problems with non-response rates in particular areas.

The problems with non-response rates in particular areas can be dealt with by using interviewers to follow up on non-responding households. If there is a low response rate to the mail-back operation, the costs of following up all non-respondents could be very high. These costs may be contained

by adopting direct sampling methods for those households that do not respond. An important point to observe in adopting such a practice is that all non-responding households must have a known probability of selection in the sample. Also, the follow-up must be intensive to ensure that all selected households provide a completed questionnaire.

A wide range of possible sampling plans could be envisaged, and it is beyond the scope of the present handbook to consider them in detail. The key elements of the plan are that (*a*) it must provide data of the standard required by clients of the census programme, and (*b*) the rules and procedures for selecting the sampled units must be easy to apply, since this aspect of the collection will, in most cases, also be undertaken by temporary staff.

For example, it may be decided that a 90 per cent response rate for all geographic areas is required. Those geographic areas with response rates of, for example, 70 per cent can have the balance of the households sampled at a rate of 2 in 3 to achieve the necessary 90 per cent response rate. Geographic areas with initial mail response rates of better than 90 per cent could have the balance of households sampled at 1 in 10. This is because there may be a difference between those households that responded and those that did not.

(*c*) *Combination methods*

A combination of both interviewer and self-enumeration methods is often used for the purpose of ensuring maximum coverage. In these cases, the self-enumeration method is adopted in areas where the response rate is likely to be high. The interviewer method is used in areas, or community situations, where the literacy levels are low or special problems exist. In areas where the mailing system may be ineffective or too expensive or where the terrain or climatic conditions impose constraints, the interviewer method is adopted as being more conducive to a better enumeration.

(*d*) *Other methods*

Other methods of enumeration have been adopted in some countries.

All households may be listed in a preliminary round and a census station is then established in the enumeration area. Respondents are requested to gather at the census station in order to give the enumerator detailed information on each topic. In this method, the enumerator does not visit every household for the purpose of completing the forms. The preliminary listing of households enables the enumerator to keep track of non-reporting households and ensure complete coverage. However, even with the adoption of this procedure, it will still be necessary for the enumerator to visit some households. This will occur in cases such as those where, owing to illness or physical incapacity, no member of the household is able to report to the enumeration station.

The inhabitants of a village or people living in dispersed settlements may be assembled at one place and enumeration carried out. In some cases, the head of the group provides the information regarding its members. In the group approach, abbreviated questionnaires are generally used. The objective in such cases is to obtain, as a priority, reliable estimates of numbers rather than highly detailed information relating to every member of the group. The drawback of such a group approach is that people may not give full and frank answers to some questions. With improvements in communications and accessibility, and with the integration of previously isolated or special groups in the larger communities, the adoption of the interviewer method should be increasingly possible in such cases.

A similar approach may also be adopted, formally or informally, where a community group, such as recent immigrants, has relatively limited skills in the official language of the country. This aproach can make effective use of limited interpreter resources and/or utilize the official language abilities acquired by school attendance of relatively young members of the immigrant group.

In recent censuses, with personal awareness of the census increasing, there have been demands for separate enumeration. Those demands are still rare, but some countries allow persons to be enumerated separately. The linkages with the household and the housing unit are maintained through the use of relevant identification codes. The questionnaire is devised so that it can be sealed and either posted or handed over to the enumerator. The adoption of this procedure would imply that arrangements have been made for early checking of such returns and amendments through personal contacts, if necessary. A reduction in the numbers of such returns can be attempted by supervisors in difficult cases through personal contacts.

(*e*) *Possibilities for change*

Most countries have tended to retain the method of enumeration they have used in past censuses. Any strategic change in the method requires careful testing and evaluation before it is introduced.

Unless there is remarkable improvement in such factors as educational levels and communication and postal systems, changes in traditional systems will be fraught with risk. This does not mean that innovation should always be rejected. Even within traditional systems, it will be worthwhile examining the procedures to determine possible areas of improvement. Such an examination and testing of possible improvements can be profitably undertaken during the intercensal period and take advantage of experience in other countries. Such methodological studies should be part of the constant attempt to improve census practices.

7. *Timing of enumeration*

The time of year during which the census enumeration will be carried out is an important planning factor. Some of the main issues that will determine the best time of the year for the enumeration include the following:

(*a*) Desirability of selecting that period of the year;

   (*i*) During which the enumeration can be carried out simultaneously in all parts of the country,

   (*ii*) During which it is likely to yield the most typical data;

   (*iii*) During which operational problems will be least;

(*b*) Operational issues. Weather conditions that may hamper field operations and calls for a large mobilization of surface or water transport vehicles should be avoided, since the mustering of such input may not always be possible or affordable. The safety, retrieval, transport and storage of census field records immediately after the census enumerations are important considerations;

(*c*) Seasonal conditions. Extreme heat or severe cold will present risks to the enumerators, while heavy rain or snow may make some areas inaccessible. In countries with sharply contrasting seasonal patterns in different geographical regions, the most suitable period of the year for the major part of the country could be selected. Additional input of transport, staff or other requirements owing to adverse weather conditions in the specified areas can then be allocated. Sometimes, such considerations may compel separate enumeration of the nomadic population;

(*d*) Expected change with the seasons. In some countries, the activity of large proportions of the population differs markedly between seasons. For example, agricultural workers may have a peak period of activity only during the agricultural season or at harvesting time. In such cases, it is unlikely that the affected part of the population will be able to devote the time needed to complete census forms. The decision as to how these activities can be reflected in a census can also be influenced by the design of reference periods for specific questions, and is a matter for each country to consider;

(*e*) Demographic and social factors. These will also be relevant if there are large migratory movements of the population during certain periods of the year (for example, undertaking harvest activities);

(*f*) Periods of long holiday festivities, pilgrimages or fasting, which should be avoided;

(*g*) Availability of personnel for the field force. In many countries, officials such as schoolteachers are employed as enumerators and/or supervisors. The period of the year chosen for the census should be when these staff are available and with the least disruption to their usual work.

8. *Census reference time*

Having determined the time of year in which the census should be taken, it is necessary to refine the timing of the census to a specific point in time.

An essential feature of a census is that each person, or each set of living quarters, is enumerated with reference to the same predetermined point in time. This census reference time is usually midnight at the beginning of the designated census day.

Each person alive at the census reference time is included in the count. People who die after this reference time are included, while people born after this time are excluded.

This Census reference time

The choice of the time of year in which the census will may depend on a number of factors. First, it is necessary to avoid those seasons in which it will be difficult to reach all inhabited areas because of rains, flooding; snow and so forth or in which the work will be particularly arduous, as is the case during extremely hot weather.

When a census has been taken and the census date is found to have been on the whole satisfactory, the next census should be taken at the same time of the year, unless there are strong reasons for changing this date. A regular census date enhances the comparability of the data and facilitates analysis. The tradition of a fixed census date in a country also provides administrative discipline, motivating all those involved in the census to make necessary preparations in a timely manner.

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Source: Principles and Recommendations for Population and Housing Censuses Revision 1 (United States Publication, Sales No. E.98.XVII.8) Paras. 1.171 and 1.173.

Every structure, housing unit or set of living quarters that exist, or have reached a defined stage of completion, as at the census reference time is included in the housing census, irrespective of whether it is occupied. This arrangement will give a true inventory of housing stock. If the housing census is independent of the population census, an appropriate reference time will have to be specified for the housing census.

The concept of the census reference time is relevant for certain characteristics of the population such as age, marital status and place of enumeration. Not all characteristics are defined in terms of such a specific point in time. Information on many census topics is elicited on the basis of other periods of time. For example, labour force status is usually based on a longer time-frame.

In actual practice, enumeration may begin before or after the census day. If before, the forms are either distributed or interviews conducted over a short period before census day and collected or updated in a short round after census day. If after census day, the forms are distributed and collected or interviews conducted over a few days following the census reference time. In either case, the information collected will refer to the situation at census reference time.

Some countries have adopted a moving census day such as the night before the enumerator's visit or the Sunday prior to that visit. This procedure is not recommended, although it has been adopted where problems force the extension of the enumeration period over a period of a month or longer. Such problems could include:

(*a*) Insufficient field staff;

(*b*) An unsatisfactory map base;

(*c*) Absence of sufficient logistic support.

The rationalization for adopting a moving census day is that the respondents will not be able to recall details of the number, and characteristics, of the members of their households on a day significantly before the enumerator's visit. Therefore, census day has to be moved nearer to the day of the visit. The adoption of this procedure involving a long reference period, while preferable to no census at all, will increase coverage error and make the interpretation of the data more difficult.

If experience has shown that a particular census day or date has been found convenient and conducive to a good census, succeeding censuses should preferably be conducted with the same reference date. Unless there are strong reasons to depart from this practice, the timing of every census at the same time of the year would be desirable. This will enhance the comparability of the data of each census. This is particularly important for data such as employment in specific industries, or residency in holiday destinations, which may be affected by seasonal factors.

9. *Duration of enumeration*

The actual duration of the enumeration period must be carefully considered and the advantages and disadvantages of each option compared. However, it is worth noting that a census is not an exact science, and whatever the duration adopted, there will need to be some trade-off between practical application of the census in the field and data quality.

Such trade-offs need to be balanced in the best interests of the most efficient and effective census.

The duration of the census enumeration will be determined by the magnitude of the census operations, the availability of staff, logistic support and the method of enumeration. In principle, the enumeration period should be as short as possible.

In the interviewer method, the duration should allow enough time for enumerators to complete the questionnaires in their workload without being rushed. If the time provided for interviewing is insufficient, the coverage and quality of enumeration will suffer. Conversely, a period that is too long may reduce the quality of the census since respondents will have problems with recalling numbers of persons, or details of individual characteristics, with accuracy. In particular, extended periods of enumeration may result in incorrect reporting of numbers.

In a self-enumeration census, if the period between the delivery of the forms and the time for collection or return is too long, there is a risk that the forms will become lost in the household or, at best, overlooked. In the mail-out/mail-back system, this could result in inaccurate information being provided owing to problems of recall.

(*a*) *A one-day enumeration period*

Some countries plan their enumeration so that it is taken over one day. A one-day enumeration is usually achieved by all persons staying at their residence on the chosen census day.

The adoption of the one-day procedure avoids the complexities that may arise owing to movement of people during an extended enumeration period. However, it has certain disadvantages:

(*a*) A large number of enumerators are required for completion of the enumeration in all areas simultaneously in one day. The enumerators will have less opportunity to become proficient, as compared with a longer period of enumeration. This is because they are operating at the bottom of a learning curve;

(*b*) In terms of budgetary efficiency, a higher proportion of expenditure is attributable to overheads (recruitment, training, etc.) than to actual enumeration;

(*c*) The supervision of fieldwork may tend to be superficial;

(*d*) There are likely to be more coverage errors, especially in urban areas where the optimum workload for a day cannot be predetermined accurately;

(*e*) To fit in with the shortened time period the content of the census will have to be restricted in comparison with what could be achieved with a longer period. The choice of topics and the degree to which information on those topics can be collected will be limited.

In actual practice in such cases, either the forms are distributed in advance for initial completion or interviews are conducted by the enumerator before census day and then verified and updated on census day. This may overcome many of the disadvantages listed above.

(*b*) *Longer enumeration period*

The adoption of a reasonably long period of enumeration would permit the use of a smaller number of better-trained enumerators. Also, the scope of the census could be expanded and, as a consequence, its utility enhanced. The enumerators would improve their skills after the start of the enumeration and supervision could be organized in a more effective manner. The inquiry could be conducted at a reasonable pace so as to ensure both accuracy of coverage and quality of information. However, if the enumeration period is too long, the defects in coverage and quality mentioned earlier might emerge.

10. *Critical dates*

Some enumeration-related activities have critical dates or deadlines. The most obvious example is the census date itself. If procedures are not in place and field staff employed and trained in sufficient time, the census date will be missed and the results will be disastrous. As the census date is the most important critical date, all other critical dates must be considered in relation to it.

Critical dates should be regarded as immovable. That is, if a date is to be considered critical, it should not be changed or allowed to be changed without serious consideration by the executive management of the census.

Early planning should establish the critical dates that will apply to the census enumeration phase. Some factors external to, or beyond the direct influence of, the statistical agency should be taken into account when establishing critical dates for census enumeration. Some of the dates that may be considered as critical include the following but will vary from country to country depending on the type of enumeration:

(*a*) Government approval for the census. This is necessary because of the potential consequential effects, such as the questionnaire not being able to be printed until the Government has approved the taking of the census;

(*b*) Completion of questionnaire design to ensure that printing can commence on time;

(*c*) Commencement and completion dates of form printing;

(*d*) Recruitment of field staff in sufficient time to allow training to be completed before enumeration commences;

(*e*) Training of field staff before enumeration commences;

(*f*) Commencement of enumeration;

(*g*) Completion of enumeration.

11. *Other major constraints*

Establishing the basis of the census enumeration should also take into account major constraints. These are factors that are effectively unchangeable or outside the direct control of the statistical agency but will influence the planning

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or carrying out of the enumeration. The value in identifying these factors is that the risks associated with these constraints can be identified and appropriate risk-management guidelines developed. Not identifying these major constraints early may result in a negative impact on the census enumeration at a time when there is little or no scope to react or where the cost may be prohibitive. Major constraints may include the following:

(*a*) Cost. While careful consideration is given to the census budget, emerging issues may result in unexpected shortfalls. Given the cyclical nature and fiscal funding peaks required for a census, it is generally difficult to obtain extra government funding if there is a shortfall. Additionally, economic rationalism by the Government of the day can place funds already approved under review;

(*b*) Government or other authority decisions. For example, the Government may direct that a census be held in a certain month or that a particular sub-group of the population be given special treatment;

(*c*) Production capacity. This applies particularly to producing maps and the printing of the census questionnaire and related procedural documentation. The scale and specialized nature of these tasks may require technology beyond that readily available in some countries. In some cases, it may be highly undesirable to undertake this work outside the country owing to loss of control and quality assurance purposes;

(*d*) Logistics capacity. This refers primarily to the bulk movement of materials (questionnaires and manuals) into the field and their return to the processing centres. It requires sufficient infrastructure (e.g., roads and railways) and transport facilities (trucks, cars, boats and possibly aircraft) to allow one of the major logistical challenges of modern society to operate smoothly;

(*e*) Coincidence of other national activities. For example, in some countries an election may be scheduled in a census year that may impact on the ability to obtain a sufficient number of enumerators. This is also a planning issue in countries where an election or other national activity may be called well into the planning of the census enumeration;

(*f*) Seasonal weather patterns that may make enumeration difficult in parts of the country;

(*g*) Security of enumerators in dangerous areas (e.g., areas of civil unrest, see example below);

(*h*) Public attitudes. If the mass of public opinion is not favourably disposed to the census operation, it will usually fail or be very expensive.

The purpose of identifying major constraints when establishing the basis of enumeration is not to solve any associated problems, but rather to take them into account in subsequent planning.

12. *Performance Indicators*

Performance indicators should be established before the census to enable an assessment of the quality of the enumeration. While the performance measures may not be highly accurate, they add value to the understanding of the census results and improve decision-making, particularly when combined with data quality assessments carried out during processing. In particular, performance indicators will be useful within the country in assessing changes between censuses. Many of the measures listed below will also be of benefit in understanding the reasons for differences between countries by either international agencies or individual countries assessing their situation in relation to other similar countries.

Some potential performance indicators include:

(*a*) Rate of underenumeration, including net underenumeration and gross overcount or undercount;

(*b*) Response rates to specific questions;

(*c*) Refusal and prosecution rates (if applicable);

(*d*) Number of calls to an inquiry service (if established) or comments made to enumerators, classified by type of inquiry or comment;

(*e*) Extent of forms returned through other than standard processes (e.g., if mail-back is the standard process, how many forms were collected by follow-up staff);

(*f*) Performance of the enumerators;

(*g*) Coincidence of political campaigns or activities that mention the census;

(*h*) Adverse conditions experienced during the census (unseasonal weather, civil unrest, etc.).

It should be noted that some performance measures are beyond the ability of the census agency to control. This does not lessen their usefulness in contributing to an understanding of the census results nor does it necessarily reflect poorly on the census agency.

B. STRUCTURE OF THE WORKFORCE

1. *Introduction*

Establishing the basis of the enumeration (see sect. A above) defines the broad operational framework within which the structure of the field workforce must operate. The present section describes the geographic, logistical, communications and social factors that have to be considered when determining the structure of the workforce to support the enumeration phase.

As described in chapter I, section D, and taking into account the basis of enumeration, it is common for the basic management structure to involve three or four layers of hierarchical management:
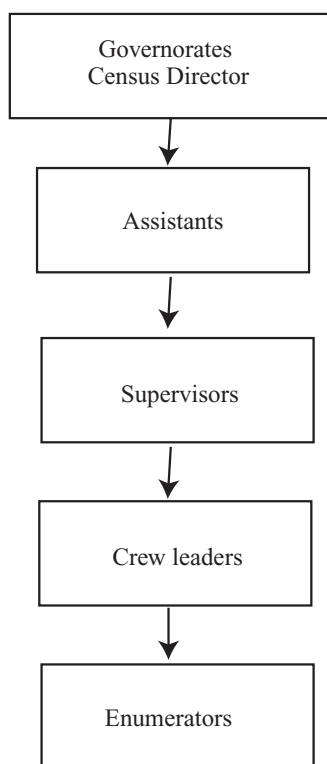
(*a*) Regional manager;

(*b*) Deputy regional manager;

(*c*) Supervisor (or crew leader);

(*d*) Enumerator.

**Census Management Structure at the governorate level
for the Palestinian Central Bureau of Statistics**

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┌─────────────────────────┐
│       Governorates       │
│     Census Director      │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│                          │
│        Assistants        │
│                          │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│                          │
│       Supervisors        │
│                          │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│                          │
│       Crew leaders       │
│                          │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│                          │
│       Enumerators        │
│                          │
└─────────────────────────┘
```

The second and third groups can be combined if it is possible to obtain the communications and logistical objectives with three groups. It is desirable to minimize the number of levels in the hierarchy, while assuring that quality and continuity does not suffer as a result.

In the Arabic-speaking countries, crew leaders are responsible for the marking and listing of buildings and housing units, as well as households and establishments.

In many countries, the existing administrative structure, both centrally and in the regions, will also be used to facilitate the management and coordination of the enumeration activity. This varies considerably from country to country.

Apart from enumerators, other specialist staff may also be employed to undertake tasks such as mapping and household listing (see sect. C below) or the enumeration of non-private dwellings. In some countries, these tasks may be undertaken by enumerators and managed by the structure shown above.

Assuming a hierarchical structure, there are a number of key issues that the statistical agency needs to address in formally determining the structure of the workforce. These include:

(a) Roles and responsibilities of each level;

(b) Time available;

(c) Staffing ratio between the different levels.

These issues are interrelated and dependent on one another and should not be considered in isolation. For example, the amount of time available may well determine the roles and responsibilities, which in turn will affect the staffing ratios.

The role of the commune chief, as shown in the census structure of Cambodia in 1998 (see chap. I, sect. D) is extremely important in countries that are heavily rural in composition and where there is a dependency on the tribal or communal hierarchy to help in the entire census process.

2. Roles and responsibilities

The roles and responsibilities at each level will vary and will depend on the basis of enumeration. However, they will always involve some form of management, supervision and communication with the level immediately below, and communication with the level immediately above. Several enumerators will be dealing with one supervisor, and several supervisors will be dealing with one deputy regional manager or regional manager. The roles and responsibilities of each level must be clearly defined in the various instruction manuals that need to be produced, and they should be reinforced during training.

(*a*) *Regional manager*

The role of the regional manager will include work similar to that of the deputy regional manager. At this level, work will also involve public communications activities and liaison with targeted government and community groups. This will help promote census awareness, which will assist field staff during enumeration.

There would normally be little direct contact with respondents or enumerators, thus, regional managers do not play a strong role in direct quality assurance of the census enumeration. They do, however, play a strong role in the quality assurance of the census field administration. For example, where a recruitment and selection process is used for enumerator positions, the regional manager may be responsible for vetting selection documentation and approving appointments. Similarly, they may be responsible for approving payment of salaries and expenses.

Regional managers would communicate on a regular basis with the statistical agency but usually this would involve progress reporting rather than seeking advice or assistance.

(*b*) *Deputy regional manager*

The role of the deputy regional manager is dependent on the basic structure of the field operation. The present handbook assumes that there is a four-tier structure where there is a deputy regional manager position. This will vary from country to country. For example, if there is only a three-tier management structure, the roles of the deputy and regional manager should be considered together.

Where the role of the deputy regional manager is primarily administrative in nature, the need for frequent (or daily) communication between these two levels is less, as is the need for face-to-face communication. Telephone contact, where available, may suffice for most of the duration of the operation.

(*c*) *Supervisors*

Ideally, supervisors should contact each of their enumerators, either in person or by other means such as telephone, on each day during the actual enumeration period.

At the very start of enumeration, the supervisor should spend some time with each enumerator doing on-the-job training (see chap. III, sect. C). Distance and travel time are key factors and it may be necessary for some enumerators to start delivering forms or conducting interviews before their supervisor can join them to observe. In these cases, it is even more important that the supervisor, if at all possible, be in contact with the enumerators at some stage during the day to ask about the day's work and to check on issues that may have arisen.

During enumeration, supervisors will undertake quality assurance tasks (see chap. III, sect. F). These tasks are critical and sufficient time must be allowed both during enumeration and between the end of enumeration and when the forms must be dispatched to the processing centres. If supervisors have too many enumerators, they may not be able to allocate sufficient time to quality assurance. This may result in errors in the data that should have been corrected in the field.

The importance of supervision

Adequate supervision of the enumeration is essential. When the enumeration lasts only a few days, control of the quantity and quality of the work accomplished after the first day of enumeration is recommended, in order to facilitate the correction of inefficiencies and to maintain satisfactory progress during the enumeration period. Where the enumeration extends over more than a few days, periodic and systematic assessment should be organized.

———————

Source: Principles and Recommendations for Population and Housing Censuses; Revision 1 (United Nations Publication, Sales No. E.98.XVII.8) para. 1.177.

If the supervisor has substantial administrative responsibilities in addition to training and supervising enumerators, this will impact significantly on the available time for quality assurance tasks. The prime focus of the supervisor should be on quality assurance rather than on administrative tasks such as completing remuneration documents for each of their enumerators. The role and responsibilities of supervisors should reflect this.

(d) Enumerators

Enumerators will usually work under general direction, following well-prescribed procedures and guidelines. While enumerators can be expected to solve some problems by reference to documentation, they will, on occasion, require assistance or direction from their supervisor.

The work of enumerators will usually involve a mixture of:

(a) Contact with respondents (including interviewing, where this method is used), which will involve representing the statistical agency to respondents, answering queries about the census and providing assistance, as needed;

(b) Clerical work at home and in the field, which will involve understanding and applying procedures and guidelines, and providing feedback;

(c) Travel to and from, and around, the enumeration area.

The mix of these will vary depending on the basis of enumeration and the specific circumstances encountered.

During the peak enumeration period, enumerators will spend most of their time in the field. Therefore, they will usually only be available to report to their supervisor in the evenings, or on their way to or from their enumeration area. This means that in many cases, supervisors will need to locate and meet their enumerators in the field to check on progress and problems. When both the enumerators and their supervisor are in the field, it is important to address the communication issues that will arise.

3. Time available

A key factor in establishing the structure of the workforce is the amount of time required for communication between people at different levels in the hierarchy. For example, each contact between enumerators and their supervisor will take time. Where distances are relatively great, the travel time required for face-to-face contact can be a significant part of the time required for supervisors to undertake their duties. Similar issues must be considered in planning for other levels in the hierarchy.

The period of greatest demand on the time of staff is the actual enumeration period (e.g., several weeks on either side of census day), when all staff are engaged in operational tasks relevant to their own level. This is also the period when they are subject to the greatest demands for across-level communication. As this is the most important period in the operation, it is the period in which the demand on the time of staff at all levels in the structure must be considered.

Budgetary considerations will also be a factor and may require that the staffing ratios are higher than otherwise be desirable. The task is to find the right balance between cost and quality in the form of available time.

4. Staffing ratios

(a) Regional manager/deputy regional manager ratio

This ratio depends to a large degree on the top-level structure of the census and whether regional managers are employed within the statistical agency or are part of the temporary collection workforce.

Where the regional managers are permanent employees of the statistical agency they will generally have support such as office facilities and personnel to assist them in managing communications with their deputies.

Where the regional managers are temporary employees, the ratio with deputies will be dependent on such factors as whether the regional managers are office or home based and how much of their role involves direct contact (e.g., training) with deputies or lower-level staff.

(b) Deputy regional manager/supervisor ratio

The deputy regional manager/supervisor ratio also takes into account available time but focuses more on the administrative and management roles of the two levels in the overall structure.

(c) Supervisor/enumerator ratio

The supervisor/enumerator ratio is the most important as it has the most impact on dealings with the public during enumeration. The number of enumerators reporting to each supervisor has a direct bearing on the amount of time a supervisor may spend with each enumerator in training and in the field. It will also impact on the amount of quality assurance that can be performed on the work of enumerators before the census forms are returned for processing.

If supervisors have too many enumerators to supervise, they may be physically unable to give sufficient attention to each individual. This may also affect their communication with their own manager and their ability to relay messages promptly.

Establishing the ratio of supervisors to enumerators cannot be done by formula and will involve some level of qualitative rather than objective judgement. It is also likely that the ratio will vary within a country (e.g., between urban and rural areas) owing to differing conditions in the various areas. However, as a rule of thumb, a 1:5 ratio can be used as a starting point and then varied accordingly, taking into account the myriad of issues to be considered. The opportunity of field tests should be used to confirm the feasibility of the general supervisor/enumerator ratio.

C. Mapping

1. *Introduction*

The quality of maps used in the census has a major influence on the quality and reliability of census data.

The vast majority of countries use maps for enumeration. There have been instances where maps have not been available for the census and countries have relied on household and building lists to conduct the enumeration. This has generally been the case in countries where such lists are strictly controlled through administrative procedures and are up to date. However, the circumstances are changing in these countries and using the lists for enumeration purposes is no longer a viable method.

The enumeration activity should rely on hard-copy maps as they play a vital role in guiding enumerators to dwellings and other places where people are likely to be during the enumeration period. They are crucial in ensuring full and unduplicated coverage of geographic areas.

Similarly, maps, more commonly as digital products, play an increasingly important role in the dissemination phase. Statistics compiled from census data can be geographically referenced and provide for methods of analysing the geographic characteristics of those statistics.

The tasks and lead times necessary to create, maintain, print and distribute enumeration area maps are significant. Therefore, careful consideration should be given to the mapping activity during the census planning and preparation phases.

Prior to developing the mapping programme for the census, consideration needs to be given to the geographic classification to be used and the mapping infrastructure available to carry out the mapping tasks.

2. *Geographic classification*

As the geography on which the census is collected will determine the geography on which the census data can be disseminated, a geographic classification should be devised in conjunction with the development of census mapping. Figure II.1 is an example of the different geographic areas and regions that may be defined for a country. These will depend on the administrative structures of the country and the needs of statistical data users.

In this example, the statistical areas are those that have been defined by the statistical agency as being the most relevant for users of statistical information and for which statistical output is generally disseminated. The complexity of the statistical areas structure and the nature of the units will vary depending on the needs of the statistical data users. Administrative regions reflect the different levels of government administration in a country and will already exist, independent of the census. Census management areas are defined for managing census enumeration. Other areas are those that are not part of any of the other area structures but for which statistical data may be required.

Statistical areas may or may not relate directly to different levels of the administrative regions. However, as the Government is one of the largest users of statistical data, it would be expected that some of the statistical areas will match directly, or aggregate to, the administrative regions (in the example above, statistical local areas aggregate to subdistricts and statistical divisions aggregate to provinces).

Census management areas may or may not relate to either administrative regions or statistical areas as they are devised to allow the most efficient census collection. In countries where the collection is undertaken by other government agencies, the census management areas may, in fact, be the same as the administrative regions.

Statistical outputs may be required for other areas, which may or may not be part of the geographic classification, such as, in the example, electoral areas or postal areas. Boundaries of the other areas may not match those of constituent enumeration areas or any other statistical areas or administrative regions. Therefore, statistical data for other areas may only be available on a "best fit" basis.

The definition of the various areas of the geographic classification, their relationship to one another and other issues relating to geographic classification will not be considered in the present handbook, except for those of direct concern to census enumeration, namely, the design of enumeration areas and the census management areas.

(*a*) *Design criteria for enumeration areas*

As the diagram above shows, enumeration areas are fundamental to both the statistical areas structure and to the census management area structure. The multi-purpose nature of this unit needs to be reflected in the criteria established for setting enumeration area boundaries. This will be a combination of geographic classification criteria and practical census collection criteria. Issues that need to be considered include:

(*a*) The need to ensure complete coverage of the country;

(*b*) The ability to manage field operations effectively;

(*c*) The usefulness of the area for census output purposes including the ability to disseminate census data for various higher levels of geographic areas through the aggregation of enumeration areas.
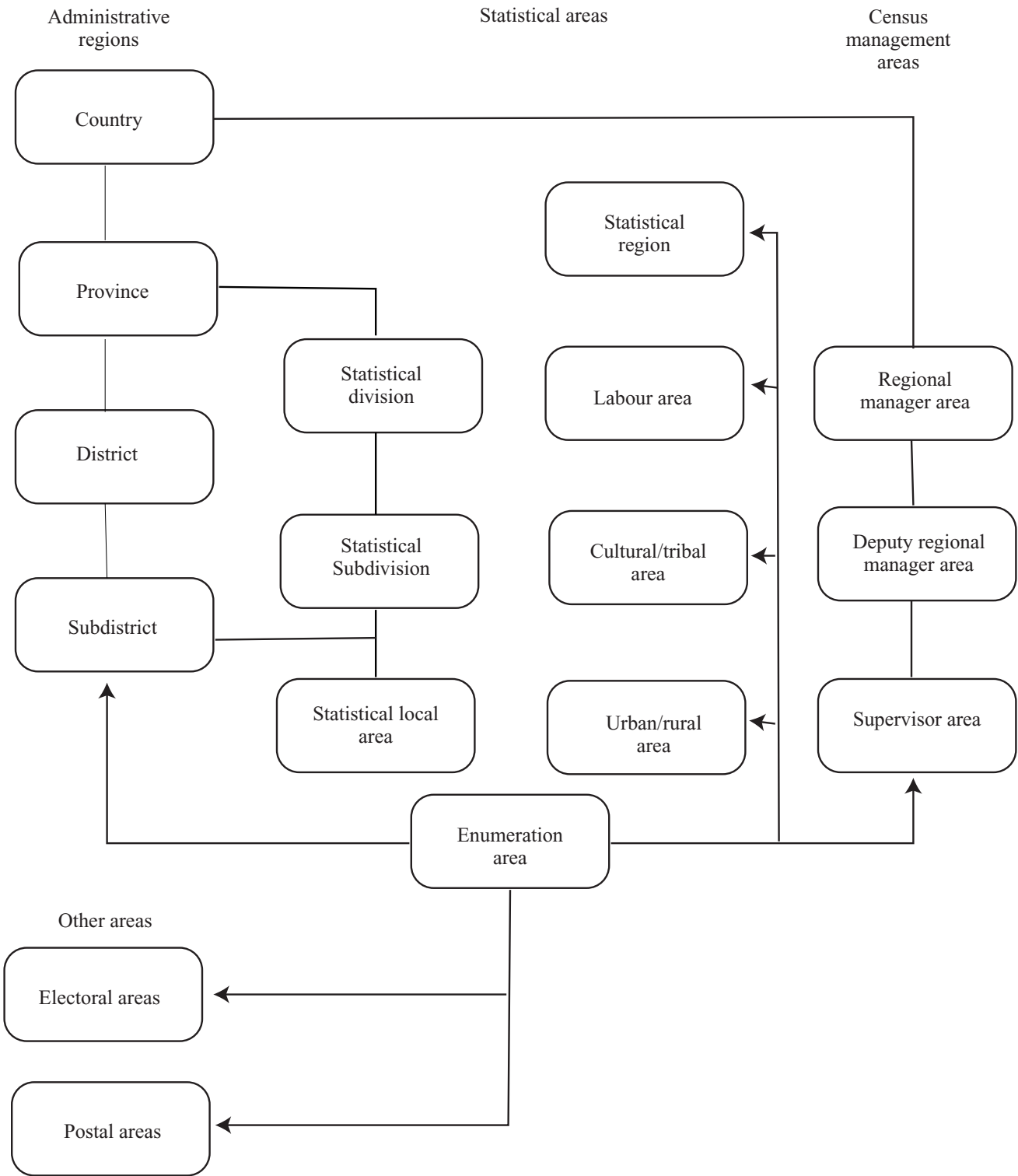
(*i*) *Complete coverage*

Enumeration areas must cover the entire territory of the country, without any overlap or gap. This should include areas thought to be uninhabited, even if the availability of mapping data for those areas is limited.

(*ii*) *Ability to manage field operations effectively*

For enumeration purposes, the enumeration areas should be designed with regard to the workload limits of enumerators. (see chap. 3, sect. B for more detail).

Figure II.1.   Example of a geographical classification for a country

Administrative regions	Statistical areas	Census management areas
Country		
Province	Statistical region	
District	Statistical division	Regional manager area
Subdistrict	Labour area	Deputy regional manager area
	Statistical Subdivision	Supervisor area
	Cultural/tribal area	
	Statistical local area	
	Urban/rural area	

Enumeration area

Other areas

Electoral areas

Postal areas

To enable effective management of the field operation phase, the determination of enumeration area boundaries must consider the following:

(*a*) Density of population;

(*b*) Type of terrain;

(*c*) Method of enumeration;

(*d*) Mode of enumerators' transport envisaged for each area of geography.

To assist the enumerators to undertake their work effectively and with a high level of accuracy, it is important also to specify in the criteria that enumeration area boundaries are designed so that they follow easily recognizable features thereby enabling enumerators to easily identify their enumeration areas. These features can include roads, waterways, established walking tracks and railway or power lines. The use of features such as village or local government boundaries, which may be necessary in order to publish small area data or for a larger geographic area such as a town, should be carefully considered, taking into account the difficulty of enumerating areas with intangible features such as compass bearings or lines of sight.

As well as determining the boundaries of the enumeration area a range of other attributes may be considered in the design of an enumeration area for census management purposes. These could include matters such as defining areas requiring special enumeration procedures (e.g., culturally specific procedures applicable to minority groups).

(*iii*) *Dissemination of census data*

For dissemination purposes, the enumeration area design needs to take into account the demand for small area data and the confidentiality of personal information. An important requirement of any census is not only to meet the small area data needs of users, but also to present information on various larger geographic units.

In many cases, it is impracticable to force enumeration area boundaries to aggregate exactly to all possible larger geographic areas. The geographic classification should make clear the higher-level geographic areas to which enumeration areas must aggregate. The design processes and procedures should ensure that this occurs.

However, for other defined boundary areas, such as postal areas, an approximation of enumeration area boundaries may be used to enable the dissemination of census data against these commonly defined areas.

There may also be other areas of particular interest to users of census output. These could include distinguishing urban and rural areas, or cultural groups. Therefore, enumeration areas may be classified during the design phase (or after census data are available) as to the degree of urban development or remoteness or may be coded to an urban centre of which it forms a part.

An important issue to users of census information at the enumeration area level is the comparability of enumeration areas across censuses. By taking into account enumeration area comparability issues during design, procedures can be developed that will allow a comparability listing of enumeration areas from one census to the next to be produced.

In cases where this is not possible, the criteria can outline design principles that will allow users to easily compare enumeration area-based data across censuses. For example, it is preferable to split an enumeration area and create two areas that exactly aggregate to the previous one. This will enable users to easily track the movements of boundaries and perform some time-series analyses of the disseminated data.

Another task that could usefully be done during the design phase is the preparation of concordances that show the link between an enumeration area and higher-level geographic areas. Both external users and the staff within the census agency working on dissemination will find such concordances invaluable in preparing census output products and services.

(*b*) *Design Criteria for Census Management Areas*

Census management areas will consist of aggregations of enumeration areas brought together for ease of managing the enumeration staff. The numbers of areas and levels in the hierarchy will depend on the structure of the enumeration staff (see sect. B above). Where already existing government administrative staff and structure are used for enumeration purposes, the census management areas may be the same as the administrative regions.

3. *Mapping technology*

Before census mapping can commence, the census agency needs to determine the appropriate technology to be used for mapping. A range of different systems can be used to produce maps for use in the census. At a base level, an agency can either produce hand-drawn maps of enumeration areas, or source hard-copy geographic maps that would allow enumeration areas to be clerically designed and represented. Alternatively, at the most sophisticated level, a Geographic Information System (GIS) could be implemented. This would provide a computer-based design of enumeration areas and significant automation of map production tasks. Agencies should refer to the United Nations publication *Handbook on a Geographic Information System and Digital Mapping for Population and Housing Censuses* (ST/ESA/STAT/SER.F/ 79), which contains further details on GIS mapping.

(*a*) *Hand-drawn maps*

In circumstances where it has not been possible to acquire appropriate base maps for areas of geography, there may be a need for enumerators (or other enumeration staff) to produce hand-drawn maps to enable successful enumeration. Hand-drawn maps do not possess the level of accuracy required by high-quality topographic maps, but are a viable option when:

(*a*) No map exists for an area;

(*b*) The available maps for an area are too small a scale to provide sufficient detail for an enumeration area map;

(*c*) The available maps for an area are considered seriously out of date and inappropriate as input into enumeration area maps;

(*d*) During the enumeration period, an enumeration area map proves to be so out of date that it is deemed to be more efficient to draw a sketch map rather than annotate changes to the enumeration area map provided.

Accurately sketching the shape and extent of an enumeration area in the field requires a great deal of skill and practice. Even where such skills are available, the resulting hand-drawn maps are almost impossible to relate one to another to obtain an overview of an entire region or country. With the exception of circumstance (d) above, owing to the timing, it is recommended that the use of hand-drawn maps be considered carefully against the benefits of requesting that an area be subject to a new survey to enable the production of an accurate base map, even though there may be significant costs incurred.

(*b*) *Map overlays and technology assisted mapping*

Where reasonable-quality topographic maps are available, they should be used as a base and hand-drawn enumeration area boundaries can be added as an overlay. The resulting maps may not be of cartographic quality, but enumeration area boundaries will at least be oriented and scaled relatively accurately and the major difficulties of relating one sketch map to another will be mostly overcome. Boundaries and other census information can be drawn on clear film overlayed on the original source map so that the two can be photocopied together for field use or separated for other purposes.

Where accurate and current maps at relevant scales are not available for a country, or part of a country, the following alternatives can be employed:

(*a*) Satellite imagery;

(*b*) Aerial photography;

(*c*) Global Positioning System (GPS).

Although relatively expensive to acquire, a satellite image typically covers a large area and can be cost-effective compared to other sources. Imagery should be pre-processed by the supplier so that it is rectified and geo-referenced (i.e., a known scale and orientation, with some latitudes and longitudes, printed on the face of the image).

While acquisition of aerial photographs for large tracts of a country is qexpensive, existing archives of photographs can be an excellent resource for both population and preliminary counts of dwellings, and as a base for rudimentary maps. It should be remembered that aerial photographs have distortions owing to variatiosn in height of the terrain and are only approximately oriented to compass bearings. Scaling, orienting and integrating the boundaries of adjoining enumeration areas will be, at best, imperfect.

Where the only recourse is to make a hand-drawn map in the field, this process can be greatly assisted by GPS. A simple, hand-held GPS receiver will give latitude and longitude accurate to about 100 metres. Greater accuracy is available with differential receivers where differential cor-

rections are available. A hand-drawn map can be greatly enhanced by the addition of latitudes and longitudes recorded at a few key points on the sketch to provide orientation, scale and absolute position. Alternatively, some receivers allow the operator to electronically log positions and comments while traversing an area on foot or in a vehicle. This technique can quickly produce a relatively accurate map.

(*c*) *Geographic Information Systems*

In recent years, many countries have adopted the use of GIS to facilitate census mapping as these platforms offer great potential benefits. However, they are comparatively expensive and are complex to maintain and operate. Adoption of GIS should be seen as a major strategic decision, and when looking at the benefits or otherwise of introducing GIS applications many issues need to be considered. Determining the overall cost benefit of introducing new or updated technology into the mapping project will be influenced by many factors, most of which will be specific to the situation existing in each country at the time of drawing up census plans. Issues to be considered include:

(*a*) The relevant technical skills base in the census agency (or within other businesses or agencies that are able to contract services to the census agency);

(*b*) The computing infrastructure within the census agency or that can be made available to the census agency under contract;

(*c*) The availability of maps or digital geographic data to be used;

(*d*) Determination of the functions that will be performed within the census agency versus those that will be outsourced;

(*e*) The cost of hardware, software, maintenance and training (which are likely to be much higher for a GIS solution than for a clerical system);

(*f*) The cost and time in updating base maps and boundaries, which will be directly related to the size of the country both in terms of the spatial area of the country and the size and distribution of the population within the country. This may involve a one-time cost, with considerable benefits for later censuses, including possible time savings in performing mapping activities for later censuses.

While there are many advantages for a country using GIS for its census, these need to be carefully weighed against the pre-requirements for the successful implementation of GIS. The alternative to GIS is one of the more traditional forms of a clerical-based mapping system.

In terms of the points raised above, the advantages and benefits of GIS are as follows:

(*a*) GIS requires a significant level of technical expertise, whereas the traditional systems utilize skills more readily available in most countries;

(*b*) By definition, GIS will require a higher level of computing infrastructure than will a clerical-based system. One of the benefits of GIS, namely, a closer linkage between maps or enumerators and map-based products for users, re-

quires that users, as well as the census agency, have the computing infrastructure to utilize the output of GIS. For the census agency to take the lead on this issue is a significant step towards using the census as a catalyst for an overall national advance in capacity;

(*c*) A clerical census system can proceed on the basis of rather rudimentary maps (for example, relatively old maps from an administrative system supported by sketch maps prepared by the enumerators "on the job"). However, use of GIS in this task requires that a digital map base exists and can be used for census purposes. If it is necessary to create the digital map base, significant lead times are required, as well as significant funding;

(*d*) In most cases, the preparation of maps and/or GIS will not be the core business of a statistical agency. It will therefore be necessary for the census agency to determine which of the functions it will undertake and which will be outsourced. This decision is of strategic importance in determining the direction of a country's census effort;

(*e*) Producing duplicate maps (including hard-copy maps for dissemination) may be less expensive with a GIS solution ;

(*f*) Space needed to store input maps for digital purposes will be far less than with a clerical system;

(*g*) GIS will have increased ability to undertake quality assurance of geographic boundaries;

(*h*) The census agency will have a greater ability to perform spatial queries against the geography database under GIS.

4. *Undertaking the mapping programme*

The mapping programme associated with a census is among the most daunting, costly and technically demanding of all census activities. With the exception of hand drawn mapping (which is an activity usually carried out by enumerators in the field), census mapping has two broad components: statistical and technical.

There are many ways of organizing the census mapping programme, from the census agency undertaking the entire programme to outsourcing almost the entire map preparation and production. The major difficulty for a statistical agency is having a good basis in one area (statistical) combined often with a lack of skills in another (technical). Decisions on this will depend on the nature of the mapping required for the census and the availability and levels of skills and infrastructure either within the census agency itself or within other government or private organizations.

Many countries have an agency that provides mapping services to the Government and the community. The mapping agency will usually cover a broad spectrum of mapping including elevation, minerals, mining, land use, and so on, but often will not be involved in large scale mapping of areas for social purposes (such as street directories and censuses). The exception is where a country has developed a land titles system, however, the output of these systems may not be suitable for use in the field.

Maps for the 1997 census in the West Bank and Gaza.

Maps were made by the Cartographic Department of the Palestinian Central Bureau of Statistics for all localities. There was no need to produce hand-drawn drawn maps. Some 80 per cent of the maps were based on aerial photographs.

Scale

- The scale 1:25,000 was used in about 90 per cent of the maps.

- The scale 1:1,000 and 1:500 was used in about 10 per cent.

- Small-scale maps for localities and governorates were produced to be used for distribution and in census reports

A team of fully qualified and trained surveyors and cartographers carried out the process of maps updating in the field.

This meant the error rate in estimating distance did not exceed two metres in most cases.

Content

Maps comprised:

- Detailed sets of data pertinent to each building (e.g., number of housing units, number of floors, building utilization and building type, in general);

- Streets;

- Roads;

- Passages;

- Other features facilitating the identification of the building;

- Borders.

The carrying out of a census can provide a catalyst for the statistical and mapping agencies to work together to the benefit of both agencies and the community. Statistical agencies are not mapping agencies and should not, for the most part, try to duplicate the functions of one. As mapping moves more and more towards computer-based systems and GIS (which mapping agencies are usually among the first in a country to take up), statistical agencies will find it more difficult to establish and maintain effective and relevant mapping programmes. Likewise, mapping agencies are not statistical agencies and often do not fully appreciate the statistical value of the information they hold or how best to present statistical information in map-based products.

(*a*) *Census agency-based mapping programme*

Regardless of the extent to which advanced technology is used, the development of a mapping system requires the coordination of a series of complex tasks with relatively long lead times. Therefore, it is important that project plans are established to manage this process. In broad terms, the main activities to be reflected in such plans are as follows:

(*a*) Establishing a mapping unit;

(*b*) Developing a timetable;

(*c*) Identifying the source of basic mapping and digital geographic data, if appropriate;

(*d*) Preparing the map base;

(*e*) Designing the enumeration areas and field management boundaries;

(*f*) Preparing maps for enumeration;

(*g*) Producing enumeration and dissemination maps;

(*h*) Developing of other dissemination map products and services.

Each of these activities is discussed below.

(*i*) *Establishing a mapping unit*

The census mapping project requires the services of a specialized project team. Where mapping activities are performed by external organizations, the mapping project teams will be responsible for specifying the requirements of the census for mapping products and coordinating arrangements with the provider of mapping services.

(*ii*) *Developing a timetable*

The mapping timetable will be dependent on several factors and the critical date is the date that maps must be delivered to the field to enable the enumeration activity to proceed. It is therefore essential that the mapping programme commence early in the census cycle to allow sufficient time to produce a national coverage of maps.

The time required will be dependent on the availability and relevance of pre-existing material, including:

(*a*) Maps from previous censuses;

(*b*) The extent of change considered for the mapping systems;

(*c*) The extent of change in the features to be depicted on the maps (including, as a key element, changes in the size and pattern of population).

It is recommended that for any proposal beyond the most rudimentary system, significant lead times be allocated to this process. Even where a fully clerical system is adopted, the dependency of most other processes in the census on the mapping system requires that it be one of the first processes to be initiated for the census.

(*iii*) *Sourcing of basic mapping and digital geographic data*

One of the major steps in the mapping project is to establish a map base of the country through the acquisition of various forms of maps. If a more sophisticated mapping system is to be developed, digital map data will be required.

As indicated above, the availability of maps and digital data will determine the suitability of using clerical or GIS methods for the various mapping activities that will be undertaken.

In general, a census agency will be required to source maps or digital geographic data from external organizations. If a census mapping project has already been established before the agency may still be required to source updates to their existing map holdings.

(1) Basic mapping data

Official published maps may be available from national or provincial government mapping agencies, the local government or municipal bodies. Special attention and coordination will be needed where a country's mapping infrastructure is provided through a network of regional organizations.

Other sources of maps may be other government agencies or private companies. These may include agencies or companies involved in the following areas:

(*a*) Public utilities, such as power, water, telephone or gas services;

(*b*) Transport, defence or the environment;

(*c*) Oil or other mineral exploration;

(*d*) Air, rail or road transport;

(*e*) Automobile associations, which may maintain maps of the road network;

(*f*) Commercial cartographic firms and providers of aerial photographic services.

Where the maps are obtained from sources outside the census agency permission to use the maps collected must first be sought from the original source, and any copyright issues addressed. Offering an assurance that the maps will only be used for census purposes will often promote cooperation from mapping agencies, while particular care should be taken when negotiating with non-government all sources.

The types of maps required for a census mapping include the following:

(*a*) Small-scale reference maps for use in the census agency to manage the overall operation;

(*b*) Relatively large-scale topographic maps for use by enumerators;

(*c*) Maps of the subregions or administrative areas above the village or its equivalent, for the use of supervisors and regional managers, showing the location of villages or small population settlements and dominant physical features such as rivers, ridges and forest areas that identify the type of terrain.

It is important that each map is relevant for its purpose. This should require that the maps for enumerators are of sufficient size to allow all significant text to be readable in field conditions (for example in poor light). Maps for supervisors or regional managers should provide sufficient detail to identify major features but not be so large as to be impossible to manipulate easily while, for example, answering a phone call from an enumerator. In many cases, the use of inset or supplementary maps may be required if the map is to cover a relatively large area.

To complement topographic maps, or in the absence of maps for an area, it may be advantageous to source remote-sensing material such as aerial photographs or satellite image to assist in the preparation of enumeration area maps. However, the cost of obtaining such material, especially satellite images, and the time and expertise required to interpret them, is likely to be extremely high and should be carefully assessed against any benefits of using them.

(2) Digital geographic data

A major consideration in developing a computer-based mapping system, even in developed countries, is the determination by the census agency of data requirements. In determining these requirements, due note should be taken of what data already exists, and plans to enhance that supply only made where a long lead time is available before the census.

In general, the digital data needed will be in the form of boundary, topographic and cultural features, and made up of both geographic (spatial) and attribute (aspatial) elements. The prime purpose is to obtain the best available mapping of dwellings. In exceptional cases, the position of every building may be mapped. More commonly, some other indicator of human occupation should be used. Where a system of recording of land ownership exists, land parcel boundaries can be a good indicator, with small parcels of land indicating larger populations.

With increasing amounts of digital data becoming available, it is also important that standards and a common data specification be produced to ensure data validity and consistency. This will also assist in the integration of data sets from different sources.

A wide range of data items could be considered for inclusion in a census mapping database. As it is likely that data items will vary considerably between countries, no list of items is suggested here. However, the key rules to be followed in selecting data items for inclusion are to question whether:

(*a*) The data item will be useful to enumerators in navigating their way around their enumeration area;

(*b*) The data item is relevant to users.

Data items that meet neither of those criteria should not be included in the database. Where possible, data items only applicable to one purpose should only be shown in the maps prepared for that purpose (even though both purposes may be satisfied from a common database).

The establishment of a digital census mapping database requires the development of a common data specification that will allow data providers to manipulate their digital data into a form useful to the mapping system, and to enable the integration of digital data from differing sources. In determining a data specification, the following issues should be addressed:

(*a*) The digital format, or formats, acceptable to the organization;

(*b*) The transfer media acceptable, for example, tape or CD-ROM;

(*c*) The datum and projection;

(*d*) The required and/or acceptable levels of detail, given by the scale of the input mapping, for geographic areas;

(*e*) The delivery units;

(*f*) The table structure for each required feature type;

(*g*) The data attributes required for each feature;

(*h*) The symbology for each feature.

The specification of a single digital format is desirable, as this would alleviate the need for any reformatting of data. Using a range of formats will require significant resources to be dedicated to data reformatting and integration. This format should also specify the datum and projection to be used. The type of media that can be used to receive the data will need to be compatible with the systems deployed for storing and manipulating the digital data.

In addition to the data specification containing the feature types required by the mapping system, it also needs to outline the attribute data required and the symbology for each individual feature type. Attribute data is important, not only to present named features on a map, but also for differentiating between features. Attribute data should consist of names, identification codes, feature codes, use classifications, mapping source and scale, and mapping dates. Symbology should refer to line types and weight, line and fill colours and cultural symbols.

(*iv*) *Preparation of base maps*

The activities associated with preparing or updating base maps, or updating base map digital data, require substantial resources to be managed over a long period of time. The final content of base maps will have a major bearing on the accuracy and completeness of enumeration area maps and, subsequently, the effectiveness of census enumeration.

The updating of base maps should be scheduled according to priorities, regardless of whether it is performed by the census mapping unit or externally. Noting that the principal purpose of all census mapping is to produce maps to collect information from people, or to depict the outcome of such a collection of information, it is suggested that updating be based on areas in which changes to the number or characteristics of the people require the maps to be updated. Thus, the task of setting priorities requires the census agency to identify areas in which there has been (or will be by census day) the greatest degree of change in the population since the base map was last updated.

An important consideration when evaluating maps is appropriateness of scale and the associated detail shown. Primary source maps require appropriate features to be shown if they are going to be useful in producing meaningful enumeration area maps that will assist enumerators. Important features include:

(*a*) Accurately named and presented roads and waterways;

(*b*) Administrative boundaries;

(*c*) Landmark features, such as schools, churches, post offices, parks and large buildings.

They also need to be accurate and readable, with text and symbols readily identifiable and correctly placed, along with the information being presented in a standard format compared to other source maps. The last, and very important, quality indicator is the currentness of the base map data represented.

The outcome of the base map preparation and update activities should be accurate, relevant base maps will allow for the design of enumeration area boundaries and the subsequent production of enumeration maps.

(*v*) *Undertaking enumeration area and census management area design*

(1) Enumeration area design

An enumeration area design manual should be produced that contains the design criteria and the procedures to be followed when designing enumeration areas. The manual can be used as a basis of training for those involved in the enumeration area design process, and should include the following:

(*a*) Enumeration area design background;

(*b*) The role of enumeration areas in both census enumeration and dissemination;

(*c*) The definition and explanation of higher area administrative and statistical boundaries and the part they play in enumeration area design;

(*d*) The cut-off date for accepting changes to higher area boundaries;

(*e*) The procedures to delineate areas by an urban or rural classification;

(*f*) Enumeration area design criteria, processing procedures and design rules;

(*g*) Procedures for assigning geographic identification codes and allocating higher area codes;

(*h*) The roles and responsibilities of staff involved in the process. The staff could be from the central census agency, regional offices or field operations.

Using a standard design manual as the basis for training, and as a reference for enumeration area designers and field staff, will play a significant role in ensuring that enumeration area design is approached in a consistent manner.

Once the base map has been updated for a region and the census agency has determined the criteria for boundary design, the design of enumeration areas can commence. It is recommended that, if possible, enumeration area design be conducted by regional statistical office staff who are primarily responsible for enumeration areas within their province or regional boundaries. Conducting enumeration area design at a regional office level ensures that local knowledge of geography and population can be utilized in the enumeration area design process.

Enumeration area design basically facilitates the design or redesign of area boundaries to provide for such things as population fluctuations (usually growth) and administrative or statistical boundary alterations. A considerable part of the design process is the gathering of information to assist in determining where population and boundary variations have occurred in order to determine the best way to design particular enumeration areas. The information used mainly includes the following:

(*a*) Legally published boundary changes in each province or regional area;

(*b*) Indicators of building activity;

(*c*) Population data from the previous census;

(*d*) Intercensal population estimates;

(*e*) Enumerator comments from the last census field operation;

(*f*) Field inspections;

(*g*) Information from local or regional governments.

If applicable, the enumeration area design process should be evaluated from the previous census with a view to improving the process for the current census. Regardless of whether new systems or procedures are employed from the previous census, any evaluation reports or mapping-related feedback must be considered, particularly to determine the accuracy and suitability of previous enumeration area boundaries. Any comments from previous census enumerators, including notations to previous enumeration area maps, should be analysed during the design process.

There will be occasions when a lack of relevant information for specific areas will require field inspections to ascertain accurate estimates of dwellings or population counts for those areas. Given the high cost of performing field inspections, it is imperative that the requirements of each inspection be well defined prior to departure to ensure that follow-up visits to the same area will not be required at a later date.

The design process must be structured so that all relevant information relating to enumeration areas of a particular region will be analysed, and a systematic update of enumeration area boundaries performed against the design criteria. The update of enumeration area boundaries will be the result of splits or amalgamations of those areas, donations of areas from one enumeration area to another or realignment of enumeration area boundaries to updated base map features.

As a result of enumeration area design, a list should be produced that provides the enumeration phase with all relevant field data for each enumeration area, and the dissemination area with relevant geographical data.

(2) Census management area design

The design of field supervisor and regional and deputy regional manager area boundaries can be determined at the completion of the process through the simple aggregation of enumeration areas, and the subsequent allocation of geographic identification codes.

(3) Quality assurance

Quality assurance should be implemented to ensure that data are correct to a minimum standard. Examples of this include ensuring that:

(*a*) Enumeration area boundaries do not cross administrative or statistical boundaries;

(*b*) Enumeration area boundaries have been drawn correctly and are complete;

(*c*) Design has been done according to enumeration area design criteria;

(*d*) The enumeration area list contains all data items and geographic codes for each area.

It is usually not necessary to check all design work that has been done in this process. Traditionally, initial design work is checked at a higher rate; once the enumeration area designer gains more experience, the check rate can be moved to a lower ongoing base rate.

(*vi*) *Preparation of enumeration and dissemination maps*

(1) Enumeration maps

Considerations for the preparation of enumeration maps include the following:

(*a*) Enumerators may not be familiar with their enumeration areas and are not likely to be expert map readers, therefore, the maps must be easily interpreted;

(*b*) Enumerators may be required to navigate in poor lighting conditions, particularly at night;

(*c*) Folding and refolding of large-format maps (above A2 in size) is inefficient for enumeration staff (including more senior staff);

(*d*) Maps need to facilitate the addition of handwritten enumerator comments relating to the planning of the collection route (blocking), difficulties in navigation, the find-ing of new dwellings, adding and deletion of streets, etc. This information can be useful both in quality assurance of the enumerator's work and in subsequent quality improvement of the base;

(*e*) Production of the maps should be cost-effective;

(*f*) Statistical boundaries overprinted on the maps must be clear and unambiguous;

(*g*) enumeration areas must be distinguishable when compared to the surrounding area;

(*h*) The maps should be suitable for dissemination purposes.

(2) Dissemination maps

It may be decided to produce a separate set of dissemination maps if the enumeration maps prove to be too detailed and cumbersome for use by statistical data users. It will generally be cost-effective to produce these maps at the same time as the enumeration maps. In general, data users require maps to understand how the enumeration areas fit together and build up to higher geographic levels. Therefore, dissemination maps can be usefully based on the next level of the statistical area structure. While data users are less concerned about topographic details, sufficient details need to be retained in order to allow the boundaries to be readily identified, as well as the presence of social and cultural features, such as schools, hospitals and major retail and work areas.

(*vii*) *Map production*

Maps should be provided to every level of field staff. Different levels will require different scale maps.

At least one map must be printed for every enumeration area in the country. It is recommended that two copies of the map be produced, one copy to be used by the enumerator and the other by the field supervisor for training and reference purposes. A larger-scale map for supervisors showing all of the enumeration areas in their area of responsibility should also be produced.

Maps should also be printed for regional managers showing the areas they are responsible for and the areas for which each of their subordinates is responsible. Such maps are an essential part of the managerial tools provided to the regional manager by the census agency.

It should be noted that regardless of whether clerical or GIS processes are used, this task can take a significant amount of time and will be performed relatively close to the end of the project. Careful consideration should be given to the time required for this work when establishing the project plan for census mapping.

(*viii*) *Preparation of other dissemination products and services*

While mapping for enumeration purposes rightly receives the highest priority and attention from census managers, it would be useful if the needs of dissemination could also be accommodated in the process. This may prove to be cost-

effective and may provide flexibility for the use of the mapping data for other purposes. Factors that should be considered include the following:

(*a*) A format. As formats are those that are widely used within the country, output products can be prepared readily to meet a wide market;

(*b*) The suitability of the data for commonly available desktop mapping applications. The map database for preparation of enumeration maps may be large and detailed and may present problems for desktop mapping use. In this case, a programme to thin the data set may be required.

(*b*) *Contract/agreement based mapping programmes*

The development of a mapping project beyond rudimentary clerical systems requires considerable knowledge of mapping, cartography and geographic systems. In the event that a census agency cannot draw on such skills from within the agency, it may be required to contract out the preparation of census maps.

Establishing a contract or agreement between the statistical and mapping agencies is based on the specification of the statistical agency's requirements and the mapping agency's ability to meet those requirements at an agreeable cost. In some cases, the production of a complete, digitized base map of a country suitable for a census (and, subsequently, electoral, postal and other purposes including commercial ones may be a sufficient reason for the Government to approve additional funding, on an exceptional basis, to establish the base map. A complete, consistent base map of an entire country suitable for small-scale activities is a national resource of high value. In other cases, a contract or agreement between the agencies provides the opportunity for the mapping agency to consolidate or increase its own mapping skills and capacity while lessening the resource and technical burden on the statistical agency. The two agencies must develop a cooperative and long-term (or strategic) relationship, but the outcome will be worth the effort.

For the census, a mapping agreement between the agencies would comprise two broad elements:

(*a*) Mapping for field purposes;

(*b*) Mapping and map-based products for dissemination purposes.

Using the same base map as the common source for both of these elements adds a level of quality assurance and consistency to the census programme that can be difficult to achieve where field and dissemination mapping are two separate elements.

Mapping for field purposes under a contract or agreement basis requires the statistical agency to specify its requirements of the mapping agency. These may include the following:

(*a*) Acquiring the base map data;

(*b*) Creating (or obtaining) the statistical boundaries and aligning them to the base map;

(*c*) Providing a process for enumeration area designers to advise on changes to boundaries (and updates to associated aspatial data);

(*d*) Producing hard-copy maps as specified for field work.

The statistical agency would undertake the enumeration area design work and validation of the associated aspatial data, as well as take delivery of the hard-copy maps for quality assurance checks and subsequent delivery into the field logistics programme. The statistical agency would also provide, after the census, any feedback received from enumerators about the base map that may be of use to the mapping agency.

Mapping for dissemination purposes is more difficult because the outputs will involve representation of statistical information (with, or as part of, a map) and often be accompanied by analysis or commentary about the information. Advances in mapping software have made it easier for census agencies to produce a wide variety of standard thematic maps.

However, advanced mapping products may require the expertise of the mapping agency. In these cases, it may be better for the statistical agency to focus on the statistics and let the mapping agency provide the technical skills required to produce the actual products.

The statistical agency would direct the development of map-based products as part of the overall output plan, taking into account user needs and requirements and the demand for different types of products. For example, it may be established that there is a strong demand for a series of thematic maps showing population change between censuses. The statistical agency would determine how the final maps should look, what standards should be applied (colour scales, etc.), what analysis should be included and how it should be presented and so on. The mapping agency would produce drafts of the maps using the information provided. These would be reviewed, changes made and so on until the product was final.

Part of the contract or agreement would cover how both agencies are represented in the presentation of maps (e.g., logos) and what financial arrangements would apply where products were sold.

D. Form design and testing

1. *Introduction*

The purpose of the census form, or questionnaire, is to capture data. A well-designed form captures data efficiently and effectively, with the minimum number of errors. It would be possible to devote an entire handbook to the principles associated with form design but for the purposes of the present handbook some fundamental issues are discussed in the sections below. Further detail on recommended questions to be asked in a census can be found in *Principles and Recommendations for Population and Housing Censuses*, revision 1.[1]

It is also recommended that countries draw on the experience of other countries by obtaining examples of forms used in previous censuses. However, caution should be exercised

when examining the form design and question wording from other countries. This is because a particular question wording that works in one country may not necessarily work in another country. Even within a country, various regions may require questions to be worded differently to elicit the same information owing to the cultural differences that exist in the country.

There is broad consensus on the five different types of census questionnaire:

1. Building, housing units and household;

2. Household and living conditions;

3. Collective institutions;

4. Establishments;

5. Agriculture.

2. *Form design*

With the form design requirements varying according to the methods of enumeration and processing, there are several issues that need to be considered. These include:

(*a*) Respondent burden;

(*b*) Format and question wording, which are affected by whether interviewer or self-enumeration methods are used;

(*c*) Layout and design of response areas, which are influenced by the need for good interviewer/respondent perception and the data capture method;

(*d*) Whether a combination of short and long forms is used.

(*a*) *Respondent burden*

Minimizing respondent burden will assist in obtaining accurate answers to the questions on the census form. The length of the form, the number and type of questions and how easy the form is to complete can all add to respondent burden. This should be borne in mind when designing the census form and is particularly important if the self-enumeration method is used.

(*b*) *Question wording and format*

The wording and format of questions will influence how well the form works. Issues that need to be taken into account when designing questions include:

(*a*) Data needs of users;

(*b*) Level of accuracy and detail required;

(*c*) Availability of the data from the respondent;

(*d*) Appropriate language that is easily understood by respondents and interviewers;

(*e*) Data item definitions, standard question wording and any other relevant information;

(*f*) Data processing system being used;

(*g*) Sequencing or order of questions;

(*h*) Space required for each answer.

An important factor to note here is language diversity. For example, Indonesia has 300 spoken languages and Zambia has 73 different dialects. This proliferation and diversity of languages has a direct effect on the methods and techniques used to train field staff, as well as on the census management structure and questionnaire preparation. This may require the questionnaire to be provided in more than one language. Additionally, field staff may have to be trained to translate into the regional languages and/or dialects spoken in the area.

(*c*) *Layout and design*

(*i*) *Interviewer/respondent perception of the form*

The layout and design of the form will have a direct impact on how interviewers or householders will complete the form and the accuracy of the data supplied. Therefore, special consideration should be given to graphic presentation, placement and presentation of instructions, the use of space, layout and colours and the wording used.

Poor use of any form design element, be it language, question sequencing or layout, creates an obstacle for the respondent or interviewer. Each obstacle may be only minor, but they all accumulate in the person's mind until a point is reached when the person no longer cares about what responses go on the form. As the purpose of the census form is to obtain high-quality information, it is important to minimize obstacles so that the form is filled in before this point is reached.

(*ii*) *Processing system requirements*

Differing requirements for the data-capture components of processing systems, ranging from key entry to electronic imaging through scanners, will require markedly differing form design. The form design requirements and form size for differing technologies may vary greatly and should be taken into account when designing the forms. It is also important to note that it is possible for the form design to easily incorporate provision for contingencies in data processing. For example, even though a form may be designed for automatic data capture (e.g., imaging, character recognition), it is a simple task to include space and codes alongside response areas on the form. By incorporating these codes on the form, responses can be easily key entered, if necessary, owing to the failure of the intelligent character recognition system.

It is important that the respondent's perception of the form is not unduly impacted by data-capture requirements.

When designing forms for more advanced data-capture methods, such as imaging, it is necessary to establish that the respondents are able to provide answers in a suitable format that can be recognized by the data-capture equipment. If the forms are self-enumerated, this will require extensive testing that includes processing of live data from tests.

A general principle that should be adopted is that pre-coded response areas should be used as much as possible. Open-ended questions should be limited to essential topics such as occupation and industry.

The use of different languages in the census

Special provisions will have to be made if two or more languages are used in the country. Several methods have been used to deal with this situation: a single multilingual questionnaire, or one version of the questionnaire for each major language, or translations printed in the enumerators manual of the questionnaire in the various languages. The problem is more serious in the case of non-written languages. Staff recruitment and training procedures (see paras.1.133-1.138) will also have to take language problems into account. Information on the distribution of languages in the country is important for sound census planning and; if not available, will have to be collected at some stage of the census preparations.

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Source: Principles and Recommendations for Population and Housing Censuses, Revision 1 (United Nations Publication, Sales No.E.98.XVII.8), para. 1.116.

(*d*) *Format of census forms*

The choice of format for the form will be influenced by the enumeration method. Census forms can be household forms or individual personal forms. A household form can be arranged as a matrix providing for answers from all members of an average-sized household on each page. Another approach to the design of household forms is the use of a booklet, with all of the personal questions asked first for person 1, then repeated for other persons in the household. Annex VII includes different types of census forms. The form used in the Argentinian census of 1991 is an example of a questionnaire designed as a booklet. The census form used in Botswana in 1991 is an example of a questionnaire arranged in a box format. The form used in South Africa in 1996 is an example of a column format. The examples of the census forms used in Uruguay and in New Zealand are included to highlight the differing requirements for automated data capture. Uruguay is an example of a system that relies on optical character recognition and New Zealand represents a system that relies on optical mark recognition.

3. *Form testing*

It is likely that as the census form is developed it will undergo several changes as its performance is tested and evaluated. Many countries concentrate their testing programme on new topics or questions, but it is also important to test the impact that these new questions may have on other questions on the form.

The principles of good form development are:

(*a*) Always evaluate the performance of a form before changes are made;

(*b*) If necessary, change the form to improve its performance;

(*c*) Always evaluate the form after changes are made to find out if its performance has improved.

The evaluation of tests provides the basis for good form design. However, there is no single best procedure for evaluating forms. Each procedure will provide a slightly different view of a form's performance. For example, three procedures that can be adopted are the following:

(*a*) An analysis of errors. This will provide data on the most obvious errors that respondents make, but does not explain why the errors occur;

(*b*) Cognitive testing. During this procedure, respondents are observed completing the form;

(*c*) Analysing the quality and level of detail given in response to particular questions on the form.

Using these procedures will give an overall picture of the form's performance, with each particular procedure giving a distinctive, though incomplete, picture of the relationship between the form and the respondents.

(*a*) *Analysis of errors*

An analysis of errors consists of counting and tabulating the number and type of errors that have occurred on a sample of forms during field tests or from the previous census.

The purposes of an analysis of errors are the following:

(*a*) To find out what errors are occurring on a form;

(*b*) To provide a benchmark against which to judge the form's performance;

(*c*) To provide information on which to base modifications of the form which will lead to a reduction in errors;

(*d*) To determine the costs of repairing the errors, both before and after re-design.

An analysis of errors is the most important quantitative measure of a form's performance. It is the basic quantitative benchmark against which the performance of one form can be compared with another. It also provides an estimate of some of the less obvious costs such as:

(*a*) The repair of errors in the processing phase which can be expensive;

(*b*) Respondent burden.

If errors remain unnoticed, they can seriously affect the quality of data; good design can reduce the incidence of errors on forms. However, it is not possible to improve the design of a form if it is not known how the form has performed in the past. Therefore an analysis of errors should always be conducted first before attempting to improve the design of a form. After the form has been improved another analysis of errors should be conducted. A comparison of the before and after results is the best evidence that the form has been improved.

There are many kinds of errors, and they have a variety of different causes for which different remedies are necessary. When conducting an analysis of errors, it is important to distinguish between the different kinds. There are generally three basic types or errors: (*a*) omission, (*b*) commission and (*c*) mistakes.

(*i*) *Omission*

Errors of omission occur when respondents fail to answer a question. Respondents may fail to answer a question because they do not notice it, because they deliberately avoid it or because they do not understand it.

Omissions are extremely hard to diagnose in an analysis of errors, partly because they can be due to many reasons. Also, a blank answer space on a form may be perfectly legitimate and not particularly significant in itself. The reasons for these errors have to be analysed in conjunction with other procedures.

(ii) Commission

Errors of commission result when respondents give information they were not asked for. They can arise because of a misunderstanding of questions or incorrect assumptions. Commissions are easier to notice than omissions in an analysis of errors, but caution should be exercised in drawing conclusions without the support of results from other investigations. In most cases, unnecessary information is not as expensive to deal with as omissions or mistakes. Errors of commission often result from failure to follow routing instructions such as "Go to part...". While the additional answers provided are not harmful in themselves, the increase in respondent effort and often frustration can have a serious effect on how accurately the remainder of the form is completed.

(iii) Mistakes

These result when respondents give incorrect information. There are many reasons why people make mistakes on forms which lead to problems in identifying the causes of this type of error. Moreover, not all mistakes are noticeable. For example, if the question on the form asks respondents to give their income and they give their net income when their gross income was needed, the mistake would go unnoticed unless there was an independent check. However, one of the great advantages of analysing mistakes is that many of them are directly observable and they can provide clues to a form's performance. Other procedures, such as cognitive testing, can be used to determine the causes of mistakes.

(b) Cognitive testing

Cognitive testing can be used as a viable supplement to full-scale field testing. In essence, cognitive testing involves a market research approach to form design testing. Typically, cognitive testing will comprise a mixture of the following:

(a) Focus group research. This is often referred to as "behind the glass testing" where a moderator leads a group of people through a structured discussion;

(b) Observational studies. This is where observers watch respondents complete forms in the environment in which they would normally do this, for example in their home.

As noted elsewhere cognitive studies are relatively expensive. To ensure the studies are directed at the topics of particular interest, an abbreviated form could be prepared. Where necessary, specific demographic groups will be recruited as subjects for cognitive testing. For example, should a topic relating to country of birth be tested, the panel of people for cognitive testing should include a high proportion of immigrants.

Advantages of cognitive testing include the opportunity to closely observe participants in completing the test form. Factors such as the time it takes to read instructions, the order in which questions are answered and the care taken when completing the form can be assessed. The facilitator of the cognitive testing exercise can also involve participants in a discussion during which specific questions can be asked. As a result, form designers are given a greater depth of understanding of how particular questions are interpreted by respondents.

Table II.1.   Census from testing programme

Purpose of Test	Time to Census Date
Specific purpose test for proposed new question	3 years
Form design and enumeration procedures	3 years
Specific purpose test for proposed new processing technology	3 years
Specific purpose test for enumeration procedures in remote area	2 years
Major test (or pre-test) of final form design, enumeration and processing systems	2 years
Dress Rehearsal (or pilot test) of enumeration, processing and dissemination systems and procedures	1 year

Extreme care should be taken when assessing the results of cognitive testing. By necessity, sample sizes are small and problems with form design may not be detected. Conversely, because of the small sample size and specific demographic groups selected, the significance of problems detected may be biased. The fact that testing conditions are not identical to census conditions should be considered.

(*c*) *Analysing the quality and level of detail provided*

This is particularly important for open-ended questions such as occupation. How the question is worded will impact on the level of detail given by the respondent. Subsequently, the level of detail given by the respondent will impact on how the response can be coded and, ultimately, on the quality of the output from the census.

Therefore, as part of the testing programme, these questions should be coded to the established classifications to ensure that the level of detail being reported is sufficient for coding purposes.

4. *Census tests*

The approach to testing will be greatly influenced by the size and diversity of the population, the enumeration method, the processing method and the resources available. It is highly desirable to provide for more than one form design

test to eliminate the need of having to use an untested question in the census itself. Form design is only one of several objectives in testing.

The test programme should be comprehensive enough to test effectively all of the main components of the census. As well as testing the form, the test programme should test any guide or other information booklet, enumeration procedures (including training and administration of temporary census staff) and processing procedures. Ideally, at some stage during the programme each of the major systems to be used in the census should be tested, up to and including the delivery of output.

In general, the earliest tests will focus on form design issues and any of the collection procedures that warrant testing, such as enumeration area design, mapping and enumeration management. Later on in the testing programme, testing should include processing systems and procedures and dissemination systems.

The testing programme should include a final pilot test (or dress rehearsal) well in advance of the census. This is a final test, at which the enumeration, processing and dissemination systems, and the interface between them, are given a final test to resolve any outstanding problems. The form design should not be changed after this final test. This test also provides an opportunity to revise the costing estimates. In order for this to happen, the final form design needs to be available and all systems have to be acceptance tested beforehand.

Table II.2, an example of a testing programme, is a guide to the type and timing of tests that may be conducted in the lead up to a census. The nature of the testing programme for each country will largely depend on the resources available. It will also depend on factors such as the extent of proposed changes to the form, procedures and processing systems.

5. *Methods of testing*

Testing requires some benchmarks against which the trial procedures can be assessed. Often this can be the procedure that was used in the previous census, otherwise it can be some externally determined standard, which it is agreed must be met. It is common to use "split samples". This is where one part of the test population is subjected to one procedure and another part to a second procedure, with the results analysed to determine which is the better outcome. The split sample approach is ideal for testing form design changes.

For tests to provide reliable results, it is important to design them to reflect as much of the final census environment as possible. Field operations, for example, should resemble census conditions as far as possible. However, using central office staff to do most of the work should be avoided. Assistance provided to respondents in the test should be similar to that available in the census proper. Processing of test data should also replicate census procedures as far as possible.

Recruiting, training and paying the staff necessary to carry out a test of the size necessary to produce worthwhile results is a major exercise, which will incur significant expenses. These expenses should be fully included in the total costing of the census. The importance of adequate testing to ensure successful census outcomes should not be underestimated.

E. Instruction manuals

1. *Introduction*

The present section includes suggested contents for the primary handbooks (or manuals) required for field operations. They are divided into three categories, representing the three levels of field staff used in this handbook. These are:

(*a*) Enumerators;

(*b*) Supervisors;

(*c*) Regional Managers/Deputy Regional Managers (a regional manager cannot supervise between 20 and 35 persons; in many countries, there may be someone in between and thus, quality can be enforced).

Given the hierarchical nature of the census operation, the handbook for each level of staff should supplement the handbook for the level below it. Therefore, the enumerators' handbook will contain detail appropriate to that level, whereas the supervisors' handbook assumes that the supervisor is familiar with the content of the enumerators' handbook. Detail in the supervisors' handbook provides additional information

about enumerator duties but avoids repeating material already included in the enumerators' handbook. Therefore, while many headings will be the same between handbooks, the content under those headings will differ in each. The main exceptions would be the timetable and introductory parts, where some repetition is necessary or desirable.

All handbooks (and other manuals and materials) should aim for commonality, wherever possible. This includes consistency of layout, style and imagery (logos, etc.). The use of different colors for covers is recommended to provide easy distinction between topics.

2. *Enumerators' handbook*

The enumerators' handbook is, with the exception of the enumerators' record book, the most important field document. It details the responsibilities and tasks of the Eeumerator and should provide sufficient information for an enumerator, after training, to work independently in the field. While the enumerators' handbook will often be the only reference available in the field, and as such should include sufficient information to cover most eventualities, it should not attempt to cover every eventuality. This may lead to the handbook being too bulky and give enumerators the impression that the job is more difficult than it really is. The aim should be to cover most ordinary situations in some detail and provide guidance on how to deal with unusual situations, should they occur.

The enumerators' handbook should focus on issues related to census taking and avoid including information about administrative arrangements (such as recruitment and payment), which should be provided separately.

Topics, particularly process-type activities (such as filling in a form) should be covered in bullet (or dot) point form, wherever possible. This will assist in quick referencing, particularly when in the field.

(*a*) Timetable

It is recommended that a timetable of census tasks and activities be included on the inside front cover (or first pages) of all handbooks. This would provide easy referencing throughout the operation.

(*b*) Introduction

The introduction section should describe the census, who takes it and why. It should introduce the goals and objectives of the census, emphasize the importance of the enumerator's role, explain how to use the handbook and describe the overall operational arrangements. Suggested sections include:

(*a*) About the statistical agency;

(*b*) About the census;

(*c*) Census organization;

(*d*) How to use the handbook.

(*c*) *Enumerator responsibilities*

This section provides a summary of the role and responsibilities of enumerators and also covers some practical matters associated with safety, lost material and so on.

Suggested sections are as follows:

(*a*) Enumerator duties;

(*b*) Enumerator conduct;

(*c*) Identification;

(*d*) Safety;

(*e*) Confidentiality;

(*f*) Lost materials;

(*g*) Access to dwellings;

(*h*) Handling materials;

(*i*) Marking questionnaires;

(*j*) Checking questionnaires.

(*d*) *Before training*

This section describes what enumerators need to do before they attend training. This may include reviewing their area, reading their handbook and completing a home study exercise. It is important that enumerators receive the handbook and other relevant census materials so that they can review them before the testing. Suggested sections are:

(*a*) Collecting or receiving materials from supervisor

(*b*) Reading enumerators' handbook;

(*c*) Completing home study exercise;

(*d*) Checking or updating maps;

(*e*) Reviewing enumeration area (if practical);

(*f*) Planning enumeration route or path;

(*g*) Advice about managing time.

(*e*) *Training*

This section describes each part of the training and what will be covered. It should include a brief description of how training will be conducted and how enumerators will be asked to participate. Suggested sections include the following:

(*a*) Preparation;

(*b*) Training session;

(*c*) On-the-job training.

Enumeration

The structure of the handbook at this point will need to take into account the type of enumeration and whether there is a pre-listing exercise to be carried out. For the sake of completeness, the content here assumes that there is a pre-listing exercise and that there will be a delivery and collection period (i.e., drop-off/pick-up method). If the census is interview based, the delivery and collection sections can be combined into a single enumeration section.

(*f*) *Pre-listing*

This section covers activities associated with pre-listing (if conducted).

Suggested sections are:

(*a*) Purpose;

(*b*) Preparation;

(*c*) Method to be used;

(*d*) How to complete pre-listing forms;

(*e*) Conducting the pre-listing exercise;

(*f*) Checking completed workloads.

If pre-listing is done prior to census day, there may be a need for separate measures for the turnover.

(*g*) *Delivery*

This section covers the delivery period in essentially a chronological manner. It should focus on what will happen most of the time, while taking into account special cases or potential problems. Suggested sections include:

(*a*) Before approaching dwellings;

(*b*) Making contact;

(*c*) Completing the record book and questionnaire;

(*d*) Large households;

(*e*) Special (non-private) dwellings;

(*f*) Refusals or objections;

(*g*) No contact made;

(*h*) Unoccupied dwellings or vacant blocks;

(i) Delivery checks.

(*h*) *Collection*

This section covers the collection period in a manner similar to that of the delivery section. Suggested sections include:

(*a*) Before approaching dwellings;

(*b*) Making contact;

(*c*) Checking questionnaires and completing the record book;

(*d*) Special (non-private) dwellings;

(*e*) Refusals or objections;

(*f*) No contact made;

(*g*) Unoccupied dwellings or vacant blocks;

(*h*) Creating dummy questionnaires or record entries;

(*i*) Collection checks.

(*i*) Conducting interviews

This section should be included when the enumerator fills out the questionnaire. Suggested sections are as follows:

(*a*) Introduction to the household questionnaire;

(*b*) Introduction to the individual questionnaire;

(*c*) Principle of interviewing;

(*d*) The art of asking questions;

(*e*) How to write in the questionnaire;

(*f*) Explanation of procedures;

(*g*) Births/deaths and so on.

(*j*) Review of completed materials and reviewing completed work

This section sets out what should take place immediately after the enumeration is completed. It focuses on quality-related issues and ensuring that all questionnaires are accounted for and that enumerator checking is complete. Suggested sections are:

(*a*) Sorting and checking questionnaires;

(*b*) Completing summary records;

(*c*) Packing questionnaires and materials;

(*d*) Returning materials to supervisor;

(*e*) Certifying work completed;

(*f*) Administrative procedure.

Annexes

Annexes are not essential. There may be some topics or matters, however, that are better covered as a separate annex rather than within the body of the handbook, for example, a list of definitions that will be needed by enumerators. A list of frequently asked questions, about working as an enumerator or by respondents, can also be useful to assure enumerators that they are not the only ones with such questions. Annexes may include the following:

(*a*) Definitions or glossary;

(*b*) Census scope;

(*c*) Frequently asked questions;

(*d*) Additional mapping information;

(*e*) Explanation of census questions.

3. Supervisors' handbook

(*a*) Timetable

The timetable is similar to the one included in the enumerators' handbook but covers additional tasks and activities required of supervisors.

(*b*) Introduction

The introduction may contain information in addition to that included in the enumerators' handbook. For example, it may contain more detailed information about census processing that will help supervisors better understand their role in a quality census. Suggested sections are:

(*a*) About the statistical agency;

(*b*) About the census;

(*c*) Census organization;

(*d*) How to use the handbook.

(*c*) Supervisor responsibilities

As well as being responsible for the supervision and, to a large degree, the quality of work of their enumerators, supervisors will often have additional responsibilities of an administrative or clerical nature. For example, where the enumerators' handbook may describe safety in relation to working as an enumerator, the supervisors' handbook will also need to provide advice about what the supervisor should do if an enumerator reports a safety problem. In other words, the supervisors' handbook will need to expand on a number of topics covered in the enumerators' handbook, without necessarily duplicating a lot of the material. Suggested sections are:

(*a*) Supervisor duties;

(*b*) Supervisor conduct;

(*c*) Contact with regional manager/deputy regional manager;

(*d*) Contact with enumerators;

(*e*) Role in telephone inquiry service;

(*f*) Identification;

(*g*) Safety;

(*h*) Confidentiality;

(*i*) Lost materials;

(*j*) Access to dwellings;

(*k*) Births/deaths and arrivals in the area at census time (scope);

(*l*) Handling materials;

(*m*) Marking and checking questionnaires;

(*n*) Quality assurance tasks.

(*d*) *Administration and recruitment*

A section similar to this will be required if supervisors are involved in the recruitment and/or payment of enumerators. Suggested sections are the following:

(*a*) Issues relating to supervisor employment;

(*b*) Recruiting enumerators;

(*c*) Administration;

(*d*) Financial matters/expenses;

(*e*) Enumerator pay issues;

(*f*) Supervisor Pay Issues.

(*e*) *Receipt of materials and workload review (pre-training)*

As in the enumerators' handbook, this section describes what is required of supervisors before they attend training. It also deals with the receipt of bulk materials and their subsequent dispersal to enumerators. As supervisors are responsible for many enumerators, they will often have a large area to review before training and should be familiar with all facets of the enumerators' responsibilities. Therefore, supervisors should do all the reading and training that is required of enumerators. Suggested sections are:

(*a*) Receipt of materials;

(*b*) Allocating materials to enumerators;

(*c*) Reading handbooks (enumerators' and supervisors');

(*d*) Review workloads;

(*e*) Checking or updating maps and/or boundaries;

(*f*) Completing enumerator training home study exercise;

(*g*) Completing supervisor training home study exercise;

(*h*) Advice about supervising enumerators.

(*f*) *Supervisor training*

This section describes each part of the training and what will be covered. Suggested sections are:

(*a*) Preparation;

(*b*) Training session;

(*c*) Additional training.

(*g*) *Training enumerators*

This section is particularly important to a quality census. Supervisors must be able to organize and conduct enumerator training with confidence and authority. The supervisors' handbook should focus on how to conduct effective training. Suggested sections are:

(*a*) Preparation;

(*b*) Checking completed enumerator home study exercises;

(*c*) Training session;

(*d*) On-the-job training;

(*e*) Additional training.

(*h*) *Pre-listing*

This section expands on the supervisors' role in the pre-listing exercises. Suggested sections are:

(*a*) Purpose

(*b*) Preparation;

(*c*) Method and forms used;

(*d*) Checking staff preparation;

(*e*) Accompanying staff in the field;

(*f*) Special cases and problems;

(*g*) Checking completed listing;

(*h*) Post-listing activities;

(*i*) Writing progress reports.

(*i*) *Delivery and collection (interviewing)*

This section expands on the supervisors' role during delivery and collection or interviewing. It should focus on those aspects of the work that improve quality. Suggested sections are:

(*a*) Supervising enumerators during delivery (interviewing);

(*b*) Access difficulties, objections and refusals;

(*c*) Special dwelling issues;

(*d*) Other special cases;

(*e*) Checking workloads before collection;

(*f*) Supervising enumerators during collection;

(*g*) Writing progress reports.

(*j*) *After collection or interviewing*

This section focuses on quality assurance in the field operation. It should assist supervisors in ensuring that all forms are accounted for and correctly completed or marked and that the questionnaires are ready for processing. Suggested sections are the following:

(*a*) Receipt of materials from enumerators;

(*b*) Completing summary records;

(*c*) Evaluation information and supervisor's report;

(*d*) Certifying enumerators' work;

(*e*) Certifying supervisor work completed.

(*k*) *Packing and returning materials*

This is the final phase of the supervisors' job and describes how material is to be prepared for pick-up. It should also cover tidying up any loose ends such as submitting their report. Suggested sections include:

(*a*) Sorting completed questionnaires;

(*b*) Sorting unused material;

(*c*) Packing material for return;

(*d*) Material delivery and pick-up arrangements;

(*e*) Completing administrative tasks.

Annexes

As in the enumerators' handbook, annexes are not essential. There may be some topics or matters, however, that are better covered as a separate annex rather than within the body of the handbook. Annexes may include:

(*a*) Definitions or glossary;

(*b*) Special enumeration strategies;

(*c*) Frequently asked questions;

(*d*) Additional administration and recruitment information.

4. *Regional managers'/deputy regional managers' handbook*

The nature and role of the regional manager (and/or deputy regional manager, if included in the field workforce) may vary significantly from country to country. Included here is a suggested list of contents for a regional managers' handbook that assumes the regional manager:

(*a*) Will be provided with computer equipment (of some description);

(*b*) Has a significant role in the recruitment and payment of staff;

(*c*) Has responsibility for financial delegations;

(*d*) Will have some involvement in public relations;

(*e*) Will undertake training of supervisors.

(*a*) *Timetable*

The timetable is similar to the one included in the supervisors' handbook but covers additional tasks and activities required of regional managers.

(*b*) *Contents*

(*a*) Introduction

   (*i*) The statistical agency

   (*ii*) Overview of the census of population and housing

   (*iii*) Outline of the census operation

   (*iv*) Structure of the census workforce

   (*v*) Support services

(*b*) Regional manager responsibilities

   (*i*) Overview

   (*ii*) Contact with statistical agency

   (*iii*) Responsibilities

   (*iv*) Ethics of census work and conduct of field staff

   (*v*) Security and confidentiality of census material

   (*vi*) Lost materials

   (*vii*) Access rights to dwellings

   (*viii*) Contact with supervisors and enumerators

(*c*) Safety issues

   (*i*) Introduction

   (*ii*) Regional manager safety

   (*iii*) Enumerator and supervisor safety

   (*iv*) Handling materials

   (*v*) Screen-based equipment

   (*vi*) Accidents or illness

(*d*) Computer equipment

   (*i*) Introduction

   (*ii*) Equipment to be delivered

   (*iii*) Setting up

   (*iv*) Getting started

   (*v*) Problem solving

   (*vi*) Backup and recovery

   (*vii*) Security of equipment and data

   (*viii*) Passwords

   (*ix*) Authorized use of equipment

   (*x*) Packing and returning equipment

(*e*) Computer application

This section would describe the specific applications to be used by the regional manager. It would likely provide some overview information and refer to a specific user manual or on-line assistance.

(*f*) Expenditure of government funds

   (*i*) Authority and role

   (*ii*) General conditions and limits in purchasing

   (*iii*) Operating bank/trust/credit card accounts

   (*iv*) Acquittal and accountability

(*g*) Mapping

   (*i*) Overview

   (*ii*) Definitions

   (*iii*) Statistical geography used in the census

   (*iv*) Review of supervisor and enumerator workloads

   (*v*) Changing workloads

(*h*) Public communications

   (*i*) Overview and public communication strategy

   (*ii*) Dealing with the media

   (*iii*) Special public communication strategies

   (*iv*) Local communications issues

(*i*) Special Enumeration Strategies

This section should describe any special enumeration strategies that may be included in the overall census plan. For example, there may be a specific strategy for very remote, isolated or inner-city areas or for large holiday resorts.

(*j*) Recruitment and administration

   (*i*) Overview

   (*ii*) Record keeping and forms used

   (*iii*) Recruitment policies and guidelines

   (*iv*) Recruiting supervisors

   (*v*) Recruiting enumerators

   (*vi*) Recruiting other field staff

   (*vii*) Appointing staff

   (*viii*) Employment forms (including taxation, etc.)

   (*ix*) Staff changes after recruitment

   (*x*) Unsatisfactory staff

   (*xi*) Accident and/or incident reports

   (*xii*) Travel Required for Census Work

(*k*) Training

   (*i*) Overview

   (*ii*) Regional manager training

   (*iii*) Training preparation and attendance

   (*iv*) Supervisor training

   (*v*) Enumerator training

   (*vi*) Other training

(*l*) Census telephone services

   (*i*) Overview

   (*ii*) Description of operation

   (*iii*) Regional manager role

   (*iv*) Supervisor role

   (*v*) Enumerator role

   (*vi*) Administration

(*m*) Special dwellings

   (*i*) Overview

   (*ii*) Definitions

   (*iii*) Enumeration strategy

   (*iv*) Regional manager role

   (*v*) Available information about special dwellings

   (*vi*) Communication strategy and/or approach

   (*vii*) Specific training issues

(*viii*) Administration and forms used

(*n*) Refusals or objections

   (*i*) Overview

   (*ii*) Definitions and policy

   (*iii*) Regional manager role

   (*iv*) Supervisor role

   (*v*) Enumerator role

   (*vi*) Specific training issues

   (*vii*) Administration and forms used

(*o*) Payment

   (*i*) Overview

   (*ii*) Regional manager role

   (*iii*) Timetable of payment activity

   (*iv*) Policy and guidelines

   (*v*) Forms used

   (*vi*) Rates of payment

   (*vii*) Method of payment

   (*viii*) Paying staff who are on other benefits

   (*ix*) Supervisor payment

   (*x*) Enumerator payment

   (*xi*) Payments to other staff

   (*xii*) Payments for incomplete work

   (*xiii*) Unsatisfactory staff

   (*xiv*) Claims for additional payment

   (*xv*) Checking payments

   (*xvi*) Payslips

(*p*) Materials

   (*i*) Overview

   (*ii*) Transport arrangements and/or contracts

   (*iii*) Timetable of transport activities

   (*iv*) Regional manager role

   (*v*) Forms used

   (*vi*) Packaging of census materials

   (*vii*) Delivery of material to regional managers

   (*viii*) Bulk delivery to supervisors

   (*ix*) Delivery to enumerators and return to supervisor

   (*x*) Bulk pick-up from supervisors

   (*xi*) Return of regional manager materials

F. PRINTING OF FORMS AND OTHER DOCUMENTS

1. *Introduction*

Printing the many items that are required to conduct census enumeration is a major activity. The main census form is the most obvious item but there are many others that need to be printed. Given the size of census enumeration, the amount of printed material is often large, and significant lead times need to be taken into account.

For each item, printing requirements need to be established, quantities calculated, items specified and production undertaken. The packing and dispatch of materials into the field (see chap. III, sect. D) relies on the timing of the printing process, and careful planning and coordination of these activities is necessary.

In the majority of countries, printing will be conducted outside the statistical agency, either through a government printer or commercially. Part of establishing the basis of the census enumeration (see sect. A above) is investigating the country's printing capacity based on broad requirements. Early discussions with major printers should be undertaken. Before proceeding to select the printer, census agencies may wish to seek specialist advice from printing consultants and/ or other census agencies.

2. *Planning and management of printing*

Planning and managing printing required for the census enumeration is relatively straightforward. The most difficult aspect may be the coordination involved in obtaining sufficient information from specialized areas within the census operation that require items to be printed (e.g. recruitment, procedures, training and payment).

The type of information required in order to plan and manage printing includes the following:

(*a*) Details of the items that will need to be printed;

(*b*) Specifications that are sufficiently detailed to enable;

(*i*) Printers to provide reliable quotations of costs and printing timetables,

(*ii*) Logistical support staff to develop plans for packing.

(*c*) Estimates of quantities of each item that are reliable and will not result in shortfalls or significant oversupply.

Planning the printing process is primarily about:

(*a*) Establishing the timetable for the preparation of manuscripts by the relevant areas of the census agency;

(*b*) Establishing key requirements and dates for the receipt of printing material (to feed into packing and distribution);

(*c*) Setting up processes to obtain information and quotations.

Table II.2. Printing table

	Notes	Item 1	Item 2 etc
Description	Describes the purpose of the item.		
Quantity	Includes any notes about how the quantity was determined.		
Stock	The type of stock the item is to be printed on (e.g., paper, cards).		
Ink	The colour or colours of the print.		
Binding	The type of binding if multi-page document (e.g., stapled, perfect bound, folded).		
Packing	How the printer is to pack the item (e.g., bundles of 40, pads of 70).		
Delivery	Location and dates; includes a breakdown if there are large quantities.		
Manuscript	When and how the manuscript will be provided by the census agency.		
Proof	Details about whether and when proofs will be required and how they will be checked.		
Quality assurance	Details about sample requirements before or during the main production run.		

This is followed by processes to establish printing, or brokerage contracts (or other formal arrangements), and then manage, the printing activity as it is undertaken.

(a) Details of individual items

The first step should be to establish a method for recording the need for a printed item and details about it that can be used to obtain a printing estimate. A simple pro forma invoice, either computer based or clerical, can be used to document printing requirements. This might include the items in table II.2, which is provided as a guide only.

If the pro forma inovice is set out on a computer spreadsheet, it could be linked to the cost and quantity sheet that is described below. If clerical processes are used, care should be taken to ensure the two estimation processes are kept in synchronization. The actual format is not as important as having a methodical approach to obtaining the initial details and then keeping the records updated as new or revised information becomes available.

(b) Cost and quantity sheet

The next step is to establish a method for recording the cost and quantity of all items to be printed. Estimated, quoted and actual costs can be recorded.

The use of estimated costs initially, enables a running total to be kept that is updated as quotations are obtained and again when actual costs are known. This information allows the total printing budget to be monitored and provides early warning if unexpected increases in costs appear likely to threaten the budget. Again, the use of a spreadsheet is ideal for this task. The following information might be recorded on the spreadsheet, which can also be used for management information purposes:

(a) Item name;

(b) Printed quantity;

(c) Initial quantity (used if there is a variation between seeking quotes and what is finally printed);

(d) Actual cost;

(e) Quoted cost;

(f) Estimated cost;

(g) Date ordered;

(h) Date delivered;

(i) Supplier.

3. Types of forms

There are four broad groups under which printing-related services will be required. These are as follows:

(a) Census forms, and post-enumeration forms;

(b) Enumerator items;

(c) Procedural and training items;

(d) Administrative items.

(a) Census forms

The importance of the main census form is so great that it should be treated as a separate printing activity from the other groups specified above. It is important that the statistical agency deals directly with the printer and that other stakeholders (e.g., processing staff) are involved in all stages of production. This is even more important if the print quality is crucial for the processing system, as would be the case, for example, where optical mark recognition is used.

The census enumeration will often include more than a single type of form (for example, personal forms and household forms). There may also be a combination of self-enumeration and interviewer forms where these two methods of enumeration are used in combination.

In some countries, the main census questionnaire may be pre-printed, with identifiers for different geographic regions of the country. There may also be slight differences in some questions because of differing circumstances throughout the various regions of the country.

There may also be other forms that will be needed in lesser numbers for enumeration in remote areas, or forms used to summarize details of persons enumerated in special dwellings such as hotels, hospitals or prisons.

There are four important issues to consider when organizing the printing of all census enumeration forms:

(a) Quantity;

(b) Quality;

(c) Paper stock;

(d) Timing.

(i) Quantity

Estimating the quantity of forms to be printed is discussed in detail in the section on distribution and return of material (see chap. III, sect. D). A lack of forms can have serious consequences as there may not be enough time to print additional quantities if a shortfall becomes apparent during the enumeration. However, printing excessive numbers of forms wastes resources and adds unnecessary costs to the census operations. Thus, great care must be taken in this process.

(ii) Quality

The quality of form printing can be crucial to the quality of census data. Mistakes on the form (for example, incorrect question wording or incorrect sequencing instructions) can result in data items being missed or completed erroneously by interviewers or householders.

Special attention should also be given to ensure that printing adheres to standards required for processing systems. These standards may refer to the positioning of response areas, and colours of the form. Deviation from these standards may result in data quality problems and costly corrections in the processing phase. Procedures that can be implemented to monitor the quality of form printing are discussed in section 4 below.

(iii) *Paper stock*

Owing to the large number of forms that have to be printed, it is important that an estimate is made of the total quantity of paper stock that is required.

Apart from the quantity required, special consideration should be given to the characteristics of the paper used for the census forms. Is it of sufficient quality to handle conditions in the field? Does it meet the specifications for the processing system? For example, some data-capture systems cannot use recycled paper because of the impurities in the paper.

These estimates should be made as early as possible. This is particularly important in countries where additional quantities of the required paper stock may need to be produced for the census. Sufficient time must be allowed for paper mills to schedule additional production and/or import additional stock.

(iv) *Timing*

Planning of the printing process needs to take into consideration the long lead times that may be required. The quantities required may place a large burden on the available printing capacities in the country. Early discussions with printers will give an indication of the lead time required to print sufficient quantities of forms. Planning should include, but not be limited to, the activities set out in table II.3, with a broad indication of timing in relation to the census date. The timing shown in the table is regarded as the ideal lead times required, although it is recognized that these lead times may not be possible in some countries. It should also be noted that countries with small populations may be able to condense this timetable considerably.

It should be noted that in most cases, the packing and dispatch of the printed forms should occur progressively and concurrently with the printing.

Many of the issues discussed above for the main census form will also apply to the post-enumeration survey form. The main difference will be that far fewer forms will need to be printed.

(b) *Enumerator items*

These items are those used by the enumerators in their work and may include some or all of those listed below. The list is not prescriptive or exhaustive but illustrates the type of items that may be required in addition to the questionnaire and the listing book. A common attribute of each of these items is that if they are used, they will be required in large numbers. The printing of enumerator items should be planned around the printing of the main census questionnaire, as these items will usually be packed together for delivery to field staff. Items that may be used by the enumerators include:

(a) Information booklets or pamphlets that explain the taking of the census. These are sometimes handed to each household by the enumerator or delivered by mail to households before enumeration commences;

(b) Privacy envelopes, which enable householders to mail their form back or prevent the enumerator from seeing it;

(c) Multilingual brochures to help enumerators communicate with householders who are not proficient in the principal language of the country;

Table II.3.   Printing activity table

Activity	Months Before Census
Preparation of technical specification (draft)	24
Preparation of technical specification (final)	23
Provision of contractual wording and/or advice	22
Review of tender document	22
Calling tenders	21
Evaluation of tenders	18
Management review	16
Letting of contract	15
Preparation of manuscript	15
Typesetting	14
Printing and quality assurance (start)	12
Printing and quality assurance (finish)	8

(*d*) Calling cards, which enable enumerators to inform a household when they will return to collect the completed form (if applicable in a drop-off and pick-up scenario);

(*e*) Non-contact cards, which enable enumerators to let households know they have not been able to contact them and what to do;

(*f*) Enumerator identification cards;

(*g*) Objection or refusal forms for enumerators to report cases of refusal.

(*c*) *Procedural and training items*

This group of items includes the instructions and guidelines that document how the census enumeration will be conducted. The items that may be included in this group include:

(*a*) Enumerators' record book;

(*b*) Enumerators' handbook (or manual);

(*c*) Enumerator training exercises;

(*d*) Enumerators prompt card, which summarizes procedures in point form for quick reference;

(*e*) Supervisors' handbook (or manual);

(*f*) Supervisors' record (or management) book;

(*g*) Supervisor training exercises;

(*h*) Instructions for training enumerators;

(*i*) Regional managers' and/or deputy regional managers' handbook or management book;

(*j*) Regional managers' and/or deputy regional managers' control book and home study exercise;

(*k*) Special enumeration instructions;

(*l*) Inquiry service instructions.

(*d*) *Administrative items*

This group includes all the forms and letters used in the administration of the census enumeration. It can amount to a large number of individual items, although some may be only a single page or of a relatively small quantity. The list below breaks these items into categories and gives some examples of the type of forms that may be included in each category. The list is not prescriptive or exhaustive, and the items to be included will largely depend on the nature of employment in the country. Categories and examples include:

(*a*) Recruitment and/or appointment:

    (*i*) Application form for enumerator position;

    (*ii*) Application form for supervisor position;

    (*iii*) Interview form;

    (*iv*) Offer of employment form (or contract);

(*b*) Finance and/or taxation:

    (*i*) Advice on payment,

    (*ii*) Taxation forms,

    (*iii*) Other financial forms;

(*c*) Control forms:

    (*i*) Record of attendance at training;

    (*ii*) Record of receipt of materials;

    (*iii*) Record of quality assurance on completed workloads;

    (*iv*) Record of return of materials;

(*d*) Letters and/or notices:

    (*i*) Approach letter to special dwellings;

    (*ii*) Letter to persons objecting or refusing;

(*e*) Labels:

    (*i*) For completed census material;

    (*ii*) For unused census material;

    (*iii*) For administrative material.

4. *Quality assurance*

As stated above, the quality of the printing process can have a large impact on the final quality of the census data. It is therefore important that a quality assurance scheme is devised whereby printing is closely monitored throughout the entire process. This should extend to the checking of proofs and production runs.

The census form is the most important form and therefore should be subject to intensive quality assurance checks in both the proof and the production stages. The other items are normally only subject to intensive constraints in the proof stages and not in the production stage. This reflects the lack of technical requirements for extreme precision of the physical placement of characters in these other items and the high cost of production checks.

(*a*) *Checking of proofs*

As material is developed, it will progress through several proof stages before it is finally typeset for the printing process. At each stage, proofs should be checked and authorized as correct by the project leader responsible for form design. Additional checks by staff not directly involved in the form design process can also prove useful in detecting discrepancies.

In some situations, the final typeset proof used for printing is the responsibility of the printer. In these cases, the typeset version should be checked and approved by the statistical agency before printing commences.

(*b*) *Production runs*

As the printing process progresses, a sample of census forms should be selected for quality assurance checks. Issues such as resources available and the level of problems detected will affect the size of the sample selected, and the sampling strategy.

However, it is important that sufficient resources are allocated to ensure the quality of the printing process. Otherwise, significant costs may be incurred in the processing phase to rectify mistakes resulting from printing errors. If these mistakes cannot be rectified during processing, problems in the final census data may occur.

Sampling rates can be adjusted throughout the printing process, with higher rates at the beginning of the printing. Where the printing technology includes the creation of new printing plates after some proportion of the work has been completed, a higher sampling rate should be employed after each new set of plates is produced. The sample rate can be adjusted downwards if detected problems decrease. However, a sample should be taken over the entire printing process from start to finish. It cannot be assumed that, if the quality is good at the beginning of the print run, this will necessarily continue.

It is also preferable that quality assurance is conducted at the printing plant. This will assist in the early detection of problems. However, agencies should not rely on the printers themselves to conduct all quality assurance checks. Independent checks need to be carried out.

An example of some of the checks that can be made on the forms include:

(*a*) Horizontal and vertical trimming;

(*b*) Positioning or skew of response areas on the actual page;

(*c*) Page numbering and correct order of pages;

(*d*) Colour, including any smudging;

(*e*) Strength of any binding.

Particular attention should be given to any specialized printing requirements that are required for data-capture systems. A final check should be undertaken by processing a sample of forms through these systems to enable a comparison of actual versus expected results.

What Can Go Wrong During The Printing Process?

Printing of questionnaires should be done well in advance. In one of the African countries, the 1990 census printing of questionnaires was a big bottleneck, which almost threatened the successful completion of the exercise. The government printer was responsible for printing questionnaires. All along assurances were given that the printing would be completed before the start of the enumeration period. At the last minute it was realized that it was not possible for the government printer to print the required number of questionnaires by the enumeration date.

This constraint was so serious that if it was not promptly addressed the whole census program could have been derailed. Other small printers, in addition to the Government printer, were used in printing questionnaires. The printing continued while enumerators were in the field. As a consequence of this problem, printing was done round the clock and in a hurry: therefore in some cases quality was compromised. The questionnaire was bulky with varying sizes of inserts. Inclusion of a supplement questionnaire on basic agriculture contributed to the delay in the production of final questionnaires. As a result of the printing constraint:

- enumeration work was extended for some days in some areas;
- printing costs increased due to the overtime costs associated with the use of private printing presses;
- transport costs increased because vehicles were sent from various provinces to collect printed questionnaires, in small batches, from the capital city where most of the printing was undertaken.

III. FIELD OPERATIONS

A. PUBLICITY

1. *Introduction*

The reason why an effective publicity campaign in a census is essential is because it contributes to the overall success of the census. By increasing public understanding of the purposes of the census, response rates will be improved and higher-quality data will be achieved.

The publicity strategy also needs to be closely allied with collection processes. Important messages about when and how the census is going to be held, what is expected from the public and how the public can find out more about the census need to be communicated. Public understanding of these aspects of the census will contribute to the smooth conduct of collection operations.

The size and complexity of a publicity campaign will vary according to the conditions in a country and the funds available for such campaigns. The costs of a publicity campaign are often overlooked in census planning and it is important that sufficient resources are included in the census budget to ensure a quality outcome.

Even though the publicity campaigns may vary among countries, the objectives, scope, and planning needs of a good publicity campaign remain standard for all censuses.

The planning of effective communication to mass audiences needs to take into account all of the potential issues that might affect the interaction between a census agency and its respondents. Such planning is not easy nor can it be undertaken at the last minute. Therefore to deliver successful outcomes the publicity issues need careful consideration in the context of overall census planning. It is essential that publicity planning has census agency management support, and be seen by the census agency staff and external audiences to have such support.

It is highly recommended that census agencies use professional communications personnel to plan and implement their publicity campaign. The benefits of this approach are that it ensures that the campaign is professional and attuned to the needs of the census agency. This also allows census management to concentrate on the core business of conducting the census. In the early stages of planning, key communications managers from within the census agency (where these exist) could be assigned to the census or external advisers appointed.

Agencies may also find that the census publicity campaign can be a natural extension of any ongoing publicity programmes that are already in place with their respondent and user communities. The advantage of using an ongoing publicity campaign is that it will have developed links with the media and provide a valuable profile-raising role for the wider community. This can be drawn upon to better generate widespread awareness of a census.

2. *Developing a publicity strategy*

Before any detailed implementation plans are developed, a strategy for the publicity campaign should be developed. While the situation in each country may vary, the following issues are generally applicable and need to be addressed when developing a publicity campaign:

(*a*) Background;

(*b*) A situation analysis that identifies any particular opportunities or issues that need to be taken into account;

(*c*) A clear statement of the objectives of the publicity task;

(*d*) Definition of the target audiences;

(*e*) Statement of messages that are to be communicated;

(*f*) Ppublicity strategies that will be implemented.

Each of these issues is discussed in the following sections.

(*a*) *Background*

Census agencies may be aware, from formal market research or from their own experience, of public attitudes concerning their census. This background can indicate the most likely opportunities and difficulties to be encountered in communicating with the public about the census. It may also reveal particular economic, political or social information and circumstances that may impact on how a census publicity programme is perceived or acted upon by the general population.

(*b*) *Situation analysis*

Once the communications environment in which the census is to be conducted has been thoroughly understood and documented, a more detailed analysis of the communication opportunities is required. For example, the census agency may be able to use government-operated mass media outlets, or it may need to ensure access to the mass media through paid advertising for effective publicity.

An important part of this analysis is to establish the current opinions of stakeholders about the census. This applies in particular to those stakeholders who are likely to be the target of the publicity campaign.

It is recommended that agencies undertake or commission detailed research, both qualitative and quantitative, into public opinions about and awareness of the census. Good research with honest and frank responses about perceptions of the census will provide a strong guide to the way an overall publicity campaign is framed and conducted. The views and beliefs of community leaders and groups should also be canvassed through appropriate forums, which may range from one-on-one meetings to an extensive process of community consultation.

Changes to the way the census form is worded, the way the census is conducted and processed and how the output is disseminated have the potential to impact on a publicity programme. The impact of these changes on the publicity programme should be considered when such changes are contemplated.

Attention should be paid to understanding the arguments of individuals or groups who do not approve of the census. At best, this will enable the communications process to seek to change their views, admittedly a difficult task for those who disagree on philosophical grounds. At worst, it will result in a better-planned census that is less likely to be the target of negative reaction by individuals or groups from the community.

Issues related to privacy and confidentiality may be equally noted in both developed and developing countries, although cultural differences may affect the specific degree of concern.

As well as this external focus, census agencies should also look inward to the strengths, skills, knowledge and perceptions of their own staff. This process of internal consultation will help to raise awareness of the census and encourage its support within the census agency. The attitude of staff towards the census, and their own individual dedication to a positive outcome, is thus both a management and a communications issue.

Different communication environments will have their own special challenges, although given the scale of census-awareness campaigns, these are not commonly encountered even by the Government. Thus, matters of literacy, ethnicity, politics, geography, access to mass media and influence of particular beliefs will need to be considered.

There is a wide variety of potential issues that can affect a census publicity campaign and identifying them is an important part of the situation analysis. To illustrate, the following issues of importance to members of the public have been identified in some countries:

(*a*) Privacy and confidentiality of information given;

(*b*) Whether the information provided was actually put to good use (see chap. I, sect. A);

(*c*) Cost of the census;

(*d*) Potential use of census information for non-statistical or other inappropriate purposes;

(*e*) Issues raised by lobby groups regarding the inclusion or exclusion of specific topics from the census;

(*f*) Requirement that name and address be included on the census form;

(*g*) Concerns about potential government intrusion into private affairs;

(*h*) Where individuals can find additional information about the census.

(c) *Statement of objectives*

The aim of a publicity campaign is to support the operation of the census and obtain a high quality result through the following measures:

(*a*) Organizing a recruitment campaign for field staff;

(*b*) Getting interested groups involved in census planning and gaining their cooperation;

(c) Organizing an awareness campaign to:

    (*i*) Maximize awareness, of when the census will be carried out;

    (*ii*) Address any issues that need clarification;

    (*iii*) Promote awareness of procedures and ways to get assistance;

    (*iv*) Encourage respondents to cooperate to the best of their ability.

The communications task is to provide timely and appropriate information, reinforce positive perceptions and effectively manage any negative issues. Contingency planning should be undertaken to ensure that management of negative issues is effective.

(d) *Defining target audiences*

While the target audience for a census is the population as a whole, for communication purposes this needs to be further analysed and broken down into relevant audience segments. The final set of segments will reflect any particular communities of people in the population that require a particular focus. Such a list should fully answer the question "To whom do we want to communicate?"

By way of example, a set of audience segments could be the following:

(*a*) The media;

(*b*) Opinion leaders and public figures who can endorse the census;

(*c*) Groups of influential people, e.g., religious leaders, teachers and unions;

(*d*) Speakers of the national language;

(*e*) Speakers of other languages;

(*f*) Groups under-represented in previous censuses;

(*g*) Population groups (e.g., ethnic groups) with special geographical, social, communication or logistical disadvantages;

(*h*) Heads of households, if appropriate;

(*i*) Users of census data;

(*j*) Staff of the census agency.

(*e*) *Statement of messages*

There are likely to be several core messages that census agencies will need to communicate to their different audiences in order to maximize outcomes for the census.

Examples of external messages could be the following:

(*a*) The census is for the good of all because it is the best way to plan for the future;

(*b*) Filling in the form is a patriotic duty of citizens;

(*c*) The census agency has a human face;

(*d*) Census enumerators will call at households at certain times;

(*e*) Assistance is available for those having difficulty filling in their form;

(*f*) Privacy and confidentiality will be honoured;

(*g*) The census date and duration of the enumeration period;

(*h*) Cooperation is mandatory;

(*i*) There are penalties for enumerators or other staff who misuse information.

(*f*) *Publicity strategies*

Strategies to achieve the publicity objectives should seek to make the census an event of national importance and a topic of public interest and debate.

Suitable broad strategies could include the following:

(*a*) Recruiting temporary field staff through advertising;

(*b*) Staging of extensive media events to mark the beginning of the census campaign (i.e. a formal launch of the campaign), followed up by the issuance of a range of media releases and background material for use by the media for the duration of the enumeration period;

(*c*) Building awareness through:

  (*i*) Effective media advertising,

 (*ii*) Active media programmes of information dissemination.

(*d*) Building support through third-party endorsements;

(*e*) Being proactive in public debates about the census and associated issues;

(*f*) Developing specific campaigns for each target audience, as defined above in section (*d*);

(*g*) Training census agency staff to act as media spokespersons;

(*h*) Developing lists of expected questions and standard model answers on key issues;

(*i*) Monitoring the public debate and media coverage.

A range of implementation strategies will be needed to put these broad publicity strategies into practice; these are discussed in the section below.

3. *Implementing a publicity strategy*

Implementation strategies, or tactics, will depend very much on the characteristics of a country's cultural, social, administrative and mass media. The following examples are offered as models of the implementation strategies that can be developed. Countries will need to adapt them based on their own particular circumstances.

An important point to note is that the publicity strategy can be divided into different stages and should reach a peak just before census enumeration.

(*a*) *Census agency staff*

(*i*) *Permanent staff*

Staff of the census agency should be regularly briefed on publicity activities and given previews of advertisements and other material before they are distributed. From a communications point of view, invitations to such briefings could also be extended to the families of staff members.

Where a staff newspaper exists, it should include regular articles about the census, concentrating on staff involved with particular tasks. A staff video service, either broadcast or by way of video cassettes, could be used to supplement other contact.

(*ii*) *Field operations workforce*

The field operations workforce may first encounter the publicity campaign through the recruitment messages used to attract them to the workforce.

After recruitment, the field staff should be given background on the publicity campaign so that they are aware of the communications environment that will impact on their work in cases where the supervisor may be involved in distributing some of the publicity or in being a part of it.

It is important that the filed staff be given instructions on the procedures for handling requests for media interviews. It is suggested that the communications manager clear all such requests.

(*b*) *General external audiences*

There will be many opportunities for publicizing the census to external audiences that are specific to each country. It is not possible to be prescriptive about these opportunities in view of the wide range of possibilities. Each opportunity

Publicity strategies for the 1997 census in the West Bank and Gaza

For the 1997 census in the West Bank and Gaza, the Palestinian Central Bureau of Statistics employed various publicity strategies, including the following:

- Newsletters were issued on a regular basis every month for about two years before the census. The audience of the newsletters included the statistical bureau staff, governmental and non-governmental organizations and the media.

- One publicity coordinator was recruited for each governate and regional publicity committees were formed. A central publicity committee was established to oversee the implementation of the publicity campaign;.

- A magazine entitled *Census and Society* was issued on a regular basis during the census fieldwork implementation. The magazine was issued for three months with a volume of 100,000 copies;

- There was a circulation of leaflets on census activities. The contents of the leaflets as well as their circulation were depended on the census fieldwork stage;

- A publicity campaign was carried out in schools in coordination with the Ministry of Education. Pens carrying the census logo and slogans were distributed. Census information was provided daily school line-ups and the distribution on schools of weekly timetables;

- The census Web site contained news About census activities, press releases, presidential decrees and other census related information in Arabic and English, as well as a census countdown on the Internet;.

- National as well as local media stations were involved in the census publicity campaign. There were a series of talk shows on the census or national and local networks. Posters, pamphlets, and comic books were used, as well as sketches on census fieldwork activities. A census contest entitled "How many are we?" was organized for estimating the total number of population in the census, with special prizes for winners. The statistical bureau organized a soccer contest, the Census Cup. The census questionnaire was explained on television. The publicity campaign also used mosques, churches, schools and universities to promote census cooperation;

- A census logo was selected two years before the census through a national contest. The census logo was printed on all census products. The census logo appealed on water, electricity, and telephone bills. Census stamps were printed the census logo in post offices in Gaza and the West Bank.

Source: Palestinian Central Bureau of Statistics.

should be examined carefully to ensure that it is aligned with the message the overall publicity campaign is trying to convey and is utilized where it has a positive cost benefit. Publicity for external audiences should be greatest just prior to and during the enumeration activity. Some examples of key tactics for general audiences can include the following:

(*a*) An information booklet;

(*b*) Media advertising;

(*c*) Community service announcements;

(*d*) Provision of speakers to the media and the community;

(*e*) Posters and comic books;

(*f*) Developing a census logo and slogan;

(*g*) Influencing key members of target audiences.

Each of these tactics is discussed below.

(*i*) *Information booklet*

A booklet can be prepared to explain the purposes of the census to householders and provide other messages as required by the census agency. Such an approach will be more useful in a self-enumeration approach, since interviewers will explain these details as part of their approach.

(*ii*) *Media advertising*

Advertisements can be paid for and placed in all forms of mass media, including newspapers, radio and television. The amount of resources devoted to each medium, and the details of placement of the advertisements (dates of, and positioning relative to other elements of the medium), should be selected carefully on the basis of advice from communication professionals within the country.

Advertisements should be professionally designed and include some audience testing research to ensure the correct message is being transmitted.

(*iii*) *Community service announcements*

In some cases, media interests will recognize the value of the census to the country and supplement paid advertising by free announcements. These could include the following:

(*a*) Statements by media staff;

(*b*) Use of interesting stories about the census during news bulletins and the like;

(*c*) Incorporating a census story in regular programming, such as serials.

Access to these opportunities will be greatly facilitated by the use of media releases to keep editors and journalists up to date on what is happening in the census. By cooperating with the media in this way it is more likely that they will cooperate with the census agency.

(*iv*) *Provision of speakers to the media and the community*

It is important to identify a set of people from within the census agency, or other government ministries, with good presentational skills to help promote census and associated issues through media presentations and interviews. Specific training sessions should be offered to develop and use responses to census issues.

To ensure that a consistent picture is provided by the spokespersons, they should be given a set of standard answers to expected questions.

(*v*) *Posters, and comic books*

In many countries, wall posters and comic books are commonly used as a method of communicating a range of social and general interest messages to the public. Where this is a common practice, this medium could be very effective in communicating the census message.

A supply of posters could be issued to regional managers and/or supervisors for placement in suitable locations in their areas.

(*vi*) *Developing a census logo and slogan*

Many countries have successfully developed a census logo and slogan. A simple but effective slogan and distinct logo can be developed and used in all national and local advertising campaigns and in all types of media (e.g., television, radio, newspapers and posters).

The slogan can concentrate on explaining why the census is important for the country and why it is important that everyone participates in respect to planning for the future. Examples of simple slogans that have been used include "Everyone counts for the census", "Census 2000: helping to build our future", and "Count us in" was widely used during the South African census of 1996.

(*vii*) *Influencing key members of community audiences*

These tactics cover ways in which influential people can be shown the benefits of the census in order to gain their support of the census. They can then encourage other members of their group to also support the census. Examples of influential people could include the following:

(*a*) Politicians (including national and local government politicians);

(*b*) Village heads or local community leaders;

(*c*) Religious leaders;

(*d*) Media commentators;

(*e*) Senior bureaucrats;

(*f*) Industry leaders.

Publicity strategies for the 1999 census in Kyrgyzstan

During the Kyrgyzstan census of 1999, the publicity strategy employed was an active information campaign using posters, publicity, and television, as well as organizing a prize lottery among census participants. The prize lottery encouraged large numbers of people to participate in the census. The lottery helped in achieving the main goal of the census – to secure practically complete coverage of the population. The mayor of Bishkek and the Government of Switzerland provided support for the lottery

The lottery, with a first prize of a studio apartment, was conducted in July 1999. There were a total of 450 prizes. The Government plans to have one more lottery based on questionnaires at the end of 1999, just after the capture of the census data.

Public support for the census, namely, by President A. A. Akayev and other prominent persons of the country, was important in the understanding of the census as a national undertaking by local administrations, statisticians and the many enumerators and census staff involved.

The clergy also provided their support in the census publicity campaign. Moreover, many mosques provided their premises for the work of the census teams.

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Source: National Statistical Committee of the Kyrgyzstan, August 1999.

The last two groups in particular should be encouraged to provide examples of the ways in which their groups have used the results of previous censuses for the benefit of the community. The overall tactic with influential people is to convince them to endorse the census by talking about it and helping it become part of community discussion. Inviting them to openings and census events and providing briefing material are useful ways to keep them involved.

It may also be possible to seek endorsement from popular figures not included in the above groups such as sports figures or popular entertainers. It should be noted, however, that such personalities may not be universally popular (for example, a football player may not be liked by the supporters of rival clubs) or they may not be seen as authoritative (e.g., what does a singer know about the census?). As with other aspects of the publicity campaign, professional advice should be sought on the implications of selecting such personalities.

(*c*) *Specific audience tactics*

There may be specific audiences that require particular attention, and different tactics, when implementing the publicity campaign. Examples of these audiences may include:

(*a*) Different ethnic groups within the community;

(*b*) People travelling within the country on census day;

(*c*) Overseas visitors;

(*d*) The homeless.

The differing cultural backgrounds of some ethnic groups within the community may require different tactics to ensure that the messages are communicated effectively to members of such groups. Persuading the leaders of these groups that the results of the census is important (i.e., relevant) to these groups is often an effective strategy since the leaders will influence other members of the group.

Directing communications through groups within these communities and placing advertisements and editorial commentary in specialized media outlets (e.g., ethnic newspapers) are also effective means of communicating with these groups. Other means could include distributing pamphlets and information sheets in the different languages of these ethnic groups.

People who are travelling on census day are frequently difficult to contact. This can be overcome by arranging for enumerators to contact passengers as they disembark from planes, buses, trains and ferries.

In many cases, there is doubt in the minds of people who have recently arrived from overseas about their participation in a census. Such doubts can be overcome by using announcements on international flights close to census day to explain the census to these people. This opportunity can also be used to communicate with residents of the country returning from overseas who might otherwise not be influenced by the publicity campaign. Information pamphlets in different languages can also be distributed to hotels and motels.

It is possible to focus on events for specific groups who may not be contacted by other means. A number of countries use the availability of subsidized food outlets to contact people without a fixed address. This could be a soup kitchen operated by charitable groups or a special event (e.g., a breakfast for homeless people on census day).

(*d*) *Schools*

Schools can provide a good opportunity for getting the message into a large number of households by providing the teachers with resource material to enable them to give a class on the census close to census day. The objective of such an exercise is to provide the message to the children so that they can pass it on to their parents, who will be responsible for completing the form or giving the interview.

A key issue with such endeavours is that the material must be provided at the correct time of year so that teachers are able to incorporate the material into their planning.

Lower primary school-age children may not relate well to census concepts, and efforts could be better focused on upper primary or secondary students.

4. *Publicity support services*

To support field operations, many countries have established publicity support services to assist in publicizing the census and provide assistance to the public. The implementation of such services will largely depend on the infrastructure available within the country. While the examples given below may not have been applicable to many developing countries in the past, they are now rapidly becoming viable in a number of countries. Two examples of such services are:

(*a*) Establishing a census Web page on the census agency's Internet site;

(*b*) Providing a telephone-based inquiry service.

(*a*) *Internet*

The numbers of people accessing the Internet has increased dramatically in recent years. While the largest increase has been in developed countries the number of people now accessing the Internet in developing countries is increasing rapidly and will further increase in the coming years.

Agencies that develop their own web page can use this to publicize the census. All material that is included in other forms of advertising can be placed on the web page. Commonly asked questions about the census and answers can also be placed on the web page. These can be updated continuously as the census agency become aware of issues raised by the public.

(*b*) *Telephone inquiry service*

The telephone inquiry service provides a system whereby members of the public can obtain assistance with particular questions on the census form, ask questions about the census or report issues in the field. This service is often referred to as a hotline. The service must communicate the same messages as the overall census communication campaign; therefore, it is appropriate to include it in this chapter.

Where necessary, assistance should be available to callers in all the languages commonly spoken in the country. This may require the assistance of telephone-based interpreters. The hotline service may also provide assistance to speech- and hearing-impaired members of the public by the use of fax and touch-telephone facilities.

Where matters raised over the hotline require action by enumeration staff (for example, a household has not been enumerated several days after census day), the hotline staff may interact with other communications procedures to raise these matters with appropriate field staff.

The hotline facility is less important where an interview approach is used, since the interviewer should be able to answer many of the questions about the census form and procedures. In addition, the interview process has clear limits regarding the involvement of the householder, while a self-enumeration approach may raise questions about the timing of visits by the collector and the responsibilities of the householder. However, all countries should consider providing a hotline service as a support mechanism.

People who are familiar with telephone services will not hesitate to use the facilities to seek information. This can lead to a considerable demand for the service and it is unlikely that the census agency will have the expertise to provide the necessary services in-house. The assistance of the country's telephone service providers will be essential to provide the service. This could take the form of a formal contract outsourcing the service.

Publicity strategies for the 1990 census in Zambia

Zambia's publicity campaign exercises, for the population and housing census, were conducted at both the provincial and district levels. The Zambian census was conducted in August 1990. However, the census publicity campaigns were launched as early as January 1990. Zambia has nine provinces and 57 districts. The one-day workshops carried out in each of the districts were de signed to create awareness among senior government officials and traditional and opinion leaders. In addition, the workshops were organized to brief the participants on the planned organization and conduct of the census and to form a basis for formulating more effective publicity campaigns within each d istrict to ensure maximum cooperation from members of the general public during enumeration.

Apart from workshops, radio and television programme were used to explain the objectives of the census. A number of posters were produced and distributed to all parts of the country. Government personnel, village headmen, chiefs and teachers were used as communication agents to distribute census publicity materials. The Ministry of Information and Broadcasting assisted in the publicity campaign, together with the entire Zambia mass media system. Ministry officials helped in translating census radio programmes in various languages for broadcasting. The television programmes were mo stly in English. These broadcasts were put on the air several times a day.

The President of Zambia launched the census by addressing the country and explaining the importance of the exercise. He urged people to cooperate with census officials. T-shirts marked 1990 census were distributed at workshops and issued to census officials as part of the publicity campaign.

Census materials, including T-shirts, car stickers, calendars and badges were used to promote the census. Radio and television interviews were held on a regular basis by the Director of the Census to answer questions and clarify issues related to the census operation

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Source: Statistical Division of United Nations Secretariat.

(*i*) *Strategies*

The hotline can be either centralized or decentralized. The advantages of a centralized hotline are the following:

(*a*) Provides a higher probability of standard responses to callers;

(*b*) Provides economies of scale to a potentially large undertaking;

(*c*) Releases regional management staff from the burden of administering and managing a hotline;

(*d*) Offers more efficient and effective training of operators.

The benefits of a decentralized hotline are the following:

(*a*) The network demand is spread over a greater number of sites, reducing the likelihood of localized system overload;

(*b*) The operators are more likely to be able to respond to issues specific to a locality.

The disadvantages of each approach are the opposite of the advantages of the other. While each country should make a judgement about the balance of views, it is suggested that the benefits of standard answers to questions and economies of scale are important arguments for centralizing the process.

As with all other aspects of the census, this element of the undertaking should be subject to testing. In particular, it should be subject to load testing to ensure that the telecommunications system can operate under the estimated peak loads. To the extent possible, this testing should simulate the types of queries raised in the census and come from all regions of the country.

Where a hotline service is offered, it should generally be widely advertised. It is thus the responsibility of the census agency to ensure that as far as possible all calls are answered. An important fall-back option is to have the capacity to add extra sites to the hotline where the demand is too high for the established sites.

It may be possible to provide this emergency service by diverting a proportion of calls to the permanent offices of the census agency. Such outcomes are not desirable as they will impact on other work in the census agency and require the use of untrained staff, thus negating a key benefit of the centralized approach.

The hotline should operate for the entire period that enumerators are on duty, and preferably for a few days afterwards (since a number of calls towards the end of the period will concern non-contact by enumerators). In a self-enumeration census, many people will complete the census form in the evening. It is therefore important that the hotline is open at that time to answer questions at the time they are being raised. Different time zones within a country also need to be taken into account.

(*ii*) *Staffing and training*

It is necessary to have sufficient staff engaged, either by the census agency or by the contractor, to meet the anticipated demand, and to have some reserves trained to assist in dealing with unexpected peak demands.

The majority of staff will be temporary employees who will provide standard answers to the most common questions expected to be asked. These will cover matters such as the meaning of the questions on the form and simple procedural matters (for example, When will the enumerator be arriving at our dwelling?). While the answers to most questions handled by the staff will be straightforward, the ability to deliver these answers in an efficient and polite manner is an acquired skill. Where possible, it is desirable to use staff who have experience from other hotlines or telemarketing campaigns.

There will also be a number of difficult calls involving either more concerned or aggressive callers or more complex topics. The census agency should provide expert staff to answer such calls, regardless of whether the Hotline is undertaken by the agency or outsourced.

Training provided to hotline operators should cover (a) basic conditions of work and telephone techniques and (b) census knowledge and specific inquiries.

Hands-on training prior to logging in for the operator's initial shift can be considered a useful approach. It would allow the reinforcement of techniques and the transmitting of news about recent developments in the census.

(*c*) *Managing demand*

Managing the demand on the hotline is a primary consideration that needs to be looked at when designing the hotline for a census. In most countries, it will not be logistically possible for any call centre, regardless of how well resourced and planned, to cope with the huge number of calls that may be received if the census becomes a topic of major public debate. The task is to manage the demand on the hotline in the first instance.

Some specific recommendations for reducing demand are the following:

(*a*) The information booklet should contain straightforward and convincing answers for householders who are concerned about the compulsory nature of the census, confidentiality and privacy;

(*b*) The information booklet should include standard responses to queries about common procedural matters, such as dates of the collection period and what response should be given by people who are away from home on census night;

(*c*) The preceding topics should also be explained in the general census publicity and be further reinforced by the enumerator at delivery.

The hotline can be an essential component of census operations and provide an important service to the public. It can also play an important role in assuring the public of the need for the census and that confidentiality and privacy are assured.

5. *Budget*

The budget for the publicity campaign will vary with each campaign.

Important factors to consider include the frequency of the census, the quantity and quality of publicity by the census agency between censuses, resources that can be called upon at subsidized rates (for example government-owned media outlets) and the size of the population.

Investment in good communication can have a real impact on the quality of data from the census. It is important to recognize this when setting the draft budget. It is suggested that the determination of the final budget is best undertaken after early planning has been done (including initial market research), as there will then be a better basis on which to seek endorsement from census agency management. This additional information will also be of value in setting broad parameters for briefing advertising and/or communications agencies.

6. *Evaluation*

It is recommended that agencies see the evaluation of a publicity campaign as a continuous process from the beginning of the campaign leading up to an overall evaluation.

A suggested basis of a good publicity evaluation approach is as follows:

(*a*) To have established objectives that are measurable;

(*b*) To measure the media exposure;

(*c*) To measure its impact on the intended audience.

Measuring media exposure could include indicators such as total coverage or broadcast time given to the messages. Measuring the impact would include the ability to track swings in public awareness (positive, negative or neutral), its relativity to the message being communicated, and the ratio of audience reach to frequency of the message.

Internal feedback, especially that noted or received by the communications unit and by field staff, is also useful.

Continuous evaluation and modification during the census enumeration process through tracking research and dynamic management will ensure that implementation of the publicity campaign is on the right track. To permit this to occur, flexible implementation tactics are essential in order to maximize outcomes.

In setting up systems to evaluate communications efforts, it is appropriate to take a long-term view and ensure that measurement of awareness can continue throughout the intercensal period, and that the methodology is such that comparison between censuses is possible.

The results of this detailed evaluation of the publicity campaign need to be considered as part of the overall census evaluation, and judgements made about what can be improved in the future. Evaluation of the publicity campaign must be seen as credible if its vital role in a successful census is to be appreciated and understood.

B. Recruitment and Remuneration

1. *Introduction*

In some countries, hundreds of thousands of staff spread, over wide and varying geographic areas, are required for field operations. The majority of these staff are only required for the relatively short enumeration period (e.g., three weeks) and therefore their relationship with the census agency is, at best, tenuous. In some countries, these staff may be recruited from the general public, while in others, existing staff from other government ministries (e.g., teachers) may be used.

The principal objectives of the recruitment exercise should be to recruit staff who are capable of undertaking the duties of the various positions and in sufficient numbers for all geographic areas.

The quality of the recruitment campaign will directly affect the quality of the data to be collected and, therefore, the success of the census. While a good recruitment campaign will not by itself necessarily guarantee a successful census, a badly conducted campaign will inevitably lead to problems and increase the risk of an unsuccessful census.

The amount of remuneration paid to field staff has a direct effect on the recruitment campaign. Staff need to be assured that payment is fair and equitable in comparison with market rates for broadly similar tasks in other jobs and is compatible with the amount, and difficulty, of the work they will undertake.

If this is not the case, difficulties will arise in recruiting sufficient numbers of quality staff.

In some countries, where existing staff from other government ministries are used, they are paid per diem costs. Again, these payments must be fair and equitable to allow the staff to perform their duties to the best of their abilities.

2. *Recruitment*

By the time the recruitment campaign is considered, the structure and ratio of staff in the various levels of the field operations hierarchy will have been established (see chap. II, sect. B, on structure of the workforce).

The other major force impacting on the recruitment campaign is the basis of enumeration. This has been discussed in chapter II, section A on establishing the basis of enumeration.

(*a*) *Determining the number of field staff*

The first step in the recruitment campaign is to determine the number of field staff required. This can be done by adopting a bottom-up approach. This means starting at the lowest level (usually the enumerator) and first establishing the number of these staff required. Workload statistics can then be applied to derive the number of supervisors required. This can then be repeated for all levels in the management hierarchy.

(*i*) *Number of enumerators*

The number of enumerators required will depend on the length of the enumeration period. The shorter the enumeration period, the more enumerators will be required. Usually, an enumerator will be responsible for a single enumeration area. Therefore, the total number of enumeration areas in a country can be used as the starting point for estimating the total number of enumerators required. Initial estimates (e.g., those required for developing an initial budget) can be based on the number of enumeration areas in the previous census and possibly adjusted by the rate of population growth. These initial estimates can be updated as the enumeration area design and mapping or household listing processes evolve.

However, while a ratio of one enumerator per enumeration area is a useful starting point, the numbers will need to be adjusted to cater for differential growth in the expected numbers of:

(*a*) Single enumeration areas that require more than one enumerator;

(*b*) Several enumeration areas that may be combined to create a workload for a single enumerator;

(*c*) Population groups that require particular attention and therefore additional or specialist enumerators;

(*d*) Special dwellings in enumeration areas that may require a separate enumerator. These dwellings can include hospitals, hotels, defence force barracks, or prisons;

(*e*) Reserve staff who can be used as replacements for staff not able to complete their duties.

As stated above, it is, by definition, normal for one enumerator to be responsible for one enumeration area. However, this will largely depend on the enumeration area design process (see chap. II, sect. C). One enumerator per enumeration area is possible if the area is designed to meet a standard degree of effort or workload. This standard is expressed as a set amount of time in days and expected number of hours worked per day. It may be based on some or all of the following:

(*a*) An existing standard developed by the country;

(*b*) The duration of the enumeration period;

(*c*) A realistic assessment of staff availability by day over the duration of enumeration, considering:

   (*i*)   Travel time to and from the area;

   (*ii*) Hours of daylight;

   (*iii*) The standard working day;

   (*iv*) Expected limitations on enumerator availability, for example, if the average enumerator will only be available on a part-time basis because he or she is working in another job;

   (*v*)   Some margin for contingencies, considering abnormal circumstances.

To test each enumeration area against this standard, the following issues may need to be considered:

(*a*) Total number of households in the enumeration area;

(*b*) Time estimated per household;

(*c*) Characteristics that may make enumeration more difficult, including low population density, remote areas and difficult terrain. This criterion may be best expressed as a weighting, according to which time per household is increased or decreased.

Ideally, the standard is applied to each enumeration area during the design process, well before enumeration. However, workloads may need to be adjusted in the field in the following ways:

(*a*) By treating several enumeration areas as one workload (i.e. they can be enumerated by one person) if they are well below the standard;

(*b*) By treating one enumeration area as two or more workloads (i.e., they require more than one enumerator) if it is well above the standard. Ideally, this should be a rare event.

(*ii*) *The number of supervisors, regional managers and deputy regional managers*

After the number of enumerators has been established, it is possible to work up the managerial hierarchy, level by level, to establish the numbers of supervisors and managers. The ratio of enumerators to supervisors is discussed in more detail in chapter III, section B on structure of the workforce.

The principles used in determining the required number of these positions are the same for all of the supervisory and management levels. To begin with, a standard based on the number of employees to be supervised or managed must be decided. This standard will depend on the following:

(*a*) Any existing standard;

(*b*) The amount of face-to-face time required with subordinates;

(*c*) Travel time, which itself is often correlated with the size of the area of responsibility;

(*d*) Estimated time required to be spent on tasks not related to staff supervision and management;

(*e*) Amount of time available to undertake this work.

It is preferable that this benchmark be decided by the census agency and adapted in the field (with advice from the census agency where necessary) where local circumstances such as the following exist:

(*a*) The population density of the area may increase the distance that needs to be travelled;

(*b*) The characteristics of the area may make enumeration more difficult and therefore require a greater level of managerial or supervisory support of enumeration staff.

(*iii*) *The number of reserve staff*

Experience has shown that staff at any level in the field workforce may not complete their duties during the conduct of enumeration owing to a variety of reasons. These could include the following:

(*a*) Availability of better employment;

(*b*) Sickness;

(*c*) Staff dissatisfaction with the duties they are undertaking;

(*d*) The census agency terminating their employment owing to poor performance.

Also, if there is a long lag time between the recruitment campaign and the actual enumeration period, some staff may not begin their duties because they have found alternate employment or have lost interest in the job.

In these situations, it is necessary to consider, and be ready to implement, strategies on how the workload can be completed without reducing quality standards. Whatever strategy is adopted, it must be able to be implemented quickly and efficiently. Strategies that may be considered are the following:

(*a*) Utilizing a pool of reserve staff that have already been trained;

(*b*) The workload being taken over by other workers of the same level who have completed their workload or are able to accept further demands;

(*c*) The workload being taken over by other workers at a higher level;

(*d*) Promoting staff to a higher level (e.g., promoting an enumerator to a supervisor's position).

The appointment of a suitable number of trained reserves is a key strategy that will reduce delays in the critical time of enumeration. The enumeration period is short and reserves need to be available, and able to be placed, in the field in a short period of time.

Reserves could attend the same training session as the staff they may replace. The appointment of reserves will involve extra payment, since they will usually be paid a retainer of some type, regardless of whether they undertake any actual work. The number of such staff needs to be decided in terms of cost and the work done to date. However, an important message is that reserves will be needed to cater for the inevitable shortfalls that will occur in the field.

In larger geographic areas, the appointment of more reserves will reduce the possibility of one reserve having to undertake a large amount of travel (e.g., from his or her home to the area where assistance is required).

An open and informative recruitment process is regarded as the key to reducing the frequency of resignations by census field staff owing to job dissatisfaction. It is essential to provide applicants for census positions with accurate statements of the duties to be undertaken, amount of workload, remuneration and quality expectations.

(*b*) *Recruitment campaign*

In general, the vast majority of positions in field operations will be filled by members of the public who are recruited through a recruitment campaign. However, some positions may be filled by people from special groups (e.g., schoolteachers or heads of villages) through direct appointment.

There are four important issues to consider with respect to the recruitment campaign. These are the following:

(*a*) The timetable for the campaign;

(*b*) The type of campaign;

(*c*) Publicity;

(*d*) Government regulations.

(*i*) *Timetable*

As noted above, an important issue when recruiting staff is to recruit them as close as possible to the date when they will commence work. However, recruitment cannot commence too late as this may leave insufficient time to undertake additional recruitment campaigns in areas where there may be a shortfall in applicants.

The recruitment campaign can be conducted separately or conjointly for each level of staff. However, selection within field operations normally works on a cascade principle, that is, where each level in the field staff hierarchy is responsible for recruiting the next level down. Issues to be considered include the following:

(*a*) Employment commencement dates, which may differ for each level of staff;

(*b*) Capacity required to process a large number of applications at one time rather than processing smaller groups of applications over a period of time;

(*c*) Adoption of a joint process, which can be universal or only apply to various components of the recruitment campaign (e.g., advertising, distribution and processing of applications). Joint processes may lead to efficiency savings;

(*d*) Desirability of attracting applicants of appropriate quality to each level in the management hierarchy. If joint advertising is used for all levels, a greater proportion of applicants are likely to apply for every position.

(*ii*) *Type of campaign*

Government agencies may have established networks of both permanent and temporary workers who could be approached to support the census. In some countries, it may be possible to use existing social, as opposed to employment, networks to attract prospective employees.

These staff may be possible applicants for field operation positions in which case advertising should be placed in the relevant media and/or key members of the network approached for assistance.

If government staff are not available for census duties, they may be able to assist by including census advertising in any internal media such as newsletters and staff bulletins. This may attract current staff who are able to undertake census duties when they are off duty from their usual position. Other government agencies such as post offices, electoral offices and local government bodies may also be prepared to display and distribute recruitment materials (e.g., posters and pamphlets).

In the early stages of planning the recruitment campaign, the census agency will need to identify which government agencies can be of assistance. A proactive approach can then be made to these agencies to obtain their support for census activities.

Community groups or institutions provide an opportunity to disseminate the recruitment campaign among groups that do not normally access the mainstream media. Posters and information about field positions can be distributed to such places as community centres, libraries, universities, schools, neighbourhood groups and sporting clubs. The use of community groups can be particularly effective in remote areas.

(iii) *Publicity*

Publicity is necessary for the recruitment campaign. Section A above outlines publicity elements that can be adopted.

An important point is that the publicity should be organized and targeted towards potential applicants. Assumptions need to be made about the type of people that will comprise the majority of applicants, for example, unemployed persons, university students or homemakers. This will dictate which media are used and the methods of publicity.

There may be some regions in the country where there will be a possibility of a shortage of applicants. These may be identified through previous experience in organizing statistical collections in such areas or be based on local knowledge. Additional publicity should be organized as part of the initial campaign in these regions and it is important that they are dealt with proactively as time is crucial in this part of the census cycle. Remote areas may fall into this category and special attention should be given to utilizing community networks that exist in these areas.

(iv) *Government regulations*

In some countries, government regulations may prescribe the methods that may be used for the recruitment of staff and these will need to be taken into account. In some cases, these regulations may not have been designed to cater for the recruitment of the large numbers of staff needed for the enumeration activity. In these cases, the census agency should negotiate with the appropriate government agencies to gain approval for the most efficient practices to be used.

(c) *Selecting staff*

The selection methodology should allow for large numbers of staff to be selected efficiently and to appoint the best quality staff from those available. In some areas, there may be an excess of applicants when compared to the number of available positions. A methodology to select the best staff can comprise the following:

(a) Using standard application forms;

(b) Distributing selection criteria and other information about the positions to applicants;

(c) Assessing the applications and shortlisting, if required;

(d) Conducting interviews.

(i) *Standard application forms*

Using standard forms, which all applicants must use, makes the task of comparing the applicants much easier and more efficient.

(ii) *Selection criteria*

The selection criteria should list the most significant qualities, attributes or experience that an applicant should possess to successfully undertake the position. These criteria will vary significantly among countries and each country should develop them based on its own particular circumstances. However, it is important that the selection criteria are documented so that prospective applicants are aware of them and know the criteria against which they are to be measured.

Other information about each position can also be made available to the applicants. Information that can be provided includes the following:

(a) Type of work;

(b) Duties of the position;

(c) Dates showing the period of employment;

(d) Amount of payment and expected payment dates;

(e) Code of conduct expected of staff.

(iii) *Assessment of applications*

Assessment of applicants against the selection criteria may be used to remove, in an efficient way, unsuitable applicants and to rank the remainder in approximate order of suitability. This can be done by scoring each applicant against each of the selection criteria. Any written references from previous employees can also be taken into account when assessing applications.

(iv) *Interviews*

Those applicants who are regarded as suitable can then be interviewed to confirm their suitability for the position. A standard set of questions should be developed and asked of each applicant. Again, each applicant's performance at the interview can be scored.

3. *Remuneration*

Field staff need to be assured that payment will be commensurate with the amount and difficulty of the work they will undertake. The payment schedule also needs to fulfil their expectations and requirements.

If these conditions are met, it is expected that field staff will not be distracted from performing their work by concerns with payment. The converse also applies. If field staff feel unhappy about their pay, especially in contrast with the conditions of employment offered prior to appointment, they will not produce high-quality work, with serious implications for the outcome of the census. Senior staff will also be distracted from quality work, with further serious, adverse impacts on the quality of output.

An efficient payment system will only require a minimum of information flowing from the enumeration activity. This will lessen the administrative load on the supervisory and managerial positions.

The rates of payment and the schedule of payments must be finalized before recruitment commences, as applicants will require this information.

A Computerized System for Remuneration of Census Staff.

(*a*) *Development of a payment system*

Development of a payment system includes determining (*a*) the basis of payment, (*b*) the payment timetable and (*c*) the system design.

(*i*) *Basis of payment*

There are numerous methods for establishing the basis of payment. In general, it should be simple and efficient to administer, clear and understandable to staff, meet public expectations for work of this nature, be precisely documented and allow for variation according to the difficulty of the workload.

Payments can be based on a record of hours worked, an estimate of time per household, or an estimate of time for the entire workload.

There are advantages and disadvantages for each option, as detailed in the table below.

Option A is not recommended for enumerators because of the high supervision overhead associated with it and the widely dispersed nature of field operations. Both options B and C are feasible, or a combination of both is possible. While options B and C require a commitment by staff to a contracted amount, there will be occasions where staff are required or directed to work over and above normal expectations. As a result, the pay system needs to be flexible enough to accommodate such cases. Staff will also need to be flexible enough to recognize that their employment contract is based on an average.

The degree of certainty in option C, for both the employee and the census agency, has considerable benefits. However, for areas of significant change in workload size, the physical amount of work may be so variable as to make this approach unworkable.

Table III.1. Basis of payment options

Basis of Payment	General Application	Advantages	Disadvantages
A. Record of hours worked	For staff under direct supervision. This is not generally the case with field operation staff.	Payment is only made for actual hours worked.	High supervision overhead
B. Estimate of time per household	For staff where the amount of work in the workload is not known until after the contract is completed.	Payment is made for every household enumerated. The budget can be calculated on the basis of number of units, together with growth factors.	Staff cannot be advised of the total remuneration before completion of the contract. Requires a greater degree of administrative effort to process, which delays the date of final payment. Enumerators may be tempted to increase the number of households in their workload.
C. Estimate of time per workload	For staff where the amount of work in the workload can be estimated.	Staff can be advised of the payment before commencement of contract. Administratively simple: requires little information flow from collection process. Timely.	Relies on estimate of workload size being reasonably accurate. Enumerators may not revisit households at which they initially had no contact.
D. Fixed payment	Usually in countries that use staff from other government ministries.	Same as option C above.	Provides no incentives to staff to complete the workload.
E. Fixed payment, plus additional rate based on the number of households above a certain level.	Usually in countries where the amount of work cannot be easily estimated.	More homogeneity in the payment of enumerators.	Staff cannot be advised of the total remuneration before completion of the contract. Requires a greater degree of administrative effort to process, which delays the date of final payment. Enumerators may be tempted to increase the number of households in their workload.

Regional managers (and deputy regional managers) can be paid on the basis of the number of staff under their control, with a weighting for areas of geographic or social complexity. Given that workloads have been designed on this basis, it is highly likely that there will be little variance in payment amounts.

(*ii*) *Timetable*

The payment timetable needs to balance the needs of field staff against the cost of processing payments. Each individual payment has an associated cost and therefore the more frequent the payments the higher the cost to the census agency. Depending on the nature of the payments processing system, these costs could be significant.

The timetable will also be determined by the availability of both personnel and payment data necessary to process payments. Personnel data is an output from the recruitment activity and payment data an output from the enumeration activity. Sufficient time should be allowed for the collection, processing and checking of the data.

In general, total payment should not be made in advance of work performed. If this occurs, staff lose the financial incentive to complete their workload and staff who do not complete their contract may be overpaid. However, in some countries, a small advance payment is made to cover any costs that the field staff may incur while undertaking their duties (e.g., travel expenses).

In some countries, multiple payments are made throughout the enumeration period. In these cases, the payment timetable should be based on conservative estimates of the rate of workload completion, by date, for each level of staff.

The timetable needs to be realistic as it must be guaranteed as deliverable. A late payment will generate hardship for staff who have made personal financial commitments based on their expectations from the payment timetable. It will also impose an extra and unnecessary workload on the census agency because of the many inquiries from staff trying to ascertain when they will be paid. These inquiries can become a major burden on the agency when all attention should be devoted to ensuring the quality of the work being undertaken. If such a situation arises, it is to be expected that the work of the field operation staff will suffer, thus diminishing the quality.

(*iii*) *System design*

Once the basis of payment and the payment timetable have been established, a system to make the payments can be considered. The system can be clerically based, electronic or a combination of both. Factors to consider include the following:

(*a*) Present systems in place in the census agency;

(*b*) Delegation of administrative control of payment;

(*c*) Security;

(*d*) Accountability;

(*e*) Reporting;

(*f*) Government policy on outsourcing;

(*g*) Links to other agencies.

Existing systems in the census agency may be used to pay field staff. However, there will be a significant increase in numbers of staff that will have to be paid during the enumeration period. Therefore, the capacity of existing systems and their ability to handle the increase will need careful testing. Extra resources may need to be allocated to these systems to ensure that they can handle the anticipated load.

The administrative control of payments to staff may be delegated to different levels in the census agency. For example, this delegation may be organized centrally within the census agency or through any regional offices that may exist. Alternatively, this delegation may be given to different levels of staff in the field hierarchy (e.g., regional managers).

There are two aspects to remuneration that must be considered with regard to security:

(*a*) The need for the census agency to ensure that the systems employed are not susceptible to fraud;

(*b*) The need to ensure that funds are accurately transferred to the employees concerned.

Both of these matters will be greatly influenced by the infrastructure and administrative systems applicable within a country. It is therefore not possible to be prescriptive about the ways in which these broad principles are implemented.

Internal controls and audit trails should also be built into the system to ensure accountability. These can assist in minimizing overpayments and ensure that funds are not misappropriated. However, there needs to be a balance regarding accountability. Risks need to be weighed against costs. Too many edits and controls will slow down the system.

The system should be capable of producing standard management reports. These may include:

(*a*) Reports of expenditure by pay, which may be measured against the budget;

(*b*) Future estimated expenditure according to the payments timetable;

(*c*) Other internal reports, which may include staff numbers and average payments by level.

Consideration may also be given to outsourcing the payments system. In many agencies, there may be a lack of expertise and/or infrastructure necessary to establish a payments system.

However, outsourcing should be approached with caution. It is likely that few external providers of such services will have systems established to deal with a system that requires a large number of employees to be recruited, paid and let go within a very short period. It is likely that the external supplier will have to undertake the same systems development exercise as the census agency, but without the ownership of the process held by the census agency. This ownership recognizes the direct link between remuneration and quality of statistics.

The system may also be required to have links to other agencies. For example, these may be required in countries with personal income taxation arrangements. In these cases, discussions should be held with these agencies to ensure that the necessary links are established and tested well before the enumeration period.

As with all census systems, the payment system should be subject to rigorous volume testing before it is implemented into field operations.

C. Field staff training

1. *Introduction*

A high proportion of staff from all levels of the field workforce are usually short-term temporary staff. They generally have limited experience or training in statistical collection activities. It is therefore important that they are given sufficient training to understand the following matters:

(*a*) The importance of their duties;

(*b*) How their efforts fit into overall census goals;

(*c*) Issues such as confidentiality;

(*d*) The way they are expected to undertake those duties.

Providing sufficient training to these staff at the beginning of their relationship with the census is a good step towards enabling them to undertake their duties in an efficient and positive manner. This is a significant step towards achieving a high level of quality in the overall census outcome.

A further benefit of good training is that it will achieve a positive relationship between the field staff and the census agency. This is potentially of great benefit if it increases the proportion of the staff who come forward to undertake census duties in the future. While these staff will still require training, it will be more a refreshment of knowledge or skill enhancement approach than basic skill provision. This will improve the quality of the census through a more cost-efficient operation or a higher level of accuracy in work or both.

In countries that use a short and a long form approach, the training programme for enumerators will need to be split in two. The training programme for the short form can be reduced considerably when compared to the training programme for the long form. The best enumerators should be used in those areas selected for the long form.

In the present chapter the training programme that is discussed relates to the field operations staff (i.e., managers, supervisors and enumerators). However, countries should also note that additional groups of people may need to undergo training on the census. These groups can include regional government administrators and/or village heads who may be involved in the coordination of census logistics in their particular areas of responsibility. These groups of people do not necessarily need to know all of the technical details associated with enumeration. However, they should be given a short training course so that they are familiar with the census framework and the responsibilities of staff working on the census, and an overall appreciation of the operations that will occur in their areas.

2. *Training programmes*

The training is directly related to the procedural aspects of undertaking a specialized operation. Therefore, it is usually impractical to outsource the delivery of the training. However, it may be desirable to utilize professional trainers in developing the training materials and providing advice on training strategies.

In the present section the methods described are a recommended training regimen for the temporary staff, engaged on operational tasks directly related to the field aspects of enumeration. However, it is likely that many of the staff of the census agency engaged in managing the operational staff will themselves be relatively inexperienced in census work. It is therefore essential that they be given sufficient training to equip them for this work.

In many countries, key participants (e.g., regional managers and census agency staff) are brought together at the start of the field operations some months before census day. This is a cost-effective way of passing on the necessary information and providing a good basis for team building among the staff. The duration of such a workshop is a matter of judgement by the census agency, taking into account such factors as:

(*a*) The nature of the staff who have been engaged;

(*b*) Their experience in census-related activities;

(*c*) The degree of change in processes since the previous census;

(*d*) The amount of time and other resources available.

Training should be delivered as close as possible to the time at which it is to be used. This applies to the field operation phase of the census as well as to other aspects of the cycle. In the field operation phase, this can be particularly difficult. This is because there are usually large numbers of staff to be trained, over a large geographic area, in a short period of time (typically three or four weeks).

The training should aim at equipping more senior staff with a high level of understanding of their role and the nature and relevance of the census. This should result in a higher level of understanding by those in lower positions. It is therefore important that the more senior staff are well trained, with particular focus on understanding the importance of their duties and how they contribute to the overall census goals.

3. *Trainers*

An effective way of undertaking training is to follow a cascade principle, where each level in the staffing hierarchy trains the level immediately below it. Using this principle, the regional managers are trained by staff from the census agency; the regional managers then train the deputy regional managers, who in turn train the district managers, who train supervisors, who train the enumerators.

A further consequence of this cascading approach is that each layer in the hierarchy must receive some training in how to train the next level down. Where possible, the importance of this training function should be emphasized in the selection of staff, in the census agency as well as the more senior field staff. It is recommended that the the number of layers in the training cascade be as short as possible.

Another method employs master trainers who are responsible for training staff in particular geographic regions. These trainers would initially undergo training (often referred to as training the trainers) in the census agency. They are then responsible for training staff in a particular geographic region. However, while these trainers can undertake some face-to-face training and coordinate training in their regions, it is unlikely that they will be able to train all staff. Therefore, some field staff will have to undertake training as part of their duties.

In some cases, the master trainers are specialist staff from the census agency while in others, the master trainers will be temporary employees. If temporary employees are used, it is important that they are given adequate training and time to become completely familiar with the concepts and issues associated with census enumeration. Permanent staff from the census agency should also carry out spot checks when these trainers are training other staff to ensure that they are conducting the training sessions correctly.

In some Arab countries, a hierarchy method of training, from top to bottom levels, is usually carried out:

• Census key subject matter persons train census directors;

• Census directors then train census supervisors;

• Census supervisors then train census crew leaders;

• Census crew leaders then train census enumerators;

• Daily visits by census key subject matter staff are organized during the training sessions;

• The census office conducts centralized workshops after the training of the supervisors and after the training of the crew leaders for open discussions on fieldwork activities and responsibilities.

4. *Developing training material*

It will usually be the responsibility of census agency staff to develop materials (handbooks, instruction kits, training packages and videos) to support the activities of the collection staff. Care and attention in the development of these materials is needed. The standard, and application, of these materials is crucial if a consistent approach to enumeration is to be adopted across the entire country. High-quality training guides and videos will make it more likely that the approved, standard procedures will be used with consequent high-quality outcomes. It is to be expected that trainers will use their initiative in developing ways of applying these materials that satisfy both their own personality and style and the needs of their audience. This should be encouraged,

and training staff should also be encouraged to pass along suggestions on methods they have found to be particularly effective.

Some countries make extensive use of video as a training tool in certain parts of the training cycle to ensure homogeneity of training outputs.

It is recommended that, where training is being given in countries with multiple languages and those with an official language and a variety of local languages, careful consideration be given to terms. The terms should first be documented and recorded and then used in the practical training sessions.

5. *Training sessions*

In preparing training sessions, the requirements of each group of trainees should be considered. The organizer of the course will need to undertake the following:

(*a*) Set the goals of the session for each group;

(*b*) Plan the session using the guide, goals and materials;

(*c*) Prepare any additional materials required;

(*d*) Practise the session, testing all visual and technical aids;

(*e*) Ensure the venue is set and seating is arranged in an appropriate manner.

During formal training courses certain techniques can be used to lay the foundation for success. These include the following:

(*a*) Knowing the subject matter;

(*b*) Following the standard training guides to ensure consistency of training;

(*c*) Encouraging trainee participation;

(*d*) Conducting practical exercises, including role playing and mock interviews;

(*e*) Looking for and overcoming signs of fatigue and boredom (for example, have regular breaks and ask questions of those losing concentration);

(*f*) Sticking to the main issues and not getting bogged down with ones;

(*g*) Dealing separately with persons within the group who need special attention.

6. *Training regional managers*

The census agency will also provide ongoing support and assistance to the regional managers throughout their period of duty. This can be achieved through visits by agency staff or frequent telephone contact at periods of more intense activity. This can be regarded as a form of on-the-job training. In addition, these staff must be provided with a printed manual setting out details of the procedures to be followed. If appropriate facilities are available, these more senior staff may be supplied with computers enabling them to contact

Table III.2.   Regional managers training course (phase one: modules 01-10)

Module	Content
01 Introduction	Introduction of staff to one another.
	Introduction to the census.
02 Administrative systems	Overview of the role and tasks of the regional manager with an emphasis on quality management. Procedure for communications among regional managers and with the census agency. Overview of collection operation computer systems (if applicable). Clerical administrative procedures.
03 Occupational health and safety for enumeration staff	
04 Form distribution and return	Logistics.
	Timetable.
	Impact of logistics on quality.
	Role(s) of staff by level.
05 Recruitment of staff	Advertising.
	Selection of staff.
	Administrative procedures for appointment.
06 Financial matters	Budgeting.
	Administrative procedures for expenditures.
	Procurement of material by collection staff.
07 Training techniques	Train-the-trainer techniques.
	Training deputy regional managers and supervisors.
08 Mapping	Use of maps in planning workloads.
	Use of maps to manage operations.
	Managing operations in areas where maps are deficient.
09 Special enumeration strategies	Communal/special dwellings.
	Other groups requiring special strategies.
10 Remuneration/payment of collection staff	Basis and rates of payment.
	Timetable for payments to each level of staff.
	Role of regional manager.
	Procedures for payment system.
Course review	Brief review of progress in each region.

the census agency for advice by using the Internet or other networks.

It is usually convenient for the senior temporary staff to receive several days of classroom-based training. As they will be employed for a relatively long period, perhaps several months, it may be effective for the training to be split into separate phases as follows:

(*a*) The first, immediately after appointment, dealing with initial tasks such as familiarization with the area, recruitment and training of lower-level staff, and establishing contact with local stakeholders;

(*b*) The second, for one day as close to census day as possible, dealing with the tasks to be expected in the enumeration activity, including quality monitoring, throughput monitoring and remuneration processes.

A model of the issues to be covered in the training courses for regional managers is given in the table below. It will be necessary for countries to adapt the model according to the needs of the census model they adopt. Countries that also employ deputy regional managers should develop a course specifically for that level, basing it on a shortened version of the regional manager course.

The model is based on two phases of formal training, covering 14 modules. The training sessions should also include review sessions as shown.

It is suggested that, where possible, the courses be conducted on a residential basis. This will encourage the managers to get to know one another and the census agency staff and assist in establishing the effective communications paths that are necessary during the field operation.

It is suggested that a class size of from 10 to 15 staff is appropriate for this course. Where there are significant differences in procedures required between regions (for example several regions in an urban area and others in the rural hinterland), it will be desirable to group the managers from similar regions together.

The first phase covers the initial tasks and administrative procedures relating to the regional manager's work. This should be scheduled just before they commence their work. Planning should allow for this to take approximately three days. Depending on the aptitude and experience of the managers, this could be extended to four days.

The second phase covers tasks that are important in the actual enumeration period. This will take at least one day and, if time is available, could be extended to a second day.

Deputy Regional Managers

As indicated in chapter II, section B, the role of a deputy regional manager may be essentially that of an administrator. If this structural model is used for the field operations workforce, it is suggested that the training course for these staff be given by the regional manager.

The course should be approximately one full day in length and comprise the following modules from the regional manager training course above:

01. Introduction (with a focus on the role of the deputy regional manager);

05. Recruitment of staff, with a focus on administrative procedures;

06. Financial matters;

07. Training techniques;

10. Payment of collection staff.

In this situation, it would be appropriate for these modules to be given less emphasis in the regional manager training and relatively more emphasis given there to the quality management and training modules. It would also be necessary that the administrative procedures to be followed by deputy regional managers be clearly specified in manuals and other documentation since there would be less direct contact between the census agency staff and the administrators.

7. *Training supervisors and enumerators*

The training of these staff can use a range of training methods, including the following:

(*a*) Home study exercises;

(*b*) Classroom training sessions;

(*c*) On-the-job training.

(*a*) *Mainstream supervisors and enumerators*

(*i*) *Home study exercises*

Home study exercises are designed to familiarize the field staff with their work before attending classroom training sessions. Completion of a home study exercise forces field staff to read their manuals, to prepare themselves for the training and to identify areas of confusion, all before attending training.

By giving the material back to the trainer before the training actually commences, the trainer can ascertain if there is a consistent problem across the group as a whole or whether just one, or a few people, are having specific problems. In essence, an analysis of home study exercises can provide the trainer with insight on where and how to focus training priorities.

To gain maximum value from this process, it is important that the documentation, including the manuals and home study exercises, are delivered to the participants well before training is to commence.

A typical home study exercise would require written answers, or completed questionnaires, to be returned and examined. Topics likely to be addressed for an interviewer-based census would cover all or most of the following:

(*a*) Rationale for the census and its use;

(*b*) Confidentiality;

(*c*) Supervisors'/enumerators' role;

(*d*) Receiving, checking and accounting for material;

(*e*) Coverage;

Table III.3.   Regional managers training course (phase two: modules 11-14)

Module	Content
Brief review of progress in each region.	
11 Public communications and inquiry services	Review of public communications.
	Plans for advertising campaign during enumeration.
	Plans for inquiry services, including (where appropriate) telephone hotline and use of the Internet.
12 Review of recruitment processes	Matching staff to workloads.
	Review of quality of staff appointed.
13 Review of special enumeration strategies	
14 Quality assurance in enumeration	Role of regional manager.
	Procedures for refusals.

(*f*) Definitions of certain topics (for example, labour force status and occupation);

(*g*) Sequence guides;

(*h*) Procedures on the doorstep;

(*i*) Procedures for interview;

(*j*) How to handle respondents who refuse to participate in the census;

(*k*) Checking and editing completed material.

Supervisors would have some additional questions covering the following:

(*a*) Materials checking procedures;

(*b*) What to watch for in observed interviews, and recording of information;

(*c*) Managing poor performing interviewers;

(*d*) Quality assurance checks;

(*e*) Editing;

(*f*) Materials collection.

These study exercises can contain approximately 20 questions for interviewers, and the same 20 and approximately 15 more questions for supervisors. The questions should be clear and unambiguous.

It is essential that the trainers have access to a complete set of accurate answers, enabling correction and analysis prior to the commencement of training.

(*ii*) *Classroom training sessions*

The amount of time spent in classroom training will vary considerably between countries and will depend on, among other things, whether the census is interviewer based or self-enumeration. With an interviewer-based census, more time will be needed to train the enumerators.

A model of the issues to be covered in training courses for supervisors and enumerators is given below. It will be necessary for countries to adapt the model according to the needs of the census model they adopt.

Supervisors

Supervisors should complete a home study exercise to familiarize themselves with their duties and to introduce them to the enumerators' handbook (or instruction manual) before they attend their formal training session. Supervisors should return their completed home study exercises to the regional manager before their formal training to enable an assessment of their understanding of procedures.

Table III.4. Supervisors training course

Module	Content
01 Introduction	Introduction of staff to one another
	Introduction to the census.
02 Confidentiality	Importance of confidentiality.
	Procedures to be followed by supervisors.
	Procedures to be followed by enumerators.
03 Dispatch and return tasks	Transport arrangements for supervisors.
	Material to be distributed.
	Distributing material to enumerators.
04 Definitions and mapping	Definitions of key characteristics, as employed in the census, which should include age, usual residence, types of housing and other characteristics determined by the country.
	Introduction to census maps.
	Use of maps in review of supervisor's area of responsibility.
05 Implications of information technology	Relationship between field operations and processing phases.
	Use of computers in collection operation (if appropriate).
06 Enumeration staff recruitment	Enumerators.
	Other field staff.
07 Enumeration staff training	Enumerators.
	Other field staff.
	On-the-job quality assurance.
08 Enumeration procedures	Role of supervisor.
	Role of enumerator.
	Role of other field staff.
09 After Enumeration	Quality assurance of workloads.
	Preparation of material for transport to the processing centre(s).
Review of course	

Enumerators

The details of duties at this level are greatly influenced by the basis of enumeration, local conditions and overall administrative requirements. Therefore, only an outline of the course is given:

1. Welcoming and introduction to the census

2. Confidentiality

3 Enumerator role

4. Occupational health and safety

5. Administrative issues

6. Definitions, mapping and other concepts

7. Special enumeration strategies

8. Duties of enumerators and procedures to be employed

(*a*) Before contact with households

(b) During contact with households

9. Quality assurance of completed forms

10. Preparation of forms for transport to supervisor

(*iii*) *On-the-job training*

For enumerators, on-the-job training, where enumerators are accompanied by their supervisor for a few interviews (or deliveries to households, if a self-enumeration approach is used), is particularly relevant to ensuring that they understand their tasks and are performing them correctly. The supervisor should assess the relative abilities of the enumerators and manage their time so that the weakest enumerators receive the greatest level of support.

(*b*) *Specialist enumerators*

Some countries may also employ specialist staff to enumerate population groups that require particular consideration. Examples of such groups could include people in communal dwellings (such as hospitals, prisons, boarding schools or hotels) or members of distinct cultural or language groups. Where there is sufficient need, it may be necessary to establish specific training schemes for these staff. As the range of possible situations is wide, no prescription for such schemes is offered in this handbook. However, the training should follow the same principles as the mainstream courses and, where possible, use the same materials to ensure a standard outcome.

8. *Administration training*

As indicted in other parts of this handbook, a large undertaking such as the filed operation phase of a census will require staff to follow a wide range of general administrative procedures relating to the terms and conditions of their employment, rules and/or laws relating to the security and privacy of census materials and other rules relating to the proper behaviour of government employees.

It is important that staff receive some training in these matters, otherwise they will be unable to perform their duties effectively. At worst, it may create situations that cause significant adverse publicity for the census and/or the census agency in general. However, it is important that administrative training does not detract from operational training. The staff are employed to collect high-quality statistical information from people, and pass this on to the census agency within an agreed timetable and at the highest level of accuracy. The collection staff are not to be employed to fill in administrative forms.

9. *Health and safety training*

Even in the best-run census, there will be situations that pose a risk to the well-being of field staff. Ways of minimizing these potential risks should be covered in the training for all levels of field staff. The matters covered could range from correct methods for handling enumeration materials to managing encounters with domestic animals. Training in this area should concentrate on the more common occurrences rather than on those that rarely occur.

The training must itself be carefully managed, to avoid overemphasizing the risks, which can create a victim mentality in the staff. It is usually possible to reverse the presentation to stress attaining the positive rather than recovering from the negative. For example, people should be trained in the correct way to lift boxes of forms, rather than listing the health risks from poor techniques; they should be given tips on how to avoid dog attacks rather than on how to submit a compensation claim when bitten.

10. *Computer systems training*

Following widespread acceptance of the Internet and other computer-based communications systems, countries may be encouraged to use these systems rather than traditional printed or voice-based communications. If such a process is to be applied, the staff who will operate the system must be given sufficient training in the use of the application. Even if familiarity with computers is a criterion for selecting staff, it cannot be assumed that the selected people will be familiar with the specific software used by the census agency.

If this element of training is undertaken successfully, the probability of a high-quality outcome from the census can be dramatically enhanced. To do otherwise risks staff becoming more concerned with learning to operate computers than focusing on their key roles.

As well as formal training in the initial courses, care must be taken to provide on-line reference material for the computing system and a readily accessible help-desk facility within the census agency.

D. Distribution and return of materials

1. *Introduction*

In many countries, the distribution and return of materials in the field operations phase will represent the largest peace-time movement of materials for any single exercise. As a logistics operation, this activity will be referred to as distribution and return tasks.

Distribution and return of materials is the term used to cover tasks associated with materials that are:

(*a*) Supplied to a packing centre;

(*b*) Distributed to field staff;

(*c*) picked up from field staff;

(*d*) Returned to data processing centres.

The tasks include the following:

(*a*) Receipt of material from manufacturers (e.g., printers) and other external suppliers. This could include the census form and materials needed for packing (e.g., boxes and tape);

(*b*) Bulk storage during the packing operation;

(*c*) Packing;

(*d*) Consignment preparation and delivery to enumeration staff;

(*e*) Bulk transport outward;

(*f*) Pick-up from enumeration staff;

(*g*) Bulk transport inward to processing centres;

(*h*) Close-down operations.

Regardless of the type of census, there will be a need for materials to be supplied to field staff and returned. For example, even in the case of a mail-out/mail-back census, there is usually a field follow-up component for which materials, including manuals and administrative supplies, will be required. In these cases, the volume of material would be rela-

tively small, but there is still a need to plan and implement these activities. Specific issues regarding using a postal service for a mail-out/mail-back census are discussed in section 8 below.

The majority of these tasks are usually carried out under contract by a government transport service or commercial operator, although the packing of materials may be done within the census office in some countries. The contractor will use specifications and consignment details provided by the statistical agency. If the volume is small, the postal service may be a feasible method.

2. *Inputs*

As a first stage in this process, decisions must be made concerning the nature and responsibilities of the centrally controlled distribution and return operation. Will deliveries be made to regional managers or to supervisors? Will enumerators be required to collect their work from a more central depot? These decisions must be made by countries, keeping in mind the impact of the amounts of material to be transported, the transport available to field staff and the condition or existence of roads or other means of transport.

Once these decisions have been made, the key inputs to the dispatch and return of materials are as follows:

(*a*) Workload estimates from the mapping programme to establish packing volumes for transport requirements;

(*b*) Name and address details from the recruitment activity to establish details on delivery and pick-up points.

3. *Material*

The material to be transported generally falls into four broad categories, that is, material for (*a*) enumerators, (*b*) supervisors (*c*) regional managers and/or deputy regional managers and (*d*) other uses.

(*a*) *Enumerator material*

Enumerator material consists of relatively few items and includes the main census form. However, it comprises the bulk in terms of volume, packing, storage and transport tasks.

This material can be packed centrally, transported in bulk to regions around the country, and then transported from there to supervisors. Supervisors then arrange for its delivery to, or pick-up by, enumerators. This may also involve some recounting of the bulk materials into lots suitable for individual enumerators. Typically, each pack will comprise a standard amount of specific material. For example, this could be a number of packs of forms of a size sufficient to enumerate a specific number of households. The number of packs allocated to each workload may be specified centrally or by the supervisor.

At the completion of the enumeration, the material is usually picked up from supervisors, after quality assurance has been completed, and returned to the processing centres.

(*b*) *Supervisor material*

This material includes the packing and transport of administrative and training material used by supervisors and includes the enumerator record book and training and procedural manuals.

Again, this material can be packed centrally and then transported to each region. It can then be included with the transport of enumerator material to supervisors. It should be packed separately from the enumerator material because it may include material of a specific nature (e.g., enumerator maps) or of variable quantity (e.g., enumerators' handbooks), depending on the composition of the workload.

After enumeration, this material is picked up from supervisors and returned to the processing centres, along with the enumerator material.

(*c*) *Regional manager and/or deputy regional manager material*

This material includes the packing of administrative and training material used by regional managers and deputy regional managers and includes material for supervisor training.

Because of the relatively small number of these staff, the material can be packed centrally and then transported directly to regional managers.

After enumeration, the material is picked up from the regional managers and the bulk returned to the processing centres. Some material that is not necessary for the processing phase may be returned to a regional or central office of the census agency. This material may include key administrative documents such as objection/refusal reports or remuneration details.

(*d*) *Other material*

In addition to the above, other material used in the field should also be included within the scope of the distribution and return activity. For example, this may include special forms used for certain population groups (such as in remote areas) and public communications material.

4. *Specifications*

A significant task in planning field operations is establishing the specifications for the packing and transport of materials. These specifications need to be developed regardless of whether these activities are carried out by the census agency itself or contracted out to another government agency or private company.

Planning for the packing, distribution and return of materials should begin, where possible and depending on the particular country, approximately two years prior to the census date. A contract should be in place at approximately the same time as the major printing contracts are established. In some cases, and particularly where these operations are commer-

Table III.5.   Specifications for distribution and retrun of materials

Part 1.   Introduction

Title	Description
Introduction	Includes a description of the census agency and the census. Sets out the role of the activity and its overall goals. Includes key dates and requirements. Sets out the structure of the specification.
Structure of census	Describes hierarchy of field structure, number of management units and enumeration areas. Brief description of the role of each level in the structure.
Overview	Brief description of the activity and its main components. Goals of each component. Describes key functions of the contractor.
Preferences, mandatory requirements	Includes a description of any particular preferences and mandatory requirements. For example, the use of dedicated vehicles for census material in the return phase may be a mandatory requirement. Not using subcontractors may be a preference.
Privacy	Clearly states the census agency's policy on privacy and the requirements in this activity.
Contract arrangement	Describes how the contract will be established and managed.
Payment	Describes preferred payment basis and the basis on which quotations are being sought.
Reporting	Basic reporting requirements.

Part 2.   Packing

Title	Description
Introduction	Describes packing activity.
Functions	Sets out and describes functions of the contractor: (a) Receipt of materials; (b) Storage and handling; (c) Packing and labeling; (d) Quality assurance; (e) Dispatching.
Timetable	Detailed timetable for packing activities.
Requirements	Detailed requirements (e.g. security, labeling, storage);
Packing	Packing details: (a) type of packs by level of structure; (b) content of each pack type; (c) quantities of each pack type.
Reporting	Detailed reporting requirements.

Table III.5.   Specifications for distribution and retrun of materials *(continued)*

Part 3.   Dispatch

Title	Description
Introduction	Describes dispatch of material to field staff.
Function	Sets out and describes functions of the contractor: (a) Receipt of materials from packing centres if they are different; (b) Storage and handling; (c) Preparation of consignments and labeling; (d) Quality assurance; (e) Delivery requirements.
Timetable	Detailed timetable.
Requirements	Detailed requirements (e.g., security of vehicles and obtaining signatures).
Transport	Transport details: (a) Description of drop-off method and requirements; (b) Description of control documentation requirements; (c) Description of consignment details and volume; (d) Method of supply of field staff names and addresses; (e) Description of control documentation requirements; (f) Handling shortfalls and surpluses.
Reporting	Detailed reporting requirements.

Part 4.   Return

Title	Description
Introduction	Describes pick-up of material from field staff and return to the processing centre(s).
Function	Sets out and describes functions of the contractor: (a) Pick up of materials from field staff; (b) Security requirements; (c) Storage and handling; (d) Delivery to processing centre; (e) Reconciliation of materials; (f) Delivery requirements.
Timetable	Detailed timetable.
Requirements	Detailed requirements (e.g., security of vehicles and obtaining signatures).
Transport	Transport details: (a) Description of pick-up method and requirements, (b) Description of control documentation requirements, (c) Handling shortfalls and surpluses.
Reporting	Detailed reporting requirements.

Table III.5.   Specifications for distribution and retrun of materials *(continued)*

Part 5.   Evaluation and pricing

Title	Description
Introduction	Describes how quotes for the contract will be evaluated.
Evaluation criteria	Describes evaluation criteria for each task: packing, distribution and return.
Pricing	Sets out in detail how prices are to be provided. Terms of payment and sanctions for non-performance.

cially based, savings can be made if printing and packing contracts are coordinated. For example, transport costs can be avoided if the printing and packing centres are co-located.

The specifications used for this activity can be used as the basis for a contract whether it be commercial or an arrangement with another government agency. Even though another government agency may be used, it is important that a formal agreement along the lines outlined below is still used. Some elements of the agreement may not need to be included, but it is important that both agencies clearly understand, and agree on, the requirements for this major activity.

In either case the specification may include some or all of the following items; however, there may be additional items required, depending on the circumstances of the country involved.

5. *Estimating Quantities*

Estimating quantities not only establishes the volume of materials to be packed and transported but also provides a key input into the printing process (i.e., the number of each item that needs to be printed). A lack of material during enumeration can have serious consequences, as there will not be enough time to print additional quantities. However, a cost-effective census requires that there are no excessive amounts of material. Estimates should also provide for a reasonable level of contingency.

The basis of estimating quantities is to establish the number of items each person in the field structure requires to complete his or her tasks. These items can then by multiplied by the number of staff in each level of the structure. This gives the standard pack sizes referred to in section 6 (*b*) below.

To establish the number of items each person requires is usually based on the amount of work to be done (i.e., dwellings to be enumerated), plus a reserve factor. This is based on the number of items to be used by each enumerator,

supervisor and so forth. For example, to enumerate 100 households, the following items might be provided to an enumerator: 110 census questionnaires, 110 information brochures, 50 calling cards, 5 objection report forms, 1 satchel, 1 clipboard, 2 pencils, 1 pencil sharpener, 1 identification card and other materials such as envelopes.

The above example shows that some spare census forms are provided. This is necessary in case the enumerator needs to use an additional form at a dwelling or finds additional dwellings in the enumeration area. Assuming that all enumerators will have a workload of 100 households, the quantities in the above list are multiplied by the number of enumerators to establish how many forms will be required in total. However, it is unlikely that all enumerators will have workloads of exactly the same size. Therefore, it is necessary to make some judgement, perhaps based on information from the mapping activity, about what is an average workload size.

During the design of enumeration areas and mapping tasks, an estimate will be made of the number of enumeration areas, and the amount of work in each. This information can be used to calculate how much material will be needed by each enumerator, supervisor and so on. This method should provide a more accurate forecast of needs.

For simple items (such as calling cards), the cost of printing additional quantities may be minimal; thus, estimates can be rounded up with little impact on the overall cost. For more complex items (such as the enumerators' handbook) the cost of printing will be more significant, and care should be taken with final calculations.

As with the printing operation, the use of a spreadsheet (either computer-based or clerical) can assist with estimating quantities. An example of how a spreadsheet might be used to record the basis of estimates and total quantities is given below. The first group of factors would be recorded in a separate sheet and used as multipliers in a second sheet containing a list of items:

(*a*) *Factors*

(*a*) Number of enumeration areas;

(*b*) Number of enumerators (if not the same as (*a*) above);

(*c*) Number of supervisors;

(*d*) Number of regional managers (deputy regional managers).

The following variables would be recorded for each item to be provided and multiplied by the relevant factor above:

(*b*) *Items*

1. Item;

2. Number per enumeration area;

3. Total required for enumeration areas ((*a*) x 2);

4. Number per enumerator;

5. Total required for enumerators ((*b*) x 4);

6. Number per supervisor;

7. Total required for supervisors ((*c*) x 6);

8. Number per regional manager (deputy regional manager);

9. Total required for regional manager (deputy regional manager) ((*d*) x 8);

10. Subtotal required (3 + 5 + 7 + 9);

11. Reserve factor (10 x per cent) where per cent is judged on an item-by-item basis;

12. Total requirement (10 + 11).

In this model, some items may not be required by all levels and would simply be shown as a nil requirement and thus would not add to the total. For example, enumerators would not require application forms for supervisor positions. However, regional managers may receive a small reserve of census questionnaires or simply a few as samples for their own use.

The primary benefit of using a spreadsheet is that assumptions about supply can be varied and quantities recalculated quickly. For example, the initial calculation may be for two copies of the objection report form in each enumeration area, but this may be considered too low and a decision made to supply a pad of 10 forms to each enumerator. This could be easily remodelled in a spreadsheet.

6. *Packing*

The movement of the bulk of the material associated with field operations is best carried out by way of modular cardboard boxes. The shape and size of the boxes should be designed around the size of the census questionnaire, taking note of the occupational health and safety requirements for

handling relatively dense material such as paper. The same cardboard boxes can also be used for transporting administrative and training material.

Within these boxes, the census forms themselves can also be packed into bundles of forms (e.g., lots of 50 forms) that are shrink-wrapped in plastic. This has the advantage of protecting the forms and making it easier for supervisors to count and distribute forms to enumerators.

The boxes should be able to be sealed to prevent tampering with the contents during transport. One method to assist security is to transport two (sometimes three) boxes inside another larger one. The outer box would be designed for security, storage and transport.

Most of the transport arrangements put in place for field operations may be based on a price per box basis. An outer box containing two boxes of census materials would be recognized as a single box for counting and charging purposes. However, this would not necessarily be the case if a price per kilogram basis were used.

It is also desirable to design boxes for use in the field operations that can also be used to store and move the census questionnaires around the processing centres. The boxes, therefore, should be pre-printed, with spaces for packing staff to identify the contents for enumeration staff and, subsequently, for enumeration staff to identify the contents for processing staff. Additional labelling for processing purposes can be included on the box when it is produced.

The content of the boxes will depend largely on how materials are to be supplied to supervisors and from there to enumerators. There are two methods: (a) bulk supply and (b) pre-packing.

(*a*) *Bulk supply*

Under this scenario, each supervisor is provided with a bulk supply of each of the required items for enumerators. The supervisor would then count out and re-pack the required items for each enumerator from the bulk supply received. Supervisors may also be supplied with a number of standard census boxes (see above) into which to repack material for enumerators.

This method has the advantage of simplicity but also a number of disadvantages, including the following:

(*a*) Reliance on supervisors to count and repack material;

(*b*) Reliance on suitable packing by the original printer or supplier;

(*c*) Larger number of different shaped and sized boxes (non-standard appearance);

(*d*) Low likelihood of materials being clearly labelled as census material.

A key task for the census management area with this method is to ensure the coordinated supply of the different items through a transport staging area. Direct supply from printers to supervisors should be avoided from both a management and a quality perspective.

(*b*) *Pre-packing*

This is where material is pre-packed centrally, or in a small number of packing centres. It involves preparing packs of material suitable for use by enumerators and higher-level staff. One method of pre-packing is to make modular packs that are designed to contain all the materials required to enumerate a given number of households. With this method, the supervisors' job only requires them to calculate how many packs each enumerator will need rather than counting and repacking materials for each enumerator. Another advantage of this method is that standard census boxes are used from the outset in a more controlled manner.

The content of the packs is determined in advance by the census agency and is based on the concept of uniform content wherever possible. This simplifies the packing process and is therefore likely to add to efficiency and more accurate delivery of supplies. Uniform content simply means that each pack type contains the same number of each item.

There may be several pack types. For example, there may be packs containing material to enumerate dwellings in urban areas, dwellings in rural areas, or people in special dwellings; or a pack may contain material for a supervisor to recruit and train enumerators.

The variation in pack types would depend on the basis of the enumeration, how feasible standard content packs are in relation to enumeration area sizes, and size of the country. The main advantages with this method are a standardized form of supply, less dependence on supervisors to count and repack, and a standardized appearance for census materials.

7. *Census agency management role*

The role of the census agency with regard to dispatch and return tasks is primarily one of liaison and monitoring. For the most part, the contractor will contact regional managers and supervisors directly about the delivery or pick up of material. The census agency can expect to be involved in liaison between the contractor and field staff in the early stages of the operation or if there are any particular problems experienced by either field staff or the contractor

The census agency management staff should meet frequently with the contractor to discuss the operation and liaison arrangements. These staff should also visit packing centres to become familiar with how the operation works.

Part of the planning of the operation will include arrangements to enable census agency management staff to monitor the delivery and return of materials. In particular, when material is picked up from supervisors, census agency management staff should maintain a close watch over what is taking place in the field as the transport of completed census forms is involved.

8. *Mail-out/mail-back census*

There are a number of key issues to consider in relation to distribution and return tasks when conducting a mail-out/mail-back census. For the mail-out component these include the following:

(*a*) A complete and accurate list of addresses for the entire country;

(*b*) The postal service infrastructure throughout the entire country;

(*c*) Cost.

In the majority of countries, comprehensive lists of addresses are not available; this situation has the potential to impact adversely on underenumeration of a census.

Even in countries where most of the population is covered by an effective mail service and a mail-based operation is adopted as the standard procedure, there may be some regions that are unsuitable for a census mailout/mailback operation. Examples include remote rural areas or informal squatter camps. Non-standard procedures will need to be adopted for such areas.

Because of the lack of comprehensive mailing lists, some countries have adopted a combination of delivering forms through an enumerator and the respondents mailing them back. The issues associated with the delivery of forms are discussed in the sections above. For the mail-back component to work efficiently, the postal infrastructure needs to be able to handle the volume of mail generated by such an operation within an acceptable time-frame. A formal agreement between the statistical agency and the postal organization would need to be in place. Issues to consider with mail-back include the following:

(*a*) Form size;

(*b*) Weight;

(*c*) Cost per unit;

(*d*) Confidentiality and security of census forms.

Forms can either be mailed back directly to the processing centres or to the regional mail-back centres specifically established to initially receive census forms when mailed by respondents.In both cases, forms received will need to be reconciled with the enumerator's record book, and procedures will need to be in place to follow up non-responses soon after census day to ensure that people have not moved and to satisfy processing timetables.

Bar code identifiers on forms and enumerator record books can be considered a basic tool for this reconciliation process.

If lower than expected response rates are achieved in the mail-back process, there will have to be increased follow-up operations by enumerators. This will have a negative impact on both the census budget and the timetable.

E. Monitoring field operations

1. *Introduction*

The key to successful monitoring of field operations is an efficient and relevant management information system. However, collecting management information for this activity is difficult because of the large numbers of field staff involved and the fact that these staff are often widely geographically dispersed. Therefore, it is important to ensure that the information collected is needed and will be used constructively in the management of the operation. The in-

formation can be collected and transmitted by a variety of methods (e.g., telephone, fax or e-mail). The issues outlined in this section are applicable to whichever method is used.

The nature of the field operation means that management information may take some time to be acquired and received by the intended user. If it is considered that the information cannot be acquired in a reasonable time-frame so that it can be used effectively, it should not be collected. Alternatively, the type of information or level of detail should be reconsidered and reorganized.

A key point is that a small amount of good information will be of more use than a large amount of poor or incomplete information. The information must be able to be used effectively, otherwise there is little point in collecting it.

Some countries equip each regional office with computer, printer, telephone and fax services. Service centres are established with a special census hotline for receiving inquiries from the public and the field staff. The central office of the census agency receives inquiries, the census key staff discuss them and then fax the answer to the intended party. Sometimes, the answer to an inquiry made on an important point is circulated to all field offices.

2. *Planning a management information system*

Planning a management information system for the field operation should comprise the following steps:

(*a*) List all potentially useful items of information, for example, number of applications received for field positions, dates training is to be started and completed and number of dwellings interviewed or enumerated. Wherever possible, have benchmark data for comparison, for example, the number of positions available compared with the number of applications received;

(*b*) Consider how and when each item of information may be collected;

(*c*) Consider how each item of information will be used and by whom. For example, information about application shortfalls may be used to start action to attract more applicants by different means;

(*d*) Review the value and usefulness of each item with a view to keeping the list to the minimum of those considered essential or highly desirable. Items considered low priority should only be included if the cost is marginal and there is at least some evaluation use for the information;

(*e*) Incorporate the final list into relevant work plans.

The type of information to be considered as part of the management information system should improve the ability of managers: (*a*) to ensure that the field operation proceeds according to schedule; (*b*) to respond to public relations issues; (*c*) to ensure that field staff are paid correctly and on time; (*d*) to manage the budget; and (*e*) to evaluate the effectiveness and efficiency of the operation.

The nature of the information that may be collected varies. It may include the following:

(*a*) Date or dates that particular activities are started or completed;

(*b*) Piece rates or amounts, such as number of dwellings interviewed or enumerated;

(*c*) Volume, such as percentage of enumeration completed;

(*d*) Status, such as incomplete, started or finished;

(*e*) Type (and number) of calls to the telephone inquiry service (including number of certain types of calls).

The information may also be required at different levels in the management hierarchy. For example, the number of applicants may be reported at the regional level, while the status of completion of a particular activity may be reported at the enumeration area. It depends to a large degree on who is going to use the information and at what level of detail.

3. *How to collect management information*

This depends to a large extent on the communications infrastructure available to the census agency and temporary field managers and staff. Information can be transmitted between the different field management levels and the census agency as follows:

(*a*) Electronically (e-mail, fax or telephone);

(*b*) By the postal service;

(*c*) With the return of the bulk census material.

The use of each type of transmission will impose its own requirements as far as the style of reporting is concerned. For example, e-mail and fax may use a standard form designed for that purpose. Telephone transmission may require the recipient to use a form designed for ease of receiving verbal information and to maximize telephone operator effectiveness. Returning information by a postal service may require that management books allow single duplicate pages to be removed.

The relative urgency of some types of information may dictate the method to be used. For example, information required to pay temporary field staff may need to be transmitted by post or electronically rather than waiting for the bulk census material to be returned to the processing centre.

In some cases, a number of different methods may be used to send information from the enumerators to the census office. For example, an enumerator may make a verbal report to his or her supervisor, who then uses the telephone to send a consolidated report to the regional office, where an e-mail report is made to the central office.

These factors need to be considered within the context of the particular country. What will work in some countries may not be appropriate in others.

4. *Where to start*

Like any census activity, it is not possible to plan the management information system for field operations as a single isolated task. Information requirements should be considered for each area of the field operation, dependencies identified and requirements consolidated into a plan. The consolidation phase should include discussions with other stakeholders of the field operation phase.

The information requirements can be expressed initially in the form of questions. The actual data requirements can then be derived from the questions. For example, to answer the question "Have all field staff been trained?" the data requirement would be a yes or no status report from field managers. In turn, this may be recorded in the field manager control book as a record of the date training was completed (a date equals a yes status, while no date equals a no status).

The question method is useful in "what if" planning sessions to start developing ideas. A small group of people from stakeholder areas can hold discussions about the questions to which they need answers. Questions are written down throughout the session and reviewed afterwards. This review begins the process of prioritizing and identifying particular data requirements.

5. *What to collect*

Included in this section is a list of areas in the field operation and types of management information that may be collected. It is not an exhaustive list but is a useful starting point for planning. More detailed information about particular aspects of the census can be obtained from other statistical agencies, in particular those with similar attributes and infrastructures that have recently taken a census.

(*a*) *Budget*

In field operations, a significant proportion of the census budget is usually spent on salaries for temporary field staff. Furthermore, a high proportion of this expenditure is incurred over the brief enumeration period. As a result, there is usually little that can be done at that time to resolve budget difficulties.

Therefore, management information data must be gathered early enough to ensure that sufficient funds are available to undertake the work. More senior staff (especially regional managers and supervisors) should provide an evaluation of the workload in their areas before enumeration commences so that potential problems can be identified and resolved. They are then responsible for ensuring that their staff work within that budget.

(*b*) *Mapping and household listing*

The mapping area provides the basis for most logistical planning for the field operation, as well as the crucial details of the number of enumeration areas and their estimated size. In some cases, the mapping will be done before the household listing exercise, if this is undertaken. In other cases, it may be conducted during or after household listing.

If mapping is carried out, taking advantage of the field work done during a household listing exercise, it is likely that the management information obtained will be reliable for subsequent aspects of the census. For example, information about the estimated number of households in each enumeration area would be aggregated to management

levels and used to check that sufficient materials were being dispatched to the particular area. The actual number of field workloads can be used to check the budget.

Mapping and household listing is usually a large exercise that takes a considerable amount of time to complete. Therefore, the work should be scheduled and management information requirements managed in a way that enables packets of information to be added to the management information system progressively (see chap. II, sect. C).

Specific management information data items from mapping and household listings may include the following:

(*a*) Number of enumeration areas;

(*b*) Number of management areas;

(*c*) Estimated households in each enumeration area;

(*d*) Estimates of potential travel requirements;

(*e*) Intelligence about problem areas.

(*c*) *Logistics*

Logistics is another key area for early management information modelling. Information about the number of workloads can be used to determine the amount of material needed to complete the enumeration, which in turn can be aggregated to determine print quantities. These estimates being available in the early stages of planning will enable an accurate costing of materials. They will also assist in establishing realistic schedules for activities such as printing and transport. The processing centres can also use these estimates to prepare for the estimated volume of material, as well as estimates of the number of workloads and records to be processed.

Management information based on logistics is based around three broad areas:

(*a*) Material acquisition and preparation;

(*b*) Delivery of materials in bulk into the field and to enumerators;

(*c*) Return of materials from the field to the processing centre.

Material acquisition and preparation specific to management information may include the following:

(*a*) Number of materials ordered and received (e.g., number of census forms printed);

(*b*) Date of receipt of materials;

(*c*) Amount of material and date prepared (packing, management books and maps);

(*d*) Amount of material and date dispatched to, and received at, each management area;

(*e*) Amount of additional material requested (for evaluation purposes);

(*f*) Number of forms expected to be mailed in (where applicable) from the enumerators record book.

The method of packing material will determine the units of measurement (see section D above).

For the delivery and return tasks, the key management information items will be the dates on which these tasks were completed for specific geographic areas.

(*d*) *Recruitment*

Management information about recruitment is aimed at enabling census managers to ensure that there are sufficient applicants from which to select suitable candidates for all field positions. A strong field of applicants increases the possibility of obtaining good quality-field staff.

Specific management information items may include the following:

(*a*) Number of positions available, by management area (from the mapping system);

(*b*) Number of applications received, by day (during the recruitment period);

(*c*) Number of applications initially rated acceptable (where practical).

During the recruitment activity, emphasis should be given to information that enables managers to respond to short-falls of applicants in particular areas.

(*e*) *Training*

Well-trained enumerators are essential to the successful carrying out of a census. Information about training is reflected in reports from field supervisors and managers that training has been conducted before the staff commence enumeration work.

Specific management information items may include the date training was completed and the number of staff trained.

(*f*) *Operation*

Information to support, and later evaluate, the field operation is mainly obtained from records created by field staff or inquiry service staff. In some cases, the information may be received in time to respond with action (e.g.,. calls from householders that forms have not been delivered or that the enumerator has not called). However, most information obtained during the operation is used for subsequent evaluation purposes.

Much of the information is obtained from control books and other records (e.g., packing slips) that are eventually returned from the field. The objective is to ensure that information being recorded is useful. Even if the information cannot be acted on to rectify a problem in the field, it can be used to inform processing centre staff about potential data quality issues. It can also be evaluated later on to improve the operation in future censuses.

(*g*) *Public relations and inquiry services*

Where a service is provided for respondents to call the census office, the management information that can be obtained is of enormous value. Such services will be of particular value where the collection is undertaken on a self-enumeration basis rather than by interview.

In some cases, such a service enables corrective action to be taken in the field, while in others, it may alert census managers to a need for additional widespread publicity about the census.

Calls to such a service should be logged and some basic information recorded. This may include (*a*) time of call, (*b*) location of caller (enumeration or management area) and (*c*) reason for call.

The reasons for the calls should be monitored to detect emerging problems requiring corrective action.

F. Quality assurance for field operations

1. *Introduction*

Quality assurance during field operations tends to identify problem enumerators within the enumeration workforce rather than systematic or process errors. This is a consequence of the brief duration of the enumeration activity and the limited scope for improving this process once it has commenced.

The strategies outlined in the sections below will enable these enumerators to be identified. However, these strategies will also allow for evaluation to occur after enumeration so that improvements can be made to future censuses. These quality assurance strategies can also be implemented in any tests leading up to the census so that identified problems can be addressed before the census.

Section 3 below assumes that the census is interviewer based. Countries that use a self-enumeration, drop-off and collect approach should in particular adapt section 3 to focus on the respondent contact elements and omit parts specifically dealing with interviewing. Sections 4 through to 6 are relevant for both interviewer and self-enumeration methods.

The scope for quality assurance in field operations is more restricted where the mail service is used for the delivery and return of forms.

The present section also concentrates on the quality assurance conducted by supervisors on the work of the enumerators. Ideally, managers may also wish to conduct spot checks on the work of the supervisors. However, it is recognized that in reality, owing to other work pressures, this may prove difficult for managers to organize.

2. *Role of supervisors*

Supervisors play a critical role in assessing and reviewing the performance of enumerators and ultimately influencing the quality of the census. The supervisor is also an important link in terms of evaluating the procedures, documentation and training for census tests.

By adopting quality assurance, and collecting and analysing quantitative information, an important aspect of the overall quality of the census can be substantiated. In particular problem cases, these checks may enable corrective action to be taken before census forms leave the field. It also provides census management with information about the quality of the enumeration.

These quality assurance checks during the main census enumeration provide valuable information after the census. The information can be used to inform the processing area about potential problems as well as contribute to the evaluation of census enumeration.

Supervisors need to be trained in the procedures required for conducting quality assurance on enumerators' work and have a thorough knowledge of the enumeration procedures.

It is acknowledged that supervisors have an extensive role in terms of supervision; however, the material contained in the present section concentrates on their role in quality assurance.

Details on quality assurance processes will need to be included in the supervisors' guide or handbook. Interviewers will also need to be advised that quality assurance procedures will be adopted. This has the added benefit of reinforcing to interviewers the need to follow all procedures andthat their supervisor will be assisting them by checking their work.

During training, supervisors should emphasize that, as well as being a means of quality assurance, these checks are also designed to help enumerators quickly become profi-cient in their work. Where significant problems are identified, the supervisor must assess whether the interviewer requires further training to overcome the problems.

The role of a supervisor is (*a*) to provide retraining of enumerators who require it following their initial training course; (*b*) to enhance the enumerators performance through practical advice; (*c*) to provide support and encouragement; (*d*) to provide contact, open communication and feedback; (*e*) to perform quality assurance on enumerators' work; and (*f*) to ensure recommended improvements are implemented.

In practical terms, it is the responsibility of a supervisor (*a*) to ascertain that the enumerator has checked the maps and household list before commencing work; (*b*) to observe the introductions to a sample of householders; (*c*) to observe the completion of a sample of questionnaires; (*d*) to observe a sample of the editing work of the enumerator; (*e*) to do checks on a sample of dwellings to ensure that enumerators have actually visited the households and completed the forms; and (*f*) to report to managers on the progress of quality assurance checks and emerging issues relating to the quality of enumeration.

Supervisors need to ensure that they establish a positive relationship with the enumerators. Supervisors need to establish a friendly atmosphere by demonstrating they are approachable and empathetic and attempt to put the enumerator at ease. Discussions should be commenced and conducted in a non-threatening manner. Supervisors should also give enumerators the opportunity to ask questions or make comments.

Performing quality assurance on the work of enumerators can be done in four ways:

(*a*) Observing interviews during enumeration;

(*b*) Checking households already enumerated;

(*c*) Checking coverage of the enumeration area;

(*d*) Checking completed census forms.

Each of these is discussed in detail in the following sections.

3. *Observing interviews*

Observing interviewers in the field is usually conducted early in the enumeration period, and less frequently later in the enumeration period. This pattern of observation is aimed at ascertaining whether interviewers have followed all of the instructions outlined in their handbook and at training. In part, it also acts as a form of on-the-job training.

Observing interviews will identify whether interviewers (*a*) are following instructions on how to complete the forms; (*b*) understand the concepts and basic definitions; (*c*) are asking the right questions in the right manner; (*d*) are able to establish good rapport with the respondents; and (*e*) are recording answers accurately.

As supervisors observe interviewers, they should complete an observed interview report. A sample observed interview report is shown below.

(*a*) *Preparation*

Before visiting any households, interviewers need to be advised that, after introducing themselves to the householder, they should introduce the supervisor as a person who is carrying out quality assurance. Generally speaking, the supervisors aim is to be "seen and not heard". However, particularly in the actual census enumeration, they may need to intervene to rectify a situation that would otherwise result in a number of incorrect questions being asked or, perhaps, questions being missed.

Before conducting any supervised interviews, the supervisor will need to do the following:

(*a*) Complete training of all interviewers;

(*b*) Make arrangements with each interviewer for a mutually agreeable meeting time and place;

(*c*) Ensure that there is sufficient time between appointments, especially in rural areas where travel time could be significant;

(*d*) Ensure that they have a full kit of required forms, including census forms, and observed interview reports;

(*e*) Ensure that they have a set of interviewers' and supervisors' handbooks and guides.

Supervisors need to ensure that interviewers are managing their work correctly. Indicators include the interviewer (*a*) meeting the supervisor at the appointed time; (*b*) having the correct equipment and forms; (*c*) having the material organized and prepared to commence interviewing; and (*d*) managing completed forms and not mixing them up.

(*b*) *Interviewing technique*

A good introduction at the door will help the interviewer obtain a positive reaction and will most likely assist with an accurate response to all relevant questions. When conducting interviews they need to (*a*) make sure that they identify and interview the head of the household (unless each person is to be interviewed); (*b*) apply the customs and etiquette expected in the country or region concerned; (*c*) explain the census and how long the interview will take; (*d*) tactfully keep the respondent to the point; (*e*) pace the interview to allow the respondent time for thought without wasting time; (*f*) assess the situation in the household from the door; (*g*) be flexible enough to come back at a more suitable time;(*h*) maintain a friendly yet positive and professional manner; and (*i*) be prepared, informed and keep to the point.

The supervisor would assess the interviewer as "requiring improvement" if any of the above information was omitted. It is also important that interviewers leave the household in a positive and friendly manner because they may have to return to collect additional information at a later time.

(*c*) *Scope and coverage*

The supervisor should check that the interviewer asks the correct questions in order to establish who is to be included or excluded from the scope of the census. While most people will be included in the census, the coverage rules for those who are to be included must be carefully applied. For example, if the census is based on place of usual residence, supervisors need to ascertain whether interviewers have only included usual residents. Similarly, if particular population groups are excluded from the census (e.g., overseas visitors), the supervisor must ensure that persons from these groups are not included.

(*d*) *Completing the census form*

There are three priorities for supervisors in relation to question wording:

(a) Identification and recording of any errors;

(b) Recording the initial asking of any questions;

(c) Recording of the response to any questions.

In an interviewer-based census, the basic principle is that everyone is asked the same question and in the same manner. This approach is necessary if there is to be nationwide consistency and accurate data. Interviewers must read the questions as worded and not rely on their memories. Supervisors are required to stress the importance of this approach and to specifically provide assessments on this matter as part of their observed interview report.

Supervisors should follow each interview with their own copy of a census form, and note when the interviewer has (*a*) strayed from the actual question wording; (*b*) missed

OBSERVED INTERVIEW REPORT

Supervisor:

Interviewer:

District/region name:

Enumeration area reference number:

Household number:

Type of household:

Administrative matters

	Done Correctly	Not Done	Comments
1. Enumeration area listing checked			
2. Organized their documents			
3. Transferred reference numbers			
4. Selected the correct house			
5. Established rapport with household			
6. Coverage established for usual residents			
7. Coverage established for visitors			
8. Established head of household			

Completion of form (for each household)

Person numbers

Questions/probing	1	2	3	4	5	6	7	8	Total
Exactly as worded									
Reworded, meaning the same									
Reworded, meaning different									
Not asked, response inferred									
Correct probing/clarifying									
Prompt needed but not used									
Incorrect/directive prompting									
Used prompt cards correctly									

Questions where interviewer had difficulties

Specify:

Comments on introductions, explanations given and closing remarks

Very good   Good   Needs improving

Specify:

questions or asked questions that do not apply; (*c*) incorrectly directed answers through prompting rather than probing for a response; and/or (*d*) recorded insufficient information.

The number of occurrences for each person should be recorded on the observed interview report.

The following scale could be used for scoring each question:

(*a*) **Exactly as worded**. The interviewer asks the question exactly as written, and possibly only adds words such as "and" or "well";

(*b*) **Reworded, meaning the same**. The interviewer adds words, although the changes are only minimal, but does not change the actual meaning. Supervisors should record these additional words, as they will be valuable in test evaluation procedures;

(*c*) *reworded, meaning different*. This category should be used if words are added, or key words missed, to the extent that the actual meaning has changed. For example, if the words "last 12 months" were omitted from the relevant question, the whole meaning of the question would be changed and it is left to the respondent to interpret what is meant by "usual activity". Once again, supervisors should record on the observed interview report the words that are actually used by the interviewer;

(*d*) **Not asked, response inferred.** This category should be used if interviewers decide they do not need to ask the question because they think they know the response, or, perhaps, they forgot to ask the question. Supervisors should also mark the questions where this has occurred and record it on the observed interview report.

Not all respondents will understand the questions put to them by the interviewers. It is important that interviewers use correct probing techniques for clarification. It is the supervisor's role to assess whether interviewers are using correct probing techniques or whether they are prompting the respondent with their own ides of what the response should be. This may lead to potentially inaccurate data.

If there is any confusion on the part of respondents, interviewers should seek clarification by, perhaps, repeating the question or by neutrally probing.

A probe or explanation is inappropriate if it either changes or limits the frame of reference of the question, limits the response possibilities or suggests possible answers. This form of questioning is being directive and prompts the respondent to react to or give a specific answer. This approach will lead to inaccurate data being collected and is therefore inappropriate. For evaluation purposes, supervisors should record where this happens on the form as well as on the observed interview report.

(*e*) *Completing the observed interview report*

In completing the last part of the observed interview report, the supervisor should provide details of questions where interviewers had difficulties; comments on introductions, explanations given and closing remarks; and overall performance.

These summary comments should be provided based on the earlier comments and the tallies of recordings from the previous pages. Care should be taken that comments are factual and positive. If, owing to an uncooperative respondent, it was difficult for the interviewer to complete the census form, this needs to be acknowledged on the observed interview report. Supervisors need to be concise and relevant; encouraging and constructive in their feedback, and not demoralizing; and precise and explicit where there are errors.

After the supervised interview is completed and they have left the household, the supervisor should discuss the evaluation with the interviewer, emphasizing the positive areas and pointing out any problems. The problems need to be pointed out in a positive manner. Any problems should be prioritized and their significance weighed in the context of the situation. Negative comments need to include suggestions for improvement.

Interviewers must be given the opportunity to ask questions, provide comments and indicate whether they agree or disagree.

In the case of extremely poor performance, supervisors may need to determine whether an interviewer should continue his or her employment. Before such a decision is made, extra supervized interviews should be carried out and supplementary training provided. However, in extreme circumstances, where interviewers have blatantly ignored instructions, they may need to be dismissed summarily.

(*f*) *Observing interviews during tests*

The procedures for observing interviews may be different for tests and the main census enumeration. During tests, the supervisor would observe approximately four interviews before suggesting any changes. During census enumeration, the supervisor would suggest improvements after the initial interview was observed. This is because during tests, evaluation of training and procedures is important and may require a few observations to confirm the nature of the problem, whereas during census enumeration, the quality of responses is so important that additional incorrect information cannot be permitted.

In tests, analysis of the observed interview report will need to be carefully undertaken, and attention paid to the types and frequency of errors. The evaluation needs to consider whether the mistakes are being made by only one interviewer, all the interviewers trained by the same supervisor, or all interviewers.

The answers to this evaluation will provide a good indication of where improvements need to be made. These could be in (*a*) the quality of the interviewers; (*b*) the interviewer recruitment programme; (*c*) the master trainers or the training; or (*d*) the instructions.

This analysis can also be of assistance to the evaluation of other aspects of tests (e.g., analysis of non-response to fertility questions by age groups and marital status). This could provide some indication of whether specific questions are being missed in certain circumstances and what those circumstances are. This would enable the interviewers' instructions and perhaps even the trainers' instructions to be reviewed before the main census.

An analysis of all errors on all completed test forms, dissected by interviewer training groups, will provide some indications of whether there are problems across the interviewing panel as a whole. This may indicate a possible problem with either the documentation or the instruction guides, or whether individual interviewers or individual trainers are at fault. This disciplined approach to analysing activities and occurrences will enable the census agency to substantiate its evaluation procedures.

4. *Checking households already enumerated*

A second method of quality assurance is for the supervisor to return and check a sample of households already enumerated to ensure that the enumerator did indeed make contact. Checks can also be made on whether enumerators completed the form in the right manner, and without leaving questions unanswered. This process is often called a probity check and the results are recorded in a probity report.

The probity report will identify whether enumerators are actually calling at households, and whether rapport has been established with the respondent. The latter point is an indication of whether enumerators are managing the interpersonal aspects of their work.

Probity checking is an integral and necessary component of the quality assurance strategy. It is a positive aspect designed to assist the development and monitoring of enumeration. Probity checks are also a public relations exercise with the community. Probity checks will: (*a*) check and confirm whether an enumerator actually called at a dwelling; (*b*) monitor respondent reaction to the enumerator's visit; and (*c*) establish whether the enumerator provided enough explanation.

In essence, probity checking is designed to give an indication that enumerators are doing their job. It is important that this is done early enough in the enumeration period to improve poor performance, and not wait until the work is nearly completed. If these checks are done too late, corrective action will be extremely time-consuming and expensive. It is recommended that three or four visits be made to dwellings that the interviewer has recorded as having finished. While the selections would normally be at random, there may be cases where the supervisor determines that specific dwellings require close inspection.

When checking households that have already been enumerated, the approach can be fairly simple. In essence, supervisors need to do the following:

(*a*) Introduce themselves and the census;

(*b*) Explain that the purpose of the visit is to conduct quality assurance;

(*c*) Establish who spoke to the enumerator and, where possible, speak to that person;

(*d*) Ask "Was the enumeration (e.g., interview) completed to your satisfaction?";

(*e*) Ask "Do you have any questions about the census?";

(*f*) Thank the respondents for their cooperation.

In this probity process, supervisors record comments by the householder regarding (*a*) whether the enumerator made contact; (*b*) whether the enumerator established rapport; (*c*) whether the interviewer completed all the questions (in an interviewer method); and (*d*) whether there were any problems.

If there are a number of problems associated with the visits made to date, the supervisor will need to ensure that interviewers know exactly where they need to improve. Depending on the significance of the problems identified, supervisors may need to determine whether to do additional probity checks before and/or after they have provided feedback to the interviewer. If significant problems continue, supervisors will need to discuss the matter with their regional manager or deputy regional manager.

5. *Checking coverage of the enumeration area*

The supervisor should assess that enumerators have covered all of the households in their allocated enumeration area and no others from adjoining areas. This can be done by reconciling the forms, or the entries in the enumerators record book, with the map and household list.

The map and household list can also be checked for any additions or deletions by (*a*) asking enumerators whether they have found any new or missed dwellings; (*b*) checking the changes they have made; (*c*) using local knowledge to ascertain any additional changes; (*d*) doing spot checks of the enumeration area.

In some countries, enumerators are required to place a visual sign on the outside of households they have enumerated. This may be done by a chalk mark or by sticking an adhesive label on an obvious space. In these cases, the supervisor can quickly ascertain whether all households have been enumerated.

6. *Checking completed census forms*

This section provides the most significant level of quality assurance of data where a self-enumeration method is used.

The supervisor should scrutinize all census forms before the material is returned to the processing centre. This scrutiny is essential to ensure that enumerators have completed their work as required and that completed workloads are of sufficient quality for the processing phase. The nature of this scrutiny should include checking that:

(*a*) All fields to be completed by the enumerator have been completed correctly;

(*b*) All census forms are accounted for;

(*c*) Census forms have been fully completed;

(*d*) Summary information has been completed correctly.

This scrutiny should be carried out as soon as possible after enumerators have finished a portion of their workload. It does not have to be left until the end of the enumeration period. They can be conducted on a daily basis for workloads

completed that day. Checks made at the start of the enumeration period will detect problems early and allow timely feedback to the enumerators.

<center>G. Technology issues for field operations</center>

<center>1. *Introduction*</center>

The use of sophisticated technology for field operations in a census has traditionally been very limited owing to (*a*) the disperse nature of the operation over the entirety of a country; (*b*) cost; (*c*) lack of suitable infrastructure; and (*d*) the majority of field staff being temporary employees who only work for a short period, usually from their homes.

Telephones and facsimiles have represented the main use of technology in the field and will continue to do so for the foreseeable future in some countries. However, personal computers and the Internet are increasingly becoming viable tools in the management and operation of field activities.

The implementation of technology for field operations has two objectives. These are (*a*) to improve the efficiency of enumeration through effective communication between census management and field staff; and (*b*) to improve accuracy and quality of administrative and operational information recorded in the course of field operations.

Field operations have two distinct periods. The first period starts with the recruitment of temporary field staff and ends just before the enumeration activity begins. This period is characterized by times of intense activity, such as recruitment or training, with reasonably quiet times in between. During this period, accuracy and quality of administrative information is important.

The second period is the enumeration itself. During this period, speed and efficiency of communication is important in order to respond quickly to issues that arise in the field.

Planning the field operations should aim to maximize the use of available technology but minimize reliance on unproved or unreliable technology. The use of technology should also be consistent across the country.

For example, the use of the Internet may be attractive. However, if it is only reliable in a small part of the country, it may not be cost-effective or efficient to have two systems in place; one based on the use of the Internet to communicate with some staff and another based on other technology to communicate with the remaining staff. Where new technology such as the Internet is to be used, it must be subject to rigorous testing in the field before being implemented.

Another important consideration is the type of information transmitted and by what method. Care should be taken that any confidential information is transmitted through secure methods. For example, facsimiles containing confidential data misdirected to a wrong number could prove embarrassing for the census agency. This could also generate bad publicity at a crucial time during enumeration.

<center>2. *Types of technology*</center>

There are four main types of technology that can be applied to field operations: (*a*) telephone; (*b*) facsimile; (*c*) computers; and (*d*) the Internet.

(*a*) *Telephone*

While the use of telephones is commonplace in most countries, there are some countries, or areas within countries, where widespread access to telephones is limited. The situation in any given country will need to be taken into account when considering the use of telephones in field operations.

In many cases, using telephones to maintain regular communication between the various levels in the field structure will be the most practical and cost-effective method of monitoring and reporting. Accordingly, planning for the census enumeration should specifically include the use of telephone communication. This can be documented in procedural manuals, which can provide guidelines on the frequency of calls. Quality assurance documentation containing check lists of items to be covered during telephone contact can also be included.

Telephone answering machines or voice mail services can also be considered. This is particularly useful during the enumeration activity, when the majority of staff will be away from a telephone for a large part of the time.

(*b*) *Facsimile* (*Fax*)

The use of facsimile is also widespread in many countries. It is relatively inexpensive and flexible in that it can be used to transmit a variety of reports or even copies of maps for updating. One advantage of using facsimile is that it is a written record. This is particularly useful for progress reporting or providing administrative data to different management levels. Standard documentation and control forms can be designed with facsimile transmission in mind. For example, a simple control form can be used to record the payment details for a group of collectors and sent to the census agency for input to the payment system.

(*c*) *Computers*

In considering the use of computers, the first issue to be addressed is how their use will assist the management of the field operations and the quality of the census. Computers provide the potential to greatly enhance the range of management information collected (see section E above). This information is easily accessible and can be acted upon quickly. However, information on computers needs to be carefully managed so that the loss of information through hardware faults does not have an adverse impact on field operations at crucial times. It should be understood that the use of computers in the field operation is primarily about the management and administration of the field system. It is not about collecting statistical information on computers.

The census agency may want to implement a computer-based system for use in field operations. In this case, and particularly where temporary staff will be using computers

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in their homes, it is a major technological undertaking and should be approached carefully. While the benefits of using computers in managing and administering field operations can be significant, the costs and potential problems can be equally significant. A clear benefit to the statistical agency needs to be established before implementing a computer-based system.

In other cases, it may be left up to individual field staff whether they want to use their own computers for managing their work. In these cases, it should be emphasized to these staff that any systems they use must be compatible with the clerical procedures implemented by the census agency. For example, it would be undesirable if reports were compiled in a variety of different formats rather than the one standard report. This can cause confusion, and extra work, for staff responsible for interpreting and collating these reports.

If it is considered that a computer-based system is desirable and feasible, a project team should be established as early as possible. This team would be responsible for planning, designing, testing and implementing the system. It is unlikely that the use of computers at the supervisor level would be feasible on cost grounds. Therefore, such a system should be aimed at the regional manger and/or deputy regional manager levels. Key issues that will need to be addressed are included in table III.6.

(d) The Internet

As a starting point, the level of use of the Internet in the community in general should be assessed to determine whether is a possibility of providing Internet-based options in the field. Only where there is significant use of the Internet should any effort be made to put it into use for field operation purposes.

One service that is usually a key component of Internet services is e-mail. This may be particularly useful for communicating with staff. In many cases, it is likely that field staffs who have access to e-mail will use it to communicate. If it is known that all field staff in a particular level in the hierarchy have access to e-mail, it may be reasonable to include the use of e-mail in the design of field operations. Again, there are cost issues that need to be taken into account, but it may prove a more cost-effective means of transferring information than the telephone or fax. Another issue that needs to be considered is security of information transferred through the Internet.

Table III.6. Issues for implementing computer systems in field operations

Issue	Description
Skills	Are the potential field staff likely to be computer literate?
Infrastructure	Can the core infrastructure of the country support widespread computer systems?
Hardware	Will computers, monitors, printers and modems be provided and who will be using them?
Telephone system	Does the telephone system in the country provide a reliable service across the country for computer based transfer of data?
Telephone lines	Will the statistical agency provide an additional telephone line exclusively for census use or subsidize the use of the managers own private line?
Software	What software will be used? How will the software be designed? Will a special purpose application be written? Will standard packages be used with the census agency providing templates (such as in Microsoft Word) or blank spreadsheets set up for use in the field?
Training	How will staff be trained?
Data transfer	How will data be transferred between the census agency and field staff and vice versa? How will different versions and updates of the same data be managed?
Security	Is the data confidential, and if so, how will the data be secured?
Testing	How will the system be tested to assure its viability?
Transport and return	How will the technology be delivered and returned?
Asset	How can the technology be used after the census? Can the hardware be used in the processing phase?

IV. DATA PROCESSING

1. *Introduction*

The strategic directions for the processing phase need to be established early in the census cycle. The single most important decision regarding the processing phase is deciding on the processing system to be used and the technologies that will be adopted.

This decision needs to be made early enough to allow sufficient time for testing and implementation of the processing system.

2. *Processing system*

Of all the phases in the census cycle the processing phase offers the greatest opportunity for the use of sophisticated technology. Rapidly emerging technologies such as imaging and intelligent character recognition offer great potential and associated benefits for census processing strategies. Issues associated with the use of particular technologies are discussed in section F of below.

There are many issues that need to be addressed before any of the technologies discussed in section F are implemented. The main aim of implementing any particular technology into the processing phase should be to assist in the effective and efficient processing of census forms. It should not be about implementing technology for technology's sake.

The following key management issues need to be addressed:

(*a*) Strategic directions for the census programme;

(*b*) Technology infrastructure currently established within the census agency;

(*c*) Level of technical support available in the country;

(*d*) Level of information technology expertise in the census agency;

(*e*) Technologies used in previous censuses;

(*f*) Establishing the viability of the technology;

(*g*) Outsourcing of processing activities;

(*h*) Cost-benefit.

Each of these issues is discussed in detail below.

(*a*) *Strategic directions for the census program*

The processing strategies that are adopted need to be considered with regard to the overall strategic directions that have been set for the census programme. These are often related to timeliness and cost; for example, the release of data nine months after census day or a reduction in costs of 5 per cent per capita of population, when compared to the previous census, would not be timely or cost-effective. The time and costs associated with the processing phase will have a large influence on achieving overall census timeliness and cost-effectiveness.

Consideration may also be given to the corporate strategic directions of the statistical agency. This is because the adoption of new technologies may have longer-term benefits for the statistical agency, such as (*a*) acquiring hardware and software that can be used after the census and (*b*) staff acquiring new skills that can be utilized in the ongoing work programme of the agency.

(*b*) *Technology infrastructure currently established*

The establishment of sophisticated technology infrastructure within a census agency is a significant undertaking (see sect. F below). The lead times necessary to test, install and configure new technology should not be underestimated. The time required will depend on the current levels of infrastructure established within the census agency.

(*c*) *Level of technical support available*

If hardware and/or software is sourced from commercial vendors, the engineering and software support provided by these vendors is both necessary and critical. Before implementing any new technology, it is necessary to establish the level of support that is available for that particular technology within the country.

This can be particularly important if the technology adopted is of a specialized nature. Owing to costs, some vendors may be reluctant to provide an extensive store of spare parts in the country and instead rely on sourcing them from outside the country if they are necessary. They may also wish to provide software support through international help desks. However, census processing is subject to tight deadlines. Delays caused by the unavailability of spare parts can affect not only the particular process where these spare parts are required but also the work flow to other processes. Similarly, not being able to obtain timely technical advice for software problems owing to different time zones can also lead to delays. These delays may not only adversely affect deadlines but can also incur significant costs in lost production.

To minimize the effect of down time on census processing activities some agencies have insisted that vendors provide support on-site at the processing centre for critical activities (e.g., data capture). This support may be in the form of an engineer on-site to maintain and service the equipment. Other support can include the provision of "hot spares", which are placed on-site at the processing centre. These are complete units that are on standby and can be

brought on-line quickly to replace units that fail. Other spare kits of parts should be ordered and placed on-site at the processing centre. These spare kits are essential, especially if the equipment has been sourced internationally rather than locally.

(d) *Level of information technology expertise present in the census agency*

Another factor to consider is the level of information technology expertise currently available within the census agency. Additional training programmes may have to be considered to provide agency staff with the necessary knowledge to support processing activities. These training programmes should be developed as early as possible to enable staff to become proficient well before processing commences. In some cases, it may be necessary to seek assistance from other countries and/or to send key personnel to other countries for training.

(e) *Technologies used in previous censuses*

In many countries, there are 10 years between censuses. Recent rapid advances in technology may mean that the technology used in a previous census has been superseded. However, this does not mean that this technology should necessarily be abandoned.

Significant resources may have been spent on establishing these technologies and census agencies may wish to capitalize on that investment by reusing significant portions of the system. It may be decided that census agency resources are better utilized in other areas of the census programme (e.g., establishing dissemination products). Reusing existing technologies will be of more significance to countries that undertake censuses every five years. If particular systems are reused, they will still need to be rigorously retested before they are implemented into processing operations.

There will also be cases where the adoption of new technology will not be cost-effective. For example, in countries where labour costs are low, the adoption of new technology such as imaging may prove to be more costly when compared to traditional key-entry systems.

(f) *Establishing the viability of the technology*

During census planning, significant lead times should be allocated for the purpose of investigating and testing the viability of different technologies.

A recommended approach, undertaken by many countries, is the testing and implementing of new technologies in other smaller statistical processing operations before the census. This has allowed these agencies to become familiar with the technology and to solve operational problems before the technology is implemented in the census. Given the importance of the census and its infrequency, it is important that agencies have a thorough understanding of the limitations of any new technology before implementing it in the census.

Regardless of whether an agency has experience with a particular technology it is recommended that a rigorous testing programme be conducted before the census. This is because technologies that are effective in one environment may not necessarily be effective in the different environment of a census. The testing programme can consist of the following:

(a) Small-scale and specific-purpose tests that target particular components of the overall processing system (e.g., data capture, coding or editing). These tests may also target particular problem areas from the previous census;

(b) Larger scale tests that not only target individual components of the processing system but also test the integration of all of the component parts of the system.

The smaller-scale tests can use either contrived test data or data from any of the pilot tests conducted for the census. These tests can be designed to test specific functionality and performance of particular components of the proposed processing system and should be undertaken first.

After the smaller-scale tests establish the viability of particular components, larger-scale tests should be conducted. The main aim of the larger-scale tests should be to test the integration of all components of the system. During these integration tests, it may be necessary to make changes to particular component parts of the system. In these cases, the complete system should be retested using the same data to measure the impact the changes have had.

The testing programme should also schedule a final processing test that imitates census conditions as closely as possible. This should be regarded as a "dress rehearsal" of census processing and should be conducted before census processing commences. While it is impossible to replicate the exact conditions of a census it is important that volume testing that simulates the load and conditions of census processing is also undertaken.

(g) *Outsourcing*

It is usually more efficient and cost-effective for census agencies to conduct the majority of processing activities. However, outsourcing may be considered for all or part of the processing activities, especially those activities that may require (a) specialist expertise that is not available within the census agency, and (b) the provision of specialized equipment that is only needed for the census and has no further use in the census agency.

Outsourcing may be particularly relevant for specialized activities, such as data capture, that use sophisticated technology (e.g., imaging and intelligent character recognition). This allows the managers of the processing centres to concentrate on the other core activities of processing. However, in these cases, managers will need to ensure that the activities that have been outsourced deliver the data quality specified. Managers will not need to be concerned with the finer details of the technology (i.e., the "how") but rather only the results (i.e., the output). However, they will need a broad level of understanding of the technology in order to both specify the contract for outsourcing and manage that contract.

Special attention will need to be paid to managing the contract owing to the loss of control that will result from outsourcing. This loss of control can have serious implications regarding the quality of data produced. Therefore, agencies should exercise extreme caution when outsourcing critical functions associated with processing. Some agencies have successfully outsourced contracts for census processing, but there are many more examples of failures. Details on managing outsourcing contracts are contained in chapter 1, section G.

(*h*) *Cost-benefit*

Apart from establishing the viability of new technologies, investigations will also need to include a rigorous cost-benefit analysis. In the early stages of planning, it is likely that several strategies and solutions will be considered. Each should be compared using the same assumptions, which may include number of units to be processed, staff costs and so on. The cost-benefit analysis should include the following:

(*a*) Capital cost of hardware, including spare parts;

(*b*) Software licence and development costs;

(*c*) Vendor support costs;

(*d*) Training costs;

(*e*) Salary costs for number of processors needed. These may vary for each strategy, depending on the amount of automation involved;

(*f*) Benefits, which may include:

(*i*) Time needed to process the forms,

(*ii*) Quality of the data produced;

(*g*) Risks.

The majority of the inputs mentioned above are straightforward and do not need further discussion. However, because of the critical nature of census processing, it is worthwhile to expand on the identification of risks and managing these risks. It is important that all of the risks associated with particular technologies are identified early and managed appropriately before, during and after implementation. The processes involved with identifying, analysing and responding to specific risks include the following:

(*a*) Identifying the risk;

(*b*) Quantifying the probability of each specific risk;

(*c*) Quantifying the impact of the consequences of each risk;

(*d*) Identifying risk mitigation strategies of each risk;

(*e*) Costing the risk mitigation strategies of each risk;

(*f*) Quantifying the probability of each risk after the risk mitigation strategy is in place;

(*g*) Quantifying the impact of the consequences of each risk after the risk mitigation strategy is in place.

B. Location of processing centres

1. *Introduction*

It is unlikely that the staff needed to process the census will fit into the census agency's present accommodation. In many countries, the number of staff needed to process the census will be larger than the total number of staff in the census agency. Therefore, premises of a sufficient size need to be found. Issues that need to be considered are (*a*) the number of locations (centralized versus decentralized) and (*b*) suitability of premises.

2. *Number of locations*

Issues to be considered when deciding on the location and number of processing centres include the following:

(*a*) Availability of skilled workforce;

(*b*) Availability of support services;

(*c*) Coordination of processing activities;

(*d*) Quality;

(*e*) Geographic location for delivery of forms;

(*f*) Dispersing infrastructure and skills throughout the country;

(*g*) Costs.

Multiple processing centres may be configured as responsible for the complete processing of data for the surrounding regions, and particular processes (e.g., data capture), with other processes (e.g., coding) conducted at different centres.

(*a*) *Skilled workforce*

Processing centres will need to be located in areas where there are a large number of potential workers who have the required skills and are available for processing. This will usually mean that the centres will be located in large urban areas. The processing centre should be located at a site within these urban areas that allows staff easy access to public transportation facilities.

(*b*) *Support services*

The activities at the processing centre rely on many support services, which may be provided by staff from the census agency, the statistical agency or other external providers. These may include specialist subject matter support (e.g., classification experts from the statistical agency), information technology support and other administrative support services. All of these support services should be available in the locations selected. The number of processing centres may impact on the level of support that is available from these support groups. It should be noted that, during census processing, some of the support staff from the statistical agency will also have commitments to the ongoing work programme of that agency.

(*c*) *Coordination of processing activities*

Coordination of overall national processing will be needed with multiple locations. The appointment of a national operations manager will assist in these coordination activities.

Special attention will be needed to ensure that each centre is properly resourced and meets the processing timetables. In some circumstances, it may be necessary to add resources to particular centres if they are experiencing unforeseen difficulties. This could impact on the budget. Reallocation of resources is much easier in a centralized scenario, as these resources can be more easily transferred between processes to overcome temporary difficulties.

(*d*) *Quality*

The most common argument against decentralizing processing to a number of locations is the risk to the quality of census data owing to a lack of consistency in processing among centres. This can occur when managers and/or staff in different centres interpret or implement procedures differently.

If multiple centres are used, particular attention should be paid to implementing consistent quality assurance procedures across all centres. In these cases, open and regular communication channels between the centres are essential. Any proposed changes to procedures and/or processing systems should be carefully coordinated with all centres. The appointment of a national quality assurance manager who is responsible for monitoring the quality of data produced in each centre will assist in coordinating these tasks among all centres.

(*e*) *Geographic location*

If a centralized processing centre is used, it may be beneficial to locate it near the site of the greatest population within a country. This would mean that a large proportion of forms would only have to be transported relatively short distances. It would also be expected that this location would also have the most suitable transportation access from most regional areas. However, with decentralization to a number of regional centres, transportation costs may be significantly reduced.

Another advantage of decentralized locations is that the staff employed at these centres have knowledge of their locality, which may be beneficial. Locally engaged staff may have a better knowledge about local industries and occupations, which can be utilized in the coding process. However, care needs to be taken that these staff do not rely too much on local knowledge and regard themselves as experts and disregard established standardized coding procedures.

(*f*) *Dispersing infrastructure and skills throughout the country*

A decision may be made to decentralize to a number of centres in order to take the opportunity to provide both infrastructure and skills to various parts of the country. This is a strategic decision, and the capabilities of the proposed regions need to be considered. While the census provides such opportunities, it should not be regarded as a training exercise and the staff in these regions must be capable of undertaking the processing activities to the agreed quality standards.

(*g*) *Costs*

If buildings are sought in the commercial market, rental costs will usually be higher for a short-term tenancy than for a longer period. In general, the costs associated with decentralized operations may be higher than those for centralized ones because of the diseconomies of scale associated with duplication of support services.

3. *Selecting suitable premises*

Obtaining available premises to house census processing activities may not be straightforward. The fact that the premises may only be required for a relatively short period of time can restrict the choice of premises. In some countries, other government agencies may have established infrastructure that can be utilized for census processing. In other circumstances, premises may need to be obtained through commercial markets. Some of the factors to consider when selecting premises for processing include:

(*a*) Security;

(*b*) Access for transportation;

(*c*) Building layout;

(*a*) *Security*

The security of the census forms is necessary owing to the confidential nature of the information on the forms and the assurances given to the public about protecting their personal information. Therefore, building security issues must be considered during the selection of a building and not as an afterthought. It is difficult and expensive to protect against determined breaches of security and, in reality, no building that houses staff can be made totally secure from the removal of confidential information. The perception that adequate security provisions have been put in place can be equally as important as the actual provisions themselves.

Dual or multi-tenancy buildings provide a risk to security, especially where entry and exit routes such as loading docks, stairs and lifts are shared; in this regard, single-occupancy premises are preferred. In single-occupancy premises, the number of entry and exit points should be kept to a minimum. Clearly, staff access is an issue, but as long as staff are able to enter and exit the building without undue delay, the fewer entry points will provide for better security control.

A combination of both electronic and physical security can be implemented. With the technological advancement in recent years, electronic surveillance has become more

financially viable and an extremely effective option, even for short-term projects such as census processing. The presence of physical security in the form of security guards not only covers the issue of perception of security discussed earlier but is also effective in the important aspect of creating a security consciousness in the minds of employees.

(*b*) *Access for transportation*

While not an overriding issue, suitable access for transport to deliver the forms may be important in some countries. If large road transport vehicles are used to transport the forms, easy access to the premises will be required. This will be particularly important if the processing is centralized in one location where large volumes of materials will need to be processed.

(*c*) *Building layout*

Because of the large volume of census forms, premises should contain a combination of office accommodation for staff and storage areas for the forms. It is recommended that single premises be used for both the storage and processing of forms. This will enable a more efficient movement of material throughout the processing centre. The storage of material nearby but in another building will involve additional handling costs and the potential for forms to be damaged, as well as introducing security risks. There will also be economies of scale with a single premise in regard to both rental cost and security.

Special attention should be paid to estimating the space required for the storage of material and for the efficient flow of forms throughout the building to reduce bottlenecks. For example, sufficient space should be provided in the office accommodation for the storage of workloads that the processors are currently working on. If this is not the case, the workloads will have to be returned to a central storage area at the end of each shift. This would create a bottleneck and lost production at the beginning of each shift, as processors would have to retrieve their workloads from a central point.

While storage of some material within the office accommodation is required, it must be remembered that the majority of material should be stored in designated storage areas and not in the office accommodation. Excess amounts of material in the office accommodation can create occupational workplace hazards and restrict the design of workplace configurations. Material can be transferred from specifically designed storage areas to the office accommodation only when it is needed for processing. Efficient flow control systems to control the movement of forms are discussed in section D below.

The design of the office accommodation will need careful planning not only to ensure that material can flow efficiently but also to take into account occupational health and safety issues. For example, several desks can be grouped together in a way that will allow the computer cables to be hidden between the desks rather than run across walkways and corridors.

C. Establishing the workforce structure and recruiting staff

1. *Introduction*

Issues associated with recruiting staff for the processing phase are in some ways similar to those associated with recruiting staff for the field operations phase. While some of the logistical issues will differ, the main objective is the same. The aim of a successful large-scale recruitment campaign for processing should be to recruit the best quality staff from those available, within the time allocated and within budget.

2. *Establishing the workforce structure*

When planning a recruitment campaign, it will be necessary to establish the workforce structure at the processing centres. It is not possible to be prescriptive about what structures should be put in place at a processing centre, as this will largely depend on the processing strategy, technology used, number of staff employed (see sect. 3 below) and the local conditions in a country.

If processing is decentralized to a number of locations, the structures can also vary according to the tasks carried out at each centre. For example, one centre may be responsible for a particular process (e.g., data capture), with other processes (e.g., coding) conducted at different centres. In other cases, multiple processing centres may be established throughout the country that are responsible for the complete processing of data for the surrounding regions.

A generic management structure is illustrated in figure IV.1. This structure is based on the assumption that there is one processing centre that carries out all tasks associated with the processing phase. Countries will need to adapt this to suit their own conditions. The roles and responsibilities of each level in the generic structure are also discussed below.

In this structure, the director of the processing centre reports directly to the executive officer in the central census agency. If processing is decentralized to a number of centres, an additional layer of management may be needed to coordinate and monitor the activities of each processing centre and report to the census agency executive officer.

Managers, who are accountable for broad areas of responsibility, report to the director of the processing centre. The areas and associated responsibilities are shown in table IV.1.

An important point to note in this generic top-level structure is that one position has been allocated for operations and one position for quality assurance. Allocating separate responsibility to these tasks at this level in the structure reflects the need for these important aspects of processing to be managed by separate positions. In general, this has not been done by agencies in the past and is a relatively new practice. However, agencies that have successfully adopted this practice have proved that there are great benefits in adopting such a model.

Figure IV.1.   Processing centre—top-level management structure
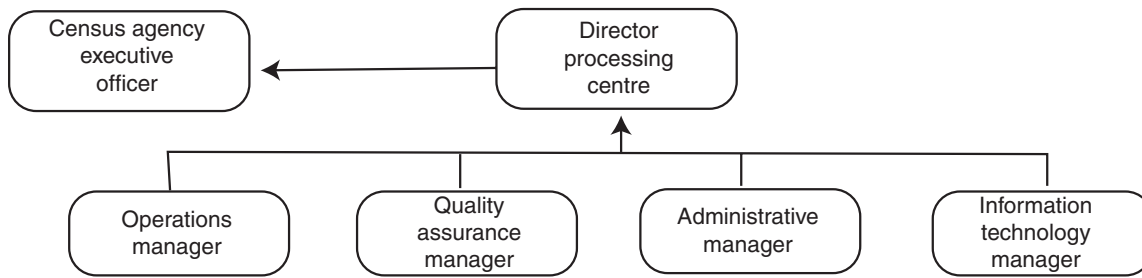
Quality assurance managers will be able to devote all of their time to ensuring that the quality of the data meets the agreed minimum standards, without the pressures of day-to-day operational control. Operational managers will similarly be able to devote all of their time to coordinating the work flow and ensuring that timetables are met. Depending on the size of the processing centre, the operations manager may need assistance from additional deputy managers at the middle management level. However, the important point is that there is a single position in the management hierarchy that is ultimately responsible for all operational tasks.

Adopting this management model during processing operations may lead to conflicting opinions regarding the different components of overall data quality (i.e., timeliness, cost-effectiveness and data accuracy). For example, the quality assurance manager may recommend that additional procedures are implemented to rectify deficiencies in a particular process that are causing problems with the accuracy of the data. The operations manager will be responsible for assessing the impact that these procedures may have on timeliness and cost. The director will be responsible for resolving conflicts and establishing a balance between quality criteria, and must do so with regard to the strategic directions set for the processing centre.

Below this top-level structure there may be another level of middle managers. The number of levels of middle management will depend on the size of the processing centre and the complexity of the processing methodology adopted. These middle managers will be responsible for several teams of staff that comprise a supervisor and several processors. An example is shown in figure IV.2.

The ratio of supervisors to deputy managers, and processors to supervisors, will vary according to the processing methodology used and the number of staff employed. However, special attention should be paid to establishing the ratio of processors to supervisors. The number of processors in these teams should be limited so that an effective team environment can be established and the supervisor has adequate time to pay close attention to all staff. As an example, some agencies have established ratios of approximately 15 processors per supervisor.

Supervisors are a key link in the management structure and communications chain. They are usually temporary staff and form the link between management, who are generally census agency staff, and the bulk of the temporary processing staff who are undertaking the processing tasks. Because of their importance in the structure it is worthwhile discussing their tasks and responsibilities. These can include the following:

(*a*) Conduct day-to-day supervision of a team of processors;

(*b*) Prioritize, coordinate and monitor the work flow;

(*c*) Maintain an effective team environment;

(*d*) Conduct on-the-job training;

(*e*) Ensure that all procedures are being followed;

(*f*) Provide performance feedback to processors;

(*g*) Report to management on issues affecting data quality and any other issues they should be aware of;

(*h*) Co-ordinate with the storage room.

In addition to supervisors, group leaders can also be engaged in the following activities:

(*a*) Provide performance and daily production reports to the supervisor;

(*b*) Assist processors with technical issues;

(*c*) Provide processors with all needed materials and questionnaires;

(*d*) Check-in and checkout of questionnaires with the storage room.

3. *Estimating staff numbers*

The strategies adopted for the recruitment campaign, and the management structure, will largely depend on the number of staff required at each processing centre. Therefore, the first step should be to estimate the number of staff required to complete processing in the time-frame specified. The number of staff required can be calculated using the following model:

(a) Estimate of total number of units (e.g., persons and enumeration areas) to be processed;

> **A possible structure for data-processing operations**
>
> The director of data processing reports directly to the executive director
>
> - The data processing operation unit assists the director of data processing in evaluating progress in different activities, solving technical problems and comparing daily production against the original data-processing work plan.
> - The data processing unit is headed by the director of data processing and includes as members the storage room attendant, the data-entry supervisor, census key subject matter staff and a representative from the administrative directorate. During the preparation stage, data processing committees can be formed to ensure that the technical and logistical planning of the data processing activities are on schedule and to make decisions regarding data processing needs.
> - The storage room attendant submits daily reports to the data-processing operation unit on the office editing, coding and final storage activities.
> - The data-entry supervisor submits daily reports on the progress made on the data-capture activity.
> - The data processing operation unit has daily meetings and a report is submitted to the executive director after each meeting
>
> ———
>
> *Source:* Palestinian Central Bureau of Statistics

(b) Estimate of total number of units to be processed for particular topics;

(c) Average production rates (units processed per hour) per processor;

(d) Average processing hours per shift per processor;

(e) Number of shifts per day;

(f) An allowance for public holidays and staff taking leave;

(g) Estimated staff turnover;

(h) Building capacity;

(i) Length of time for processing.

(*a*) *Total number of units*

The total number of units to be processed can be derived from a variety of sources. The total number of enumeration areas and/or dwellings may be available from the mapping and listing process for the current census. The estimated number of persons may be available from current population estimates that are based on the previous census.

(*b*) *Total number of units per topics*

Not all questions on the census form will be processed for each person enumerated. For example, only those persons in the labour force will need occupation and industry coded; some questions may only relate to females over 15 years of age (e.g., fertility questions); and some questions may be targeted towards immigrants (e.g., year of arrival).

Therefore, estimates on data entry and coding actions required can be made for each topic, based on estimates of labour force participation rates, number of females over 15 years of age, or immigrants.

(*c*) *Average production rates*

Sources for this variable can be the results from the previous census and/or any processing pilot tests that are conducted for the current census. If data are not available from these sources, it is possible to draw on the experiences of other national census agencies that have similar conditions. For example, for key-entry systems, an overall average of 6,000 keystrokes per hour is a realistic estimate.

Figure IV.2. Processing centre—middle management structure
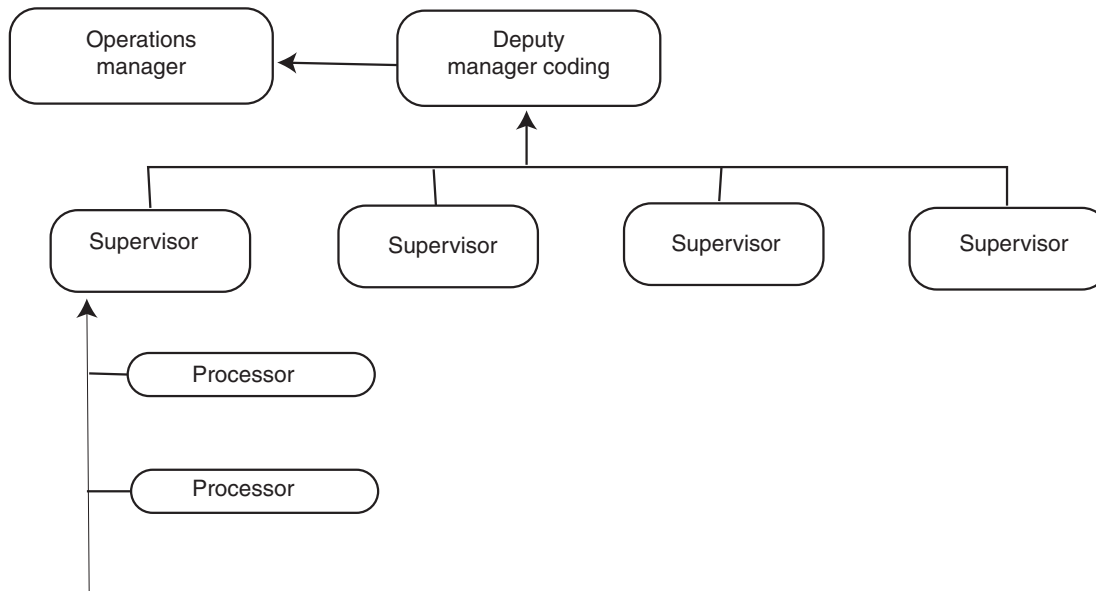
It is important that realistic estimates are made for this variable and, where possible, they should be based on quantitative data from previous experiences. This is because salary costs for processing are generally a large component of the overall census budget. Discrepancies between these estimates and the rates actually achieved during production can have a large impact on the overall census budget.

An allowance must also be made for the expected learning curve of processors. As processing continues, staff will become more proficient and therefore production rates will rise. The steepness and length of the learning curve (i.e., the time it takes for processors to reach peak efficiency) largely depends on the particular process, the technology used and the quality of staff recruited. In some simple processes' staff may reach peak efficiency in a short period of time, whereas for more complex processes, the learning curve can be spread over several months.

It should also be recognized that the actual form design could dramatically affect the production rates that can be achieved. It is therefore important that managers responsible for processing have an input into the form design process.

(d) *Average processing hours per shift*

It is important to estimate the processing hours achievable in a single shift. It is unreasonable to expect that a person employed for an eight-hour shift will be able to deliver eight hours of processing. Allowances must be made for time spent in meetings, training programmes, work breaks and so on. The amount of time allowed for this will vary depending on a country's particular circumstances, but it is important to factor unproductive time into the equation. In some countries, this time can comprise approximately 25 per cent of the total shift hours (e.g., six processing hours can be achieved in one eight-hour shift).

Allowances should also be made for the total amount of time processors will spend on quality assurance tasks. Some countries allocate an overall 10 per cent of processors' time for these tasks. This percentage will vary over the life cycle of the processing phase and should be built into the model.

(e) *Number of shifts per day*

Some countries may use more than one shift in a day. Using multiple shifts can assist in reducing capital costs associated with equipment purchases and/or reduce the total time needed to process the census. If multiple shifts are adopted, adequate time should be allowed between the shifts to avoid congestion.

(f) *Public holidays and leave*

Public holidays are the easiest to allow for as they are generally known. However, calculating an allowance for staff taking leave is more problematic. Again, this will largely depend on the particular conditions of service the staff are employed under and the country's particular circumstances. Experience has shown that when temporary staff are engaged to process the census and they have access to leave provisions (e.g., paid sick leave or other leave), they will generally avail themselves of these provisions. The experience of previous processing centres will provide a good guide as to the expected trend.

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(g) Staff turnover

The prevailing economic climate in a country will directly affect both the quality of staff available and staff turnover. The economic climate will differ markedly over time and from one country to another (and even between regions in a country), and therefore staff turnover may or may not be a significant issue. Countries will have to assess the significance of staff turnover when estimating staff numbers.

The majority of positions (often greater than 90 per cent) at a processing centre are usually short-term temporary ones, with relatively low remuneration attached to them. Therefore, in times of economic growth, with job growth flourishing and low unemployment, a census processing centre is more likely to be seriously affected by a high turnover of staff. Conversely, with an economy contracting and alternative jobs difficult to find, the processing centre will experience a more stable employment base.

Costs attributable to high staff turnover, which may be hidden in large ongoing organizations, are magnified in a short-term project, with a fixed budget and deadlines.

A booming economy and high turnover of staff is likely to result in:

(a) Loss of the best quality staff first;

(b) Additional recruitment costs and delays;

(c) Additional training costs for replacement staff;

(d) Learning curves for new staff, reducing production rates and quality of work overall;

(e) Management focus on training rather than on production;

(f) Possible greater utilization of leave credits;

(g) An increased risk of industrial disharmony.

(h) Building capacity

The capacity of the buildings selected to house processing staff may be a constraint on the number of staff that can be employed. Ideally, buildings with sufficient capacity will be sought after the required staffing numbers have been established, but this is not always possible.

Table VI.1.   Areas of responsibility at processing centres

Areas	Responsibilities
Operations	Day-to-day operations of the processing of forms. Includes all of the main processing tasks, including data capture and coding and coordination of work flows. Responsible for ensuring that timetables are met.
Quality assurance	Monitoring and control of all quality assurance systems and procedures, including edits and validation. Responsible for ensuring that data meet all quality standards.
Administration	Responsible for all administrative support of the processing centre. Includes facilities' management, recruitment, payroll services, purchasing and budget monitoring. Responsible for provision of efficient and effective support services.
Information technology	Responsible for all information technology support, including communication networks, hardware and software installation and maintenance. Responsible for maintenance and support of all information technology infrastructure.

Estimating data-entry time in the 1997 population and housing census in the West Bank and Gaza

The Palestinian Central Bureau of Statistics estimated the time needed to enter the data for the 1997 census, considering the following factors:

1. Number of working days per month was assumed to be 25 days.

2. Three shifts a day were used.

3. Each shift consisted of seven hours, with about one half-hour in between the shifts.

4. Six out of seven working hours were assumed as a base for average hours per day shift.

5. Only five out of seven working hours were used as a base for average hours in the midnight shift.

6. For the contingency plan, 10 per cent of data-entry time was used for cases of non-operational equipment that would delay the data-entry process.

7. Ten per cent of total data-entry time was added for data' entry verification.

8. Ten per cent of total keystrokes required were added to the total number of keystrokes required for editing and correction.

9. Ten per cent was added to the total time estimated for factors that might affect production such as closures, equipment malfunction and down time.

10. Average number of keystrokes for data entry of numeric data was assumed to be 5,000 keystrokes per hour.

11. Average number of keystrokes for data entry of alphanumeric data (entering the name of the head of household) was assumed to be 3,000 keystrokes per hour.

12. Only the name of the head of household was entered into the computer.

_____

Source: Palestinian Central Bureau of Statistics

(*i*) *Length of time for processing*

The length of time for processing can be either a constraint (e.g., processing must be completed by a certain date) or a variable (e.g., the building capacity allows for x number of staff and therefore processing will be completed on a certain date). However, in general, the length of time for processing will be a constraint. It is usually set as a goal in the census planning phase.

Once staffing numbers have been calculated, recruitment of staff can be divided into two streams. The first task should be to recruit the managers and the second to recruit the bulk of the processing staff.

4. *Recruiting managers*

Managerial positions are more specialized and fewer in number than the bulk of processing staff and therefore can be recruited through a different campaign. In the majority of countries, the senior managers of a processing centre will be recruited from census agency staff. In these cases, agencies can adopt their traditional recruitment methods.

It is essential to have managerial staff from the census agency at the processing centres as they will have an expert knowledge of the processing systems and procedures that have been developed. They will also be aware of the dependencies associated with the processing phase, the overall

census goals and how the processing phase will contribute to these goals. They will also understand the data and the core business of the census agency. It is also highly desirable to recruit capable staff who have experience in processing operations, as their knowledge and experience of operational work is a valuable asset.

However, agencies should note that the environment at a processing centre is generally quite different from that in the central statistical agency. It is operational and in the beginning is often described as "organized chaos". Therefore, to ensure that this chaos is indeed organized, it is important that the senior managers at the processing centre are aware of the different operational nature of the processing centre and that they are suited to this environment.

The number of subordinate staff a manager in a processing centre will usually supervise is higher than in the census agency. Therefore, the supervisory role of the manager becomes far more important.

A predominantly temporary workforce, many of whom may have been previously unemployed, can draw together a wide range of social and economic backgrounds. This environment is therefore more likely to have a volatile and socially unstable employee base than that of a more permanent workforce, where staff have security of tenure and a consistent source of income. In particular, managers must have good people skills in addition to statistical knowledge.

It should not be assumed that statistical experts who have worked on the development phases of a census can easily transfer to a staff management position and cope with people skills as a matter of course. While there may be numerous census agency staff who are capable of adapting to the alternative role, the fact that good staff management skills are not easily attained and are crucial to the success of the processing centre should be kept in mind.

Managers will need to fully understand, and have a commitment to, the quality assurance principles adopted for the processing centre. They will also need to have the ability to instil this commitment in the staff they will manage.

A successful strategy for recruiting managers in a processing centre will require striking the right balance between retaining current technical knowledge, providing developmental opportunities for employees of the census agency and searching, often externally, for staff with people management expertise.

5. *Recruiting supervisors and processors*

These levels in the workforce structure comprise the largest number of staff and they will generally be recruited on a temporary basis. Therefore, the recruitment of these staff may require different strategies from those used in recruiting the managerial staff. Strategies that may be adopted include the following:

(*a*) Agencies conducting their own recruitment campaign;

(*b*) Using other specialist government employment agencies;

(*c*) Outsourcing to private sector recruitment agencies, if they exist and they have access to resources.

(*a*) *Agencies conducting their own campaign*

The option of agencies conducting their own recruitment campaign may be regarded as the easiest and most cost-effective one. However, there are a number of issues that should be considered that could outweigh any expected savings. These include the following:

(*a*) Bulk recruitment of this order of magnitude is usually not a core function of a census agency. Although there may be officers within the agency who perform the task on a small scale, it is unlikely that they would have the required expertise for large-scale recruitment;

(*b*) The timing of the task is far from ideal given that any recruitment strategy would have to be aimed as close to commencement of processing as possible in order to reduce the dropout numbers. It would therefore coincide with other major preparatory tasks that may require the focus of management;

(*c*) Depending on the economic situation at the time, a large-scale recruitment exercise could require significant infrastructure to cater for a possible flood of inquiries and applications.

If an agency chooses to conduct its own recruitment campaign, it will have to decide to what lengths it wishes to go to secure suitable staff. There is a large amount of reference documentation and assessment techniques relating to the general process of selecting staff. However, few of these are applicable when discussing the placement of a large number of short-term staff within a very short period. Therefore, the ideal results may not be achievable within the available time-frame and budget. It is therefore important to determine the essential criteria to be met by prospective applicants.

One of the simpler and more cost-effective options for determining suitability for a position in a processing centre is the application of a short selection test. This test can be designed to evaluate those attributes that are deemed most applicable to the duties involved. These attributes may include the following:

(*a*) Aptitude for the repetitive clerical tasks to be performed;

(*b*) Accuracy in performing this type of work;

(*c*) Comprehension of written material;

(*d*) Speed in performing tasks, without loss of accuracy.

A short, multiple-choice explanation that tests the above criteria can prove a valuable guide to an applicant's suitability. While some basic infrastructure will be needed to conduct these tests, this should be available in the processing centres that are being established to process the census.

The results of these tests can be used to establish a ranking of applicants, which can be used as the order in which

applicants will be offered employment. This list can also be used for contingency purposes (see sect. 8 below) to replace processing staff, if necessary.

It may also be useful to confirm applicants' suitability to the positions through conducting short interviews, during which each applicant is asked a standard set of questions. At these interviews, applicants should be given complete information about the position, the tasks to be performed and the performance standards required. Undertaking a large number of interviews over a short period of time can be physically and mentally demanding for the interviewing staff. Therefore, careful management of this workload is required.

(b) Using specialist government employment agencies

Whether these agencies exist and are an option will largely depend on the circumstances in a country. If such agencies do exist, their expertise and permanent infrastructure can be used effectively. This may prove to be more cost-effective than the census agency establishing the infrastructure for a not often repeated exercise.

However, the current trend in many countries is for such government agencies to operate on a cost-recovery basis. Therefore, the savings that may accrue in direct costs by using these agencies may not be a significant factor. Other considerations, such as lessening the burden on managers at the processing centre, may make using these other government agencies an attractive option.

(c) Outsourcing to private sector recruitment agencies

In some countries, private sector recruitment agencies offer similar services to those of government agencies, although at a cost that is sometimes prohibitive for the recruitment of large numbers of staff. Census agencies need to ensure that the selected private sector agency understands, and will implement, their requirements. It is possible that a task for profit organization may have a conflict of interest in that there could be a desire to place persons from its existing lists who may not necessarily be the most suitable applicants.

The principles regarding selecting and managing contracts in outsourcing are covered in chapter I, Section G.

6. Recruiting other specialist staff

Apart from managers, supervisors and processors, there may be a need to recruit specialist staff for particular functions at the processing centre. These staff can include:

(a) Specialist information technology staff;

(b) Specialist administrative staff;

(c) Storepersons for the movement of material;

(d) Support services staff (e.g., for maintenance, security and cleaning).

If these staff perform functions that are not part of the core business of the census agency, these functions may be outsourced to other agencies or private companies. In other cases, separate recruitment campaigns may be needed because of the specialist nature of these staff.

7. Timing of recruitment campaign

As with all recruitment campaigns, it should be conducted as close as possible to the time when people are required to commence work. This will lessen the impact of applicants not accepting the job offer because they have found alternative employment or lost interest in the position.

All positions in the processing centre can be filled on a cascading principle from the top down. This means that senior managers are recruited first, followed by middle management, supervisors and, finally, processors. Specialist staff mentioned in section 6 above will be recruited as they are needed. This will enable the senior and middle managers to be involved in the selection process of their staff if this is undertaken by the processing centre. It will also allow for the staff at the managerial level to receive training before the supervisors commence work and the supervisors to be trained before the processing staff begin.

Processing centres that contain large numbers of staff may also need to stagger their intake of staff over several weeks. This is because of the logistical problems associated with processing and training large intakes of staff at one time.

8. Contingency planning

An important issue that is often overlooked when considering recruitment strategies is contingency planning. If staff turnover becomes a significant factor, which would not be unreasonable to expect in a temporary workforce (especially in boom times), and this turnover exceeds expected natural attrition, there will be the need to recruit additional staff. The alternative would be an extension of the processing timetable.

It is recommended that any recruitment campaign include a contingency factor where the addition of staffing levels can occur efficiently, quickly and with little additional expense.

9. Remuneration

The remuneration paid to staff will affect the number, and quality, of staff who will apply for these positions. As far as possible, remuneration should be in comparison with market rates for broadly similar jobs. However, agencies should be aware that, in many cases, government rates will be below market rates.

Remuneration can be in either of two forms:

(a) Set wage rates regardless of the output produced by the individual;

(b) Payment based on the number of units processed (piecemeal rates).

Adopting set wage rates results in less administrative overhead and does not promote a production-line mentality, where staff focus on production rather than quality. Some countries that have adopted set wage rates have also implemented small performance bonuses, which can include time off or extra holidays. These bonuses are given to staff who are performing at or above an agreed minimum standard. It provides a small incentive for staff and rewards those staff with superior performance. It may also assist in retaining good quality staff.

Payment based on units produced has the advantage of only paying for actual work completed. Estimating processing costs for budget purposes can also be simpler. This is because it is generally easier to forecast numbers of units to be processed than production rates. However, a major disadvantage is that staff can become focused on production and disregard the quality of the work they produce. This can have negative implications on the quality of data produced. The complexities associated with this scheme can also make it difficult to administer.

D. Processing operations

1. *Introduction*

Operations at the processing centres need to be carefully managed in order to achieve a successful outcome for this phase of the census. The quality of the staff employed at the processing centres will have a large impact on the success or otherwise of the processing operations. In particular, the quality of the staff employed as managers of the processing centres, and the management tools they are provided, are critical to the success of the processing operations.

Adequate management structures (see sect. C above) will need to be put in place in order to coordinate and control all of the activities involved in processing (see figure IV.3 below).

2. *Data-processing cycle*

The data-processing cycle involves many different interdependant activities. The number and nature of these activities will largely depend on the technology used to process the census forms (see section F below). As an example, the diagram below shows the major activities that may comprise a census processing system using key entry. The order of these activities may vary depending on the technology used. If key entry is not used (e.g., optical mark recognition or intelligent character recognition is used instead), the coding activity will take place after balancing.

As can be seen in the above diagram, the processing phase is a client area of the enumeration phase and, as such, relies on the quality of the output from that phase. The dissemination phase is the major client area of the output from the processing phase and, again, relies on the quality of the output produced by the processing system.

The quality and quantity of output from each activity in the processing cycle has a direct effect on the success or otherwise of the next activity and other activities downstream. It is also important to note that, in this example, all activities interact with one another through ongoing quality assurance. This can become evident at any stage. For example, the staff undertaking validation may detect problems that are the result of inadequate procedures and/or training in one of the other activities (e.g., receipt and registration).

While data processing can to a large extent be regarded as a linear cycle, all activities will usually be concurrent. Initial activities such as receipt and registration will commence first, but the other activities will commence shortly thereafter as soon as sufficient workloads have been completed by the initial activities. It is important that the flow of forms between activities is managed and coordinated carefully to ensure that each activity has sufficient forms for all staff. A buffer or backlog of forms should be established between each activity (e.g., two weeks of work), which will ensure that staff do not run out of forms to process. For example, using the system described in diagram IV.2 above, the data-capture activity should not commence until there are sufficient numbers of forms for two weeks of processing. If it takes one week for this amount of forms to be processed by all of the activities before data capture, then data capture would not commence until the third week.

(*a*) *Quality assurance and edits*

These strategies are discussed in detail in section E below. However, it is worthwhile to consider their relationship to all other activities in the processing cycle. As can be seen from the above diagram, quality assurance and edits can be regarded as the core of the processing cycle and are critical to producing high-quality data. They ensure that the output from each activity is of the required quality for the next activity and provides a mechanism whereby appropriate feedback is delivered to all activities.

(*b*) *Receipt and registration*

As forms are received at the processing centres, they should be registered to ensure that all enumeration areas in the country and all households within each enumeration area are accounted for.

The managers of this activity will be required to closely coordinate their work with managers in the field operations phase. They will need to monitor the deliveries from the field to ensure that material flows smoothly, with minimal delays or congestion.

(*c*) *Preliminary checking*

Regardless of the technology employed to process the census forms, some type of grooming of the forms will be necessary. The extent of grooming can vary from superficial checks to ensure that the forms are in adequate condition to be read by scanners to transcription of damaged forms and manual editing of responses.

(*d*) *Coding*

Coding assigns classification codes to responses on the census form. Coding can be an automated system, computer assisted, clerical or a combination of all three.

(*e*) *Data capture*

For the purposes of the present handbook, data capture refers to the system used to capture information from the census form and create a computer data file. These systems could include:

(*a*) Key entry;

(*b*) Optical mark recognition;

(*c*) Intelligent character recognition;

(*d*) Electronic lodgment of forms (e.g., the Internet).

A detailed discussion of the various systems that can be used for data capture is included in section F below.

(*f*) *Balancing*

Balancing refers to a system to ensure that a computer record has been created for every enumeration area, every household within each enumeration area, and every person within those households.

(*g*) *Validation*

Validation is the final check of data to ensure that the quality of the data meets agreed minimum standards (see sect. E below for further details).

3. *Controlling work flows*

Close attention needs to be paid to monitoring and controlling work flows throughout the entire processing phase. Each activity depends on the quality and quantity of the output from the previous activities. Once all activities are fully operational, it is critical that each activity meets production targets to ensure that the following activity has sufficient work.

Delays in one activity can lead to costly lost production in the following activities. If difficulties are being experienced in one activity, managers may need to reallocate resources between activities or change procedures in order to raise production levels. Any proposed changes in procedures to raise production will have to be carefully considered to ensure that the quality of the data is not adversely affected.

(*a*) *Movement of forms*

In some processing systems (e.g., imaging), the physical forms will only be required up until data capture. After this, electronic images of the forms will be transmitted through-

Figure IV.3. Data processing cycle
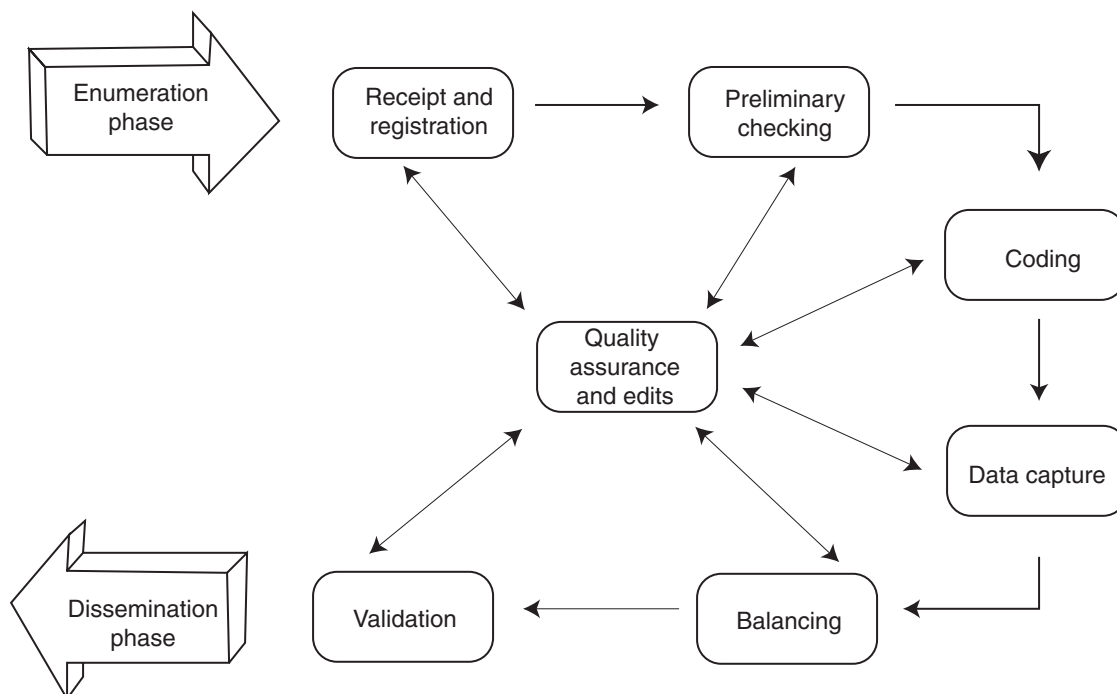
out the remaining activities, with the physical forms only required for disaster recovery. In other systems, the physical forms will be required for all activities.

In all cases, controlling the movement of forms between relevant activities needs to be done efficiently and in a controlled manner. This can be done through a flow control system. These systems can be clerically based or sophisticated automated systems that track material in real time using radio frequency devices. Advancements in technology in recent years have seen the development of cost-effective stock control systems that use bar codes for tracking purposes. These systems are relatively cheap and ideally suited for tracking boxes containing census forms. Regardless of the type of system used, a flow control system should contain the following:

(*a*) Movement rules that specify both legal and illegal movements. For example, forms for an enumeration area cannot flow into coding unless balancing has been completed;

(*b*) Flexibility to allow forms to be flowed back to previous activities if reprocessing for a particular enumeration area is necessary;

(*c*) Provision for timely management information about work flow and location of forms (e.g., number of enumeration areas in an activity and exact physical location in the processing centre of an enumeration area).

(*b*) *Status of data*

Apart from controlling the movement of forms, it will also be necessary to control the transfer of the electronic data. In many processing systems, there will be a variety of automated stages that manipulate and transform the data files. The number of these automated stages can often exceed the total number of activities shown above in diagram IV.2. These automated stages can include the following:

(*a*) Edits that check for inter- and intra-record consistencies;

(*b*) Derivations of data items (e.g., labour force status);

(*c*) Imputations for missing data items based on the values of other data items;

(*d*) Imputations for number of persons in households where forms are missing;

(*e*) Quality assurance points (see sect. E below);

(*f*) Aggregations and transformation of files for final release of the data from the processing centre.

The automated system used to control the movement of data is commonly referred to as process control. The process control system is similar to the flow control system mentioned above but reports and controls the different stages of the data files rather than the physical forms. The system should report on the stage of each workload (e.g., enumeration area) and contain the following:

(*a*) Rules that specify when the next automated stage can begin. For example, labour force derivations cannot commence until all labour force variables have been coded;

(*b*) Flexibility to allow the stage of a data file to be reset if reprocessing is required for a particular enumeration area, household or topic;

(*c*) Provision for timely management information about the stages of files.

4. *Management information system*

An essential tool for managers at a processing centre is a management information system. An effective management information system enables efficient activity monitoring and can improve the effectiveness of decision-making within the processing centre.

Implementing a management information system can be a complex and costly exercise. Agencies should therefore seek assistance and advice from other countries that have implemented such systems. For example, the CENTRACK module of the Integrated Microcomputer Processing System is one system that can provide management information.

The general requirements of a management information system are as follows:

(*a*) To allow access to all relevant management information by the different levels of management in the areas of production, work flows, staffing information, quality assurance and budget control;

(*b*) To ensure that all management information is as timely and detailed as needed, while maintaining integrity and accuracy of collected data;

(*c*) To forecast and report on the outcome of future activity within the processing centres for:

(*i*) Crisis resolution to determine the effects of alternate decisions;

(*ii*) Highlighting potential problem areas before they arise;

(*d*) To ensure that information acquired in one census can be utilized for planning in future censuses.

Activities at the processing centres need to be monitored closely to assist with the smooth running and integration of all activities; this will ensure that timetables and budgets are met, and that data produced are of a high standard. Because large amounts of data can be processed very quickly, it is imperative that the management information system delivers timely and accurate data to management. The vast majority of census processing is conducted using computerized systems. Therefore, the capture and production of management information data can be automatic and should be regarded as an integral component of the processing system.

Management information data can be made available in a variety of standard reports and/or in a form that allows different managers to select the level of detail in which they are interested. For example, senior management at the processing centres may only be interested in overall production rates, whereas middle managers may be interested in individual section production rates, and supervisors in pro-

Table IV. 2. Report on units processed

Activity	Week 1			Week 2			Total		
	Forecast	Actual	Difference	Forecast	Actual	Difference	Forecast	Actual	Difference
Registration	3,500	2,700	-800	5,500	5,400	-100	9,000	8,100	-900
Preliminary checking	2,300	2,400	+100	3,000	3,100	+100	5,300	5,500	+200
Data capture	2,000	2,000	0	2,400	2,400	0	4,400	4,400	0

Table IV. 3. Report on production rates (units per hour)

Activity	Week 1			Week 2			Week 3 etc	
	Forecast	Actual	Difference	Forecast	Actual	Difference		
Registration	50	35	-15	55	38	-17		
Preliminary Checking	75	80	+5	85	95	+10		
Data capture	20	20	0	24	24	0		

Table IV. 4. Report on processing hours worked

Activity	Week 1		Week 2		Week 3	
	Total Hours	Average hours per person	Total hours	Average hours per person	Total hours	Average hours per person
Data capture	1,000	35.5	1,400	37.3	1,550	38.0
Coding etc.	0	0	1,125	41.4	2,750	40.5

(ii)   Flow Control

Table. IV. 5.   Examples of report of activity status for each region

Activity	Region A			Region B			Total		
	Not started	In progress	Complete	Not started	In progress	Complete	Not started	In progress	Complete
Data capture	70 percentage	20 percentage	10 percentage	90 percentage	10 percentage	0 percentage	80 percentage	25 percentage	5 percentage
Balancing	90 percentage	5 percentage	5 percentage	100 percentage	0 percentage	0 percentage	95 percentage	3 percentage	2 percentage
Coding	95 percentage	3 percentage	2 percentage	100 percentage	0 percentage	0 percentage	97 percentage	2 percentage	1 percentage

Example: **Report of activity status for governorates in the Palestinian census.**

Region	Total Enumeration areas	Office	Editing	Office	Coding
		Processed	Accumulated	Processed	Accumulated
A	298	298	298	298	298
B	58	29	29	12	12
C	184				
D	115				
Total	655	327	327	310	310

(iii) *Staffing*

Table. IV. 6.   Report of activity by staff numbers and cost

Activity	Week 1		Week 2		Week 3		Total to date
	Number	Salary cost	Number	Salary cost	Number	Salary cost	Salary cost
Registration	25	12,500	35	17,500	35	17,500	47,500
Preliminary checking	10	5,000	25	12,500	55	27,500	45,000
Data capture	0	0	15	7,500	65	32,500	40,000
Etc							
Total	35	17,500	75	37,500	155	77,500	132,500

Table IV. 7.   Report on discrepancy rates by topic

	Week 1			Week 2			Week 3		
	Sample	Discrepancy	percentage	Sample	Discrepancy	percentage	Sample	Discrepancy	Percentage
Address	1,390	76	5	1,450	65	4	1,270	40	3
Industry	2,449	136	6	1,800	91	5	2,011	90	4
Occupation	2,139	159	7	2,452	146	6	2,586	122	5

duction rates for individuals. Therefore, information should be collected at the finest level of reporting (i.e., individual) and then aggregated to broader levels of detail (e.g., section) for reporting purposes.

(*a*) *What to collect*

(*i*) *Production rates*

The production rates achieved in each activity will determine whether timetables will be met. Therefore, to monitor production the following will need to be collected for each activity:

(*a*) Units completed, (*b*) total processing hours worked; from which then derives (*c*) production rates (units per hour).

The base measurement of units can comprise enumeration areas, households or dwellings, persons or a combination of these units. The measure used will depend largely on the nature of the processing system and the workload allocation system used to distribute work to staff.

(*ii*) *Flow control*

In order to control work flow it is necessary to monitor the flow of material throughout all processes. Therefore, the following will be needed:

(a) Total number of units and overall percentage not yet started, by each activity;

(b) Total number of units and overall percentage currently within each activity;

(c) Total number of units and overall percentage completed for each activity.

(*iii*) *Staffing*

A large component of the census budget is salaries for processing staff. To monitor this activity the following will be needed:

(*a*) Staff numbers by activity;

(*b*) Salary costs by activity.

(*iv*) *Quality assurance*

Ensuring that the data meet the minimum required standards will be an important focus of managers at the processing centres. The quality of the data produced should be monitored over the complete processing cycle. To accomplish this, the following will be needed:

(*a*) Error or discrepancy rates by activity and/or topic;

(*b*) Error or discrepancy rates by individual by topic.

A detailed description of quality assurance strategies is contained in section E below.

(*v*) *Automatic edits*

In many processing systems, there will be a series of automated edits (see sect. 3(b) above). Because these edits are automated, it is important that they are monitored to ensure that they are functioning as specified and that they are not producing unexpected results. A simple method of doing this is to automatically record the number of times each edit is applied. Examining this data may also alert managers to anomalies in the census data. For example, there may be a larger than expected count for an edit that checks on inter-record consistency (e.g., number of people under 15 years of age reporting an occupation). This may indicate a processing system error (e.g., incorrect data capture of age values) or may be attributable to respondent error.

(*b*) *What to report*

(*i*) *Production*

Before the establishment of the processing centres production plans should be drawn up that show expected production rates for each activity over time. During production, the management information system should automatically measure actual production rates and compare these to the original production plan. This will enable managers to track progress easily and will allow the early detection of bottlenecks in processing and/or delays in the timetable. Some hypothetical examples are shown below.

The reports above can be further broken down to finer details (e.g., groups, sections or individual persons) to show respective managers how their section compares to other sections and to the overall average for an activity.

Again, the report above can be further broken down to finer details (e.g., groups, sections or individual persons) to show respective managers how their section compares to other sections and to the overall average for an activity (see sect. E below for further details on quality assurance).

(*v*) *Automatic edits*

Table IV. 8.   Report on automatic edits

Edit No	Total
1	475
2	4,895,960
3	3,249,143
4	251,397
5	391,638
etc.	52

(*c*) *Feedback to individuals*

While the reports shown above, with varying degrees of detail, can be utilized by the various levels of management at the processing centre, it is also important to provide timely feedback to individuals on their own performance. The reporting period for these reports can vary (e.g., weekly, fortnightly or monthly), but regular performance feedback to staff allows them to compare their own performance with the rest of their section.

E. Quality assurance for processing

1. *Introduction*

In earlier chapters, the quality of census data is defined as multidimensional, involving elements of data accuracy, budget, timeliness and relevance. During the processing of census data, assuming that the criterion of relevance has already been met, the emphasis should be on data accuracy, budget and timeliness.

While the aim should be to improve all three elements, it may be necessary to improve one element at the expense of another. For example, it may be necessary to add procedures to improve data accuracy at the expense of budget allocation and/or timeliness. Managers at a processing centre must be responsible for balancing these three quality criteria and must do so with regard to the strategic directions set for their particular census programme.

2. *Total quality management philosophy*

The environment at a census processing centre is particularly suited to the adoption of a total quality management philosophy. This philosophy is founded on the belief that errors in the output of a process are primarily the result of deficiencies in the process itself, rather than the actions of individuals working in that process. This means that managers must take responsibility for data quality, as they are ultimately responsible for the process in which their staff work.

However, while managers must ultimately take responsibility for the process, the staff are their most valuable resource when implementing a total quality management philosophy. If this resource is used wisely and staff are involved in the process and empowered to define and achieve useful results, there is every opportunity for success. Implicit in this philosophy is the belief that most people want to work and that the rate and quality of their work are determined by the process. Staff who work in the process are in the best position to advise on improvements to that process.

While most deficiencies in data quality will be the result of deficiencies in the process, it must also be recognized that census data for particular geographic areas are unique. If a user needs data for one particular geographic area, and the data are of poor quality, they cannot be substituted with data for another geographic area of higher quality. Therefore, it is important to ensure that the quality of the data for each enumeration area is at least of a minimum acceptable standard.

Line managers have responsibility for quality by ensuring that staff understand the management philosophy. It is important that the rationale behind the total quality management approach is clearly explained when staff are first introduced to the system. Managers should also ensure that their ownbehaviour is consistent with the total quality management philosophy, as staff soon pick up on inconsistencies between what managers say and what they practise.

Managers need to ensure that staff comments and observations are fed into the quality improvement process. The belief that it is the process rather than the individual that determines the quality of output needs to be reinforced throughout the entire approach to management. Managers should ensure that both formal and informal means are used to encourage staff to contribute, and that staff are comfortable in giving their opinions.

Providing feedback to staff is an important component of the total quality management philosophy. This feedback should not only concentrate on negative aspects, although this will be necessary in some cases; it is important that staff also receive positive feedback and encouragement.

To be successful, it is necessary to create a culture in which everyone has the opportunity to contribute to quality improvement at the processing centre. The staff who are employed there perform basically repetitive clerical and screen-based tasks, and it is up to managers to motivate them, and to encourage them to assume some ownership of their work.

However, while the majority of data-quality problems will be the result of deficiencies in the process, there are circumstances where the actions of individuals clearly have an impact on quality. These individuals need to be dealt with by management and, where all else fails (e.g., counselling and retraining), their employment should be terminated. By communicating why such decisions have been taken, managers can use these rare events to reinforce to all staff their commitment to quality.

3. *Quality management framework*

Processing of census data is a complex exercise that usually involves many different processes (see sect. D above). While each of these processes can be regarded as a separate entity, each one relies on the quality of the output from the preceding process. To assist in obtaining the highest possible data quality, a framework incorporating the following components can be established at a processing centre:

(*a*) Quality management system;

(*b*) Quality assurance points for each process;

(*c*) Continuous quality improvement processes;

(*d*) Validation of data.

Each of these components is discussed in detail below.

4. *Quality management system*

Quality management systems that can be incorporated into census processing are in some respects similar to conventional quality control inspection systems as discussed in chapter I, section C. However, there are some important and significant differences, which are outlined below.

(*a*) *Units of work selected*

As it would be far too costly to inspect all units of work, a sampling scheme is usually implemented. This sampling scheme can involve selecting a sample of a processor's work that is reprocessed by another processor and the results compared. In some countries, approximately 10 per cent of processors' work is selected for quality management processing.

Sampling schemes to measure the quality of work can be implemented for all stages of census processing and the actual implementation of such schemes depends largely on the actual process. However, some general principles can be applied to a wide variety of processes. Some basic rules are as follows:

(*a*) Sampling rates should be relatively high at the beginning of a process, gradually tapering off to an ongoing monitoring rate as processors become more proficient;

(*b*) At a minimum, all processors should have their first workload (e.g., enumeration area) sampled;

(*c*) More proficient operators should be subject to a lower sampling rate;

(*d*) All processors should have some of their work sampled over the complete life cycle of the process;

(*e*) Sampling rates may be increased towards the end of a process so that the quality of work does not suffer as staff lose interest in the process as it comes to an end;

(*f*) Complex processes (e.g., coding occupation or industry) should be sampled at a higher rate than simpler processes (e.g., coding birthplace or religion);

(*g*) Initial sampling units should be based on operational efficiency. For example, if the basic workload is an enumeration area, the sample should first be based on a percentage of enumeration areas. The sample can then be further refined to a percentage of households within those enumeration areas, persons within those households and lastly topics for those persons.

In some countries, with populations of about three million, verification was implemented at the following rate:

(*a*) Office editing, 100 per cent;

(*b*) Office coding, 100 per cent;

(*c*) Data entry, 100 per cent at the early stages and for new data entry staff; then a random sample of only 5%.

(*b*) *Method of operation*

The method of operation will largely depend on the process. As an example, the following is based on a quality management scheme for the coding process, where responses from the census forms are coded to a classification.

Table IV.9. Individual performance feedback report

Processor name: John Smith

Period: Fortnight ending 30/06/00

	Production (units/hour)	Discrepancy rates (percentage)		
		Address	Industry	Occupation
Your average	68	2	7	7
Your section average	60	4	4	7
Your group average	65	3	6	5
Overall activity average	75	3	4	5

A sample of each processor's work is selected by the sampling scheme. This sample can then be reprocessed by another processor (quality management processor) from a different section. The data files produced by the two iterations are then compared. Any mismatches between the two files can be inspected by a supervisor performing the role of adjudicator. The supervisor can then determine what the correct code should have been. A discrepancy is defined as either the original processor's or the quality management processor's code not agreeing with the supervisor's code.

Involving processors and supervisors in the quality managemnt system, rather than expert coders, will give these staff ownership of the quality of their work. Another advantage in using normal processing staff is that experts tend to use their expert knowledge rather than follow procedures. The objective is to promote consistent adherence to procedures and also to identify systematic errors caused by deficiencies in the process itself.

Once supervisors have inspected the mismatches, they can provide feedback reports to processors. These reports show the discrepancies between the code the processor assigned and the code the adjudicator believes is correct. The major objective of these reports should be to alert processors to instances where they are not following procedures correctly.

Supervisors should be trained to provide feedback to the individual processor, in a clear and concise way, such as "You coded the response to X when procedure N says to code the response to Y using these steps". The feedback reports can be standardized to concentrate on providing feedback on adherence to procedures.

(c) Rejected units of work

In general, rejected units of work are not reprocessed, except in cases where they do not meet the defined minimum standard. This is because the benefit of correcting all discrepancies is generally not justified by the cost. For example, if the overall discrepancy rate for occupation coding is 10 per cent, and the quality management sample rate for occupation is 10 per cent, correcting all the discrepancies for occupation would only reduce the overall discrepancy rate for that topic to 9 per cent. The actual improvement in the discrepancy rate for occupation would be further reduced by the effects of errors in the inspection process and errors introduced during correction.

However, because census data at the enumeration area level is a unique product, reprocessing will be required where quality management processing identifies severe data-quality problems.

5. Quality assurance points

As mentioned above, census data for particular geographic areas are a unique product. It is for this reason that there are a series of quality assurance points that every enumeration area should go through during processing. These points ensure that each enumeration area is of an acceptable minimum standard.

The traditional application of quality assurance points refers to a number of automated checks and measures, systems and utilities built into the processing system. The purpose of these points is to set measures that can be quantified and used to determine a pass or fail status for the output from a process.

This is based on each part of the process having identified points where the progress of the data or output can be flagged as either "pass" or "fail" and used as a measure of the success of that process.

For example, the overall data produced by the processing system must pass validation (see sect. 7 below) and be of an acceptable standard for the dissemination phase. Before data reach the validation stage, each process must produce data that are of an acceptable standard for subsequent processes. When the output of a process has passed the checks of the quality assurance point, the next process can proceed. However, if the output fails the checks of the quality assurance point, the next process cannot commence until corrections are made to the output.

Examples of quality assurance points that may be implemented in a census processing system (see sect. D above) may includethe following:

(a) Registration process. Every enumeration area and each form associated with that area is received at the processing centre;

(b) Balancing. Data have been captured for every household in an enumeration area and every person in those households;

(c) Coding. Coding results for each topic in each enumeration area are of a minimum acceptable standard;

(d) Edits. Checks and necessary data transformations have been made to ensure consistency of data items, for example, that fertility data only relate to females.

A common quality assurance point that can be used is to examine coding results in the form of discrepancy rates, as mentioned in (c) in the above list. A report can be generated of enumeration areas where the discrepancy rate for any topic is above that defined as acceptable. This report will identify particular enumeration areas that may require reprocessing owing to unacceptable quality. It will also identify those processors who require some type of retraining, either through on-the-job training by their supervisor or formal training.

Defining what level of discrepancy rates are acceptable before an enumeration area passes this quality assurance point can be based on results that have been achieved in (a) previous censuses, (b) processing tests conducted for the current census, (c) coding of the same topics in other surveys or (d) international comparisons.

Quality assurance points focus on each process achieving the best possible output rather than relying on later processes to correct data. To achieve improvements in all relevant areas of quality (i.e., budget, timeliness and data accuracy), it is essential that proactive cyclic measures of quality are used

and that problems are addressed at their source. Quality assurance points set a measurable standard and can be fine-tuned to reflect the success of the process. For example, if accuracy is high, tolerances can be refined to reflect a finer detail of checking and improve accuracy further. However, changes in tolerance levels must take into account cost and timeliness issues, as well as quality, and be realistic in terms of what is important to the final outcome.

Continuous checking of the output from each process is particularly effective in the development and testing programmes leading up to the census. In these tests, there is a greater opportunity for processes and procedures to be thoroughly tested and the output assessed by all stakeholders. Any required changes can be tested again and reassessed thoroughly. There may not be as many opportunities for this during census processing owing to operational pressures.

Tolerances for quality assurance points used in production can be determined on the basis of the results from the testing programme. Where there are known remaining issues or problems after the testing programme, these can be specifically targeted for measurement in the operational phase.

Some quality assurance points can be designed not to be mandatory but instead to advise about possible problems. These are measures where the purpose is to flag a possible problem that requires investigation but allows the output to proceed to the next process. An example of this is the tolerance levels set for the number of "not stated" fields. It is to be expected that some topics will be missed by respondents or interviewers, thereby leading to "not stated" values for some fields. An advisory quality assurance point could produce reports where the number of "not stated" fields for an enumeration area are above the average expected. This could then be investigated to ensure that this is as reported on the forms and was not caused by processors not following procedures or some other system error.

6. *Continuous quality improvement*

Continuous quality improvement is a core component of total quality management. The fundamental difference between continuous quality improvement and classic quality control is that, instead of aiming to achieve a specified average quality limit, continuous quality improvement aims to continue to improve the quality of the output of a project throughout the life of that project. Continuous quality improvement will determine the quality of the data produced over and above the minimum standard ensured by the quality assurance points.

A continuous quality improvement approach can be implemented during census processing in the following ways:

(*a*) By using teams of processing staff to identify and resolve quality problems;

(*b*) By using quantitative measures of quality, based on discrepancies in the output of the process;

(*c*) By giving priority to identifying and addressing the root causes of these discrepancies.

To ensure that continuous quality improvement is implemented correctly, the following four-step cycle is recommended:

(*a*) Step 1. Measure quality;

(*b*) Step 2. Identify the most important quality problems;

(*c*) Step 3. Identify the root causes of these important quality problems;

(*d*) Step 4. Implement corrective action and return to step 1.

(*a*) *Step 1. Measure quality*

Discrepancy rate data produced by the quality management system should detail the discrepancy rate for both the original processor and the quality management processor for those enumeration areas and topics selected by the system (see examples of reports in sect. D above). It is important to note that these are not necessarily error rates but are measures of inconsistency in processing.

Discrepancy rate data provide information on which areas of processing are not meeting the quality targets and therefore allow the first step of measuring quality to be performed.

(*b*) *Step 2. Identify the most important quality problems*

The quality management system can also produce discrepancy profile data that are used to identify which particular codes are being assigned incorrectly. These data can be presented using standard reports in a variety of different software packages.

This step requires that the most important quality problems are identified and that discrepancy rate data are analysed to determine which topics, and particular areas within those topics, need to be targeted. Compiling profiles of discrepancy data will identify what the most important data-quality problems are for these topics.

The first step is to determine what are the most frequent discrepancies. Therefore, reports should identify the most prevalent discrepancies and remove those discrepancies that are below specified frequency minimums (table IV.10).

The next step is to consider what level of discrepancy should be of the most concern. For example, if coding a particular topic assigns a six-digit code, it could be argued that discrepancies at the major group, or one-digit level, are more serious than discrepancies at the six-digit level. For example, whether a person's occupation is coded as "manager" or "clerk" is a significant discrepancy. Therefore, further analysis could result in the report in table IV.11.

The above example is specified at the one-digit level and shows that nearly two thirds of the original occupation discrepancies shown in the previous table have been coded to different major groups. The most prevalent of these discrepancies in the example are between major groups 1 and 2. This suggests that processors are having trouble differentiating between these two groups.

(*c*)   *Step 3   Identify the root causes of these important quality problems*

To perform step 3 of the cycle, information from a variety of sources is needed.

(*i*) *Case reporting forms*

Staff working in a process are in the best position to advise about how that process can be improved. Processors and supervisors can be provided with case reporting forms that allow them to describe problems they are having with a procedure, processing system or coding index. These forms are also a vehicle for any suggestions they may have about how the process can be improved.

(*ii*) *Adjudication feedback reports*

As mentioned above, supervisors have the opportunity to provide feedback to individuals on the discrepancies between the code they assign and the code the supervisor believes is correct. The major objective of adjudication feedback reports is to alert processors to instances where they are not following procedures correctly.

Another benefit from supervisors' performing this adjudication role is that it provides them with an opportunity to contemplate why these discrepancies are occurring, particularly if a number of processors are making similar errors. Therefore, they will be able to advise on deficiencies in training, procedures, processing systems and coding indexes. This enables them to make a valuable contribution to identifying the root causes of the important data quality problems identified through step 2 of the continuous quality improvement cycle.

(*iii*) *Quality improvement teams*

The use of teams of processors to identify and propose solutions to quality problems is central to the total quality managment approach. Separate teams can be established for the different processes at a processing centre.

The focus of these teams should be to provide a formal mechanism through which staff can contribute to improving the process in which they work. Each team should comprise mainly processors and some supervisors, with a middle-level manager performing the role of facilitator. These teams should meet on a regular basis at the beginning and less frequently once the major problems with the process are addressed. It is important that participation by staff in these teams is encouraged by management and that members are rotated so that as many staff as possible have the opportunity to contribute in these forums.

The function of these teams is to assist in identifying the root causes of important quality problems and to recommend corrective action to address these problems. Case reporting forms, as mentioned above, can be passed on to these quality improvement teams. The case reporting forms should be returned to the originator, containing feedback on the suggestions. Members of the teams can also meet with staff in their area to identify problems not raised through formal channels.

Discussions in the quality improvement teams should be wide-ranging and members must feel free to raise any issues they think are relevant. It is important that individuals are provided with information about the process, if they request it. Otherwise, they will not be in a position to make sound suggestions for improving the process and will be less willing to contribute to continuous quality improvement.

A record of the discussions at these quality improvement team meetings should be distributed to all processors and suggestions sent to management of the processing centre. These suggestions can then be considered by management (see step 4 below).

(*d*)   *Step 4.   Implement corrective action and return to step 1*

The first part of step 4 of the cycle is to implement corrective action to address the root causes of the quality problems identified in step 3.

Before any corrective action is implemented, the ramifications of these changes must be carefully considered so that the implications are fully understood and predictable. Therefore, proposed changes should be considered at a high management level at the processing centre. This could be done through the establishment of a quality management steering committee.

Managers can consider information from a variety of sources, including the issues and suggestions generated by the quality improvement teams. It is important that managers provide timely feedback to the quality improvement teams on the issues raised in their reports, and any proposed corrective action. In some cases, while the suggestions may be worthy of consideration, they cannot be implemented for a variety of reasons (e.g., technical reasons, cost or adverse impact on other processes). The reasons for not implementing the suggestions should be clearly stated in the feedback to the quality improvement teams.

It is important that the contribution of processors and supervisors is acknowledged, otherwise this contribution may not continue. Changes to be implemented should be seen as coming from the suggestions of quality improvement teams, rather than from management.

The types of corrective action that may be available include the following:

(*a*) Changes to procedures;

(*b*) Changes to the processing systems;

(*c*) Retraining or additional training;

(*d*) Reminders about particular procedures sent to staff;

(*e*) Changes to coding indexes in processes where they are used.

The second part of step 4 is to continue to measure quality and evaluate the effectiveness of the corrective action that has been implemented. As the most important quality problems are resolved, the cyclical approach is continued and the next most important set of problems is targeted. This results in the quality of the process being continuously improved.

Table. IV.10. Discrepancy report at the detailed level

(frequency > 30)

Correct code	Incorrect code	Frequency	Percentage of total discrepancies
123456	123457	65	4
	200023	70	5
	810001	34	2
	Sub total	169	
234678	134567	68	4
	245679	55	3
	498765	35	2
	Subtotal	158	
etc.			

7. *Validation*

The purpose of validating census data is to identify system problems and ensure data quality for final output. It is the final check to ensure that the data produced by the processing system meet the specifications of the editing program and output requirements.

Validating the data before it leaves the processing centre ensures that errors that are significant and considered important can be corrected in the final file. This final file can then be used as the source database for the production of all dissemination products. It is important that all products are created from the one source file. Changes to the source file after validation can result in products being produced from different source files, which may impact on data and product integrity.

While it is the final check of data, validation should not be viewed as the last process in the processing cycle. It is vitally important that validation is an ongoing and parallel process to all other processes. This allows for the early detection of problems and subsequent implementation of fixes to either processing systems or procedures. In this way, validation has the same aim for the processing system as that for the final data. This ensures that the stages in the processing system are producing output as specified, and as required for the next system. In this way, it contributes to continuous quality improvement of both the system and the data.

It is also important that a validation process is included in any processing tests prior to the census. Validation of the data in these tests will allow early detection of system problems (e.g., edits) before the processing system is commissioned for the census. The role of validation in improving the processing system is even more critical in the testing stages. The early detection of problems allows for a more thorough examination of the problem, and development and testing of fixes, than can be undertaken during census processing. Problems found during census processing are subject to the conflicting priorities of timeliness and cost. Therefore, the decision may have to be made to correct the data alone, without correcting the process.

(*a*) *Defining the data items*

In conjunction with the census dissemination area and other stakeholders, the specification of the output data items to be validated should be determined. Each data item is defined for the legal values to the output classification, what constitutes "Not applicable" categories, and any specific data combinations that are mutually exclusive.

In addition, known data problems from previous censuses, or owing to the feedback received from the enumeration activity, are identified and procedures for checking them are defined.

Table. IV.11.   Discrepancy report at the broad level

Correct code	Incorrect code	Frequency	Percentage of total discrepancies
1	2	70	8
	8	34	3
	Sub total	104	
2	1	68	7
	4	35	3
	Sub total	103	
etc.			

(*b*) *Define the method*

The procedures and methods for validation must be defined to ensure coverage of problems and consistency of approach. Each time the data are corrected or changed for some reason, they should be validated, following the same procedures, to ensure that both the error has been corrected and no new problem has been created.

(*c*) *Aggregating the data*

All data items should be checked for consistency and accuracy for all categories at a number of levels of geographic aggregation. As validation should run parallel to the other processes, it should commence with the first enumeration areas that complete processing, and continue with larger aggregations of data as they become available for validation. These aggregations will eventually comprise entire geographic regions, as defined for the country (e.g., regions or States).

This ensures that data are checked a number of times, and also ensures that larger table populations are checked. This is essential as small table populations may not fill all cells in a table. Therefore, data errors, and the processing problems that produce them, may go undetected until a large amount of data is available. By the time a large amount of data is ready for validation, some initial processes may have already been completed and the opportunity to correct the process where the error was created passed or considered not worthwhile given time and cost constraints.

(*d*) *Comparison with other data and inter-censual change*

Where possible, it is beneficial if data items in both census data and recent surveys can be compared. This is particularly important if the comparable data items have been collected in a recent survey or are available from administrative by-product collections. This can give indications of expected changes, or provide an explanation of changes or movements detected in the census data.

When validating intercensal change between current and previous census data, it is useful to specify tolerance levels for changes in the data items. For example, this may involve setting a tolerance level of plus or minus 5 per cent in population growth for a particular geographic region. This tolerance level can be based on expected normal rates of population growth in these regions. Any growth outside this range would signal the need for more detailed investigations into the reasons for the growth or decline.

Changes in the components of the workforce, or in the types of industries and occupations in which people are employed, occur over time in all economies. Having some background knowledge of what sort of changes may be expected in the data, and where they may occur, is part of the validation process. This ensures that the data released for dissemination have been checked to ensure that they reflect what has actually occurred. This is particularly critical in areas of population growth or decline, where the census data are required for equitable distribution of funds and electoral distribution.

The staff undertaking validation at the data-processing centre have ready access to the forms, and to much of the enumeration material such as annotated enumerator books and maps. This makes ascertaining why a change has occurred, or determining if there is a problem with the data collected, a more effective process at this stage than at a later stage when data products have already been disseminated.

The final validated data released from the processing centre should be complete, with details of any changes in the data that may be problematic for users.

(e) Regional office participation

Some statistical agencies will have regional offices spread throughout the country. These offices may have a better, if not an expert, knowledge about their particular geographic regions. This expertise can be used in the validation process as follows:

(a) Seeking advice from regional offices before processing starts to identify any known changes that will affect the comparison of census variables. For example, these changes may include population shifts, ethnic clusters, new housing developments or regional employment changes such as the opening or closing of a large employer;

(b) Determining if the level of growth or decline of population and dwellings in the census is in line with anticipated growth or decline. This can be done through the checking of census counts of persons and dwellings at the smallest geographic level of output (e.g., the enumeration area), as well as for aggregated areas (e.g. statistical regions or administrative areas).

F. Technology issues for processing

1. Introduction

The successful introduction of technology into the processing phase will have a large impact on the overall success of the census. The nature of census processing (i.e., the capture and manipulation of large amounts of data) is ideally suited to computerized technology.

In fact, census processing has a long association with computers. The first commercially available computer, the UNIVAC 1, was first installed at the United States Bureau of the Census in 1951. Since that time, advancements in technology through the different generations of mainframes and the more recent rapid advancements in personal computers (PCs) have enabled census agencies to become sophisticated in the way in which they process and manipulate data. This has led to more efficient and cost-effective processing and, ultimately and more importantly, provided a better product for the users of census data.

The use of sophisticated technology such as the rapidly emerging technologies of imaging and intelligent character recognition offers great potential and associated benefits for census processing. However, agencies also need to be aware of the lead times and technology infrastructure required for the successful implementation of intelligent character recognition. A variety of data-capture systems, in particular, imaging and intelligent character recognition, are discussed in the sections below. Details on this technology have been provided because it is rapidly becoming viable for census operations and is being adopted by many agencies in the 2000 round of censuses.

2. Processing platforms

The increase in processing power and storage capacities of the mid-range systems (e.g., Unix) and lower-end systems such as personal computers has provided new opportunities for many countries. The associated reduction in costs of these platforms has also contributed to the trend of countries moving away from expensive mainframe solutions.

Apart from cost considerations, the PC and mid-range platforms offer greater flexibility and user-friendly systems. This has led to the development of more sophisticated applications on these platforms. However, data management and network considerations take on greater importance in the planning phases for these platforms.

3. Data-capture methods

For the purposes of the present handbook, data capture is defined as the system used to capture the information recorded on the census forms and create associated computer data files. These data files are then passed through a coding process to transform the information into classification codes required for the dissemination of data. Data-capture systems include the following:

(a) Key entry;

(b) Optical mark recognition;

(c) Digital imaging;

(d) Intelligent character recognition;

(e) Electronic lodgement of forms (e.g., the Internet).

Each system has different advantages, costs and impacts on hardware and software requirements at both data capture and later stages. A complete census data capture may contain a combination of more than one of the above. In this chapter, the focus is on imaging and intelligent character recognition as these technologies are relatively new for censuses and some agencies may not previously have had access to sufficient information on which to base a decision on whether their use would be cost-effective.

Another emerging technology for data capture is handheld devices for computer-assisted personal interviewing. This technology has not been discussed in any detail in the present handbook because the technology has been limited to surveys. At the present time, the cost associated with this technology does not make it viable for census operations.

(*a*) *Key entry*

In key entry systems, staff manually enter every response from the census form into computers. This method requires relatively simple software systems and low-end computing hardware because of the low volume involved. However, it does require many more staff than do the automated data entry systems and is likely to take more elapsed time to complete. The decision to use manual entry versus automated entry is partly based on timetable requirements and relativities between staff and hardware costs. Other factors, such as whether it is feasible or possible to implement more sophisticated technology (see sect. A above) also need to be taken into account. Where staff costs are low and computing infrastructure is moderate, keyed entry may be the optimal method.

These systems can also require either post-collection processing to group textual responses into classification classes, or a clerical process prior to keying to assign the classification class to be key entered.

(*b*) *Optical mark recognition*

Optical mark recognition machines read responses to "tick-box" type questions on specially designed forms. Only the presence or absence of a mark is detected by the machine and any handwritten responses must be later manually entered or coded by way of computer-assisted methods.

The advantages of optical mark recognition include the following:

(*a*) The capture of tick-box responses is much faster than key entry. Typically, optical mark recognition machines will read, on average, 7,000 A4 pages per hour;

(*b*) Equipment is reasonably inexpensive;

(*c*) It is relatively simple to install and run;

(*d*) It is a well-established technology that has been used for a number of years in many countries.

Disadvantages of optical mark recognition include the following:

(*a*) Precision required in the printing process;

(*b*) Restrictions on the type of paper and ink that can be used;

(*c*) Precision required in cutting of sheets;

(*d*) Restrictions as to form design;

(*e*) Requirement that response boxes be correctly marked with appropriate pen or pencil;

(*f*) Significant additional costs associated with (*a*), (*b*) and (*c*) above.

Optical mark recognition forms may be marked by the respondents or the interviewers or responses may be transcribed from the census forms onto optical mark recogni-

tion sheets by staff in the data-processing centres. However, the latter method of transcription in the office is regarded as inefficient and a source of errors.

(*c*) *Digital imaging*

Digital imaging machines are similar in operation to optical mark recognition machines but they use a digital camera, or scanners, to take an image (or picture) of each page of each form. While the physical process of scanning the forms is similar to that used for optical mark recognition, the outcome differs as the scanning process results in an image (and, optionally, a data file), while the optical mark recognition scanning process only results in a data file. The image file that results from digital imaging is subsequently used for further "heads-up" processing. In "heads-up" processing, operators refer to an image on the screen rather than a physical form. The advantages of heads-up processing is that savings are possible from the reduced paper handling as the electronic images can be used in place of the actual forms. Heads-up processing is more efficient and results in greater operator productivity.

In general, a digital imaging system can easily incorporate a combination of recognition of optical mark recognition tick-box type responses with the presentation of written text for processing by operators. However, imaging is usually the precursor to a more sophisticated system of intelligent character recognition.

(*d*) *Intelligent character recognition*

Intelligent character recognition is an extension of the digital imaging system described above.

After the forms are scanned, the images are processed by one or more recognition engines (software), which then examine response areas to interpret tick-box type questions (optical mark recognition) and "recognize" what has been written by a respondent or interviewer in constrained text fields, and translate this into text values (intelligent character recognition). Bar codes can also be processed by these recognition engines.

Figure IV.4 shows how intelligent character recognition can operate in a census processing environment.

(*i*) *Scanning*

In the above example, the census forms are processed through scanners which take an image of each page of the census form, resulting in image files.

Once images for all forms in a suitably sized workload (which can be smaller than a complete enumeration area) are captured, they are loaded to network storage and data collection from them can begin. The physical forms are placed in store, with minimal further reference expected, while images are transferred to near-line storage and off-site backup.

The first step in the data collection process is to "recognize" the data from the images. This is essentially identifying any tick-box responses that have been marked, as well as attempting to translate handwritten response areas into textual values. The images are processed by software commonly referred to as a recognition engine. The recognition engine processes the raw data from the form using predetermined confidence levels that indicate how confident the recognition engine was that the character it recognized is valid. This process can be undertaken in batch mode on PCs or servers.

Recognition generally occurs using one of two methods. The first method is based on creating histograms of each character and matching the histogram against a pre-identified set (character set) of histograms. The similarities between the input and character set histograms are scored and the highest scoring match is returned. The second method, which has similarities to histograms, is where the input character image is split into a number of components. These components are matched against a similarly created character set, with the character with the highest number of matching components being the one returned.

(*iii*) *Automated repair and validation*

Those fields on the census form that contain characters not recognized by the recognition engine can then be transferred to an automated repair process. This automated process is used in an attempt to reduce the amount of operator repair (see (iv) below) required for unrecognizable characters. This process usually involves using dictionary look-up tables and contextual editing.

For example, the recognition engine may recognize the majority of characters (apart from one) in a response to a question on person's birthplace. The characters in the text string may be recognized as "VANUA-*-U" with -*- indicating a character the software could not recognize. This text string can then be passed through a dictionary that is specifically associated with that particular topic. In this example, it would be a list of countries of the world. If the text string only matches one entry in the dictionary where all characters in the text string match, regardless of the missing character, then the missing character in the text string could be assigned a value. In this example, the missing character would be assigned a value of "T" so that the response would be "VANUATU".

Figure IV.4. Intelligent character recognition processing system architecture
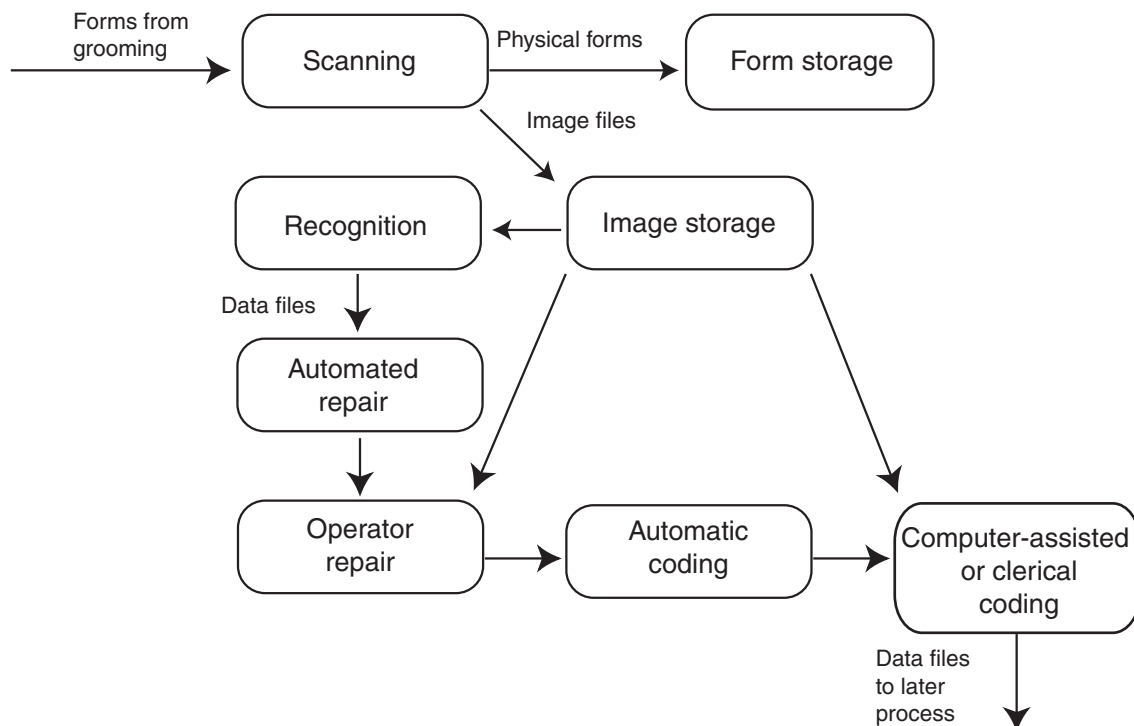
It is recommended that a generic dictionary not be used in this process. Instead, various dictionaries that are tailored to particular census topics should be used. For example, responses associated with occupation should be matched with a dictionary that only contains typical occupations that occur in a particular country. This method is usually better for simpler topics, which have a smaller number of possible responses, such as country of birth. This process can also be used for numeric fields, such as Zip code, where the possible values are known.

(*iv*) *Operator repair*

For those characters that cannot be recognized by the recognition engine, or assigned by the automatic repair process, operator repair (also known as "key from image") will be required. In this process, operators will examine the individual images of these characters and either confirm or correct what was identified by the recognition engine. Operator repair should only be carried out for selected fields that have a high probability of being coded automatically, with the images for other fields being directly transferred to the coding process. It is also important to fully repair numeric data.

Some systems provide other repair methods, which can speed this process, or, alternatively, provide options that allow all responses to key fields to be verified.

Once the dictionary look-up system has either recognized all the characters or operator repair has been carried out, the data can be passed on to the automatic and manual coding processes (see sect. 4 below).

(*v*) *Advantages of intelligent character recognition*

An intelligent character recognition solution can be expected to provide the following advantages:

(*a*) Savings are made in salaries owing to the reduced number of staff needed to code responses, as a proportion of the recognized handwritten responses can be automatically coded without any human input (see sect. 4 (*c*) below);

(*b*) Additional savings are possible through the efficiencies gained by using electronic images rather than physical forms. These include savings from not having to physically move forms, and the increase in production that is possible from coding staff referring to images rather than physical forms;

(*c*) The reduction in staff costs will also have consequential reductions in various other costs (e.g., recruitment, administrative support staff and building rental costs);

(*d*) Automatic coding will provide improvements in data quality, as consistent treatment of identical responses is guaranteed;

(*e*) Processing time can be reduced owing to the automated nature of the process. This can lead to a significant reduction in time for census results to be released to users and thus contribute to an important component of data quality (i.e., timeliness);

(*f*) Form design does not need to be as stringent as that required for optical mark recognition;

(*g*) Corrections for paper skew are more sophisticated;

(*h*) Some systems do not need special colours to be used in the printing process (although these do assist in reducing the image sizes), as they can successfully remove preprinted values (including black boxes used around ticked responses).

(*vi*) *Disadvantages of intelligent character recognition*

The disadvantages associated with an intelligent character recognition solution are as follows:

(*a*) Higher costs of equipment owing to the sophisticated hardware and software required. The images that are created also add greatly to the data volume, which again adds to the cost of hardware;

(*b*) Character substitution, which can affect data quality. This is where the recognition engine returns a value for a character that is not the same as the response on the form. For example, a 4 is assigned by the recognition engine when the value on the form is actually a 9. The majority of software companies now state that their recognition engines achieve substitution rates of less than, or equal to, 1 per cent for numeric characters. However, the effect of these substitutions should not be underestimated. This would be a problem for critical fields such as age when no interfield editing can occur. Systems do exist that allow all "confident" responses for specific fields to be verified;

(*c*) The tuning of the recognition engine, whereby confidence levels are set for the software to recognize a character as a particular character (e.g., a 9 as a 9), is particularly critical. These levels can be adjusted so that more characters are accepted by the software and therefore require less clerical repair. However, the confidence levels that are set will affect quality (owing to character substitution, if the levels are too low) and cost (owing to the need to repair by operators, if the levels are too high). The values need to be carefully tested to achieve the planned required balance of quality and cost outcomes;

(*d*) To recognize handwritten responses they must be written in a constrained response area, and the handwriting must be of a certain standard, for example:

A	N		E	X	A	M	P	L	E		O	F		A
R	E	S	P	O	N	S	E		A	R	E	A		

(*e*) Network design and capabilities are critical to the overall operation. The use of images can require millions of additional files across the network, which can comprise thousands of extra gigabytes when compared to other solutions such as optical mark recognition;

(*f*) The expected savings resulting from the automatic coding process might not eventuate because of lower than expected automatic coding rates;

(*g*) Systematic errors may occur in the automatic coding process that will affect data quality;

(*h*) Suitable character sets may not exist for some countries;

(*i*) The use and storage of images may raise privacy concerns with respondents.

(*vii*) *Risk management*

Intelligent character recognition is a relatively new technology that has only had limited testing in census operations and therefore involves a greater risk than other more proved technologies. Therefore, it is critical that countries considering adopting this technology do so only after a rigorous testing programme. It should not be assumed that, because intelligent character recognition has worked in one country, or in one particular statistical collection, it is appropriate for census operations in another country.

If countries do adopt intelligent character recognition technology, the risks associated with the technology need to be managed carefully. Some of the risk management strategies that can be adopted include the following:

(*a*) Reducing as far as possible intelligent character recognition response areas;

(*b*) Limiting the effect of character substitution on critical topics such as age by:

(*i*) Repair operators checking the result of recognition for these topics;

(*ii*) Introducing optical mark recognition tick-box response fields for these topics;

(*c*) Using lists of common responses and associated optical mark recognition tick-box response fields for some topics with an "other" category that allows respondents to write in their response;

(*d*) Additional questions on the census form can be used for cross-referencing (interfield editing) by the recognition engine to reduce character substitution. For example, if questions relating to both date of birth and age in years are asked, these can be used as a cross-reference. However, unlike data contained on statistical forms relating to finance, the data on census forms do not normally allow for this type of cross-referencing of fields;

(*e*) The results from the recognition of critical fields can be subject to higher software confidence levels or verified by repair operators by reference to the images;

(*f*) Image quality checking;

(*g*) Manual sampling of all processes to ensure integrity and measure error rates.

More generally, the intelligent character recognition solution increases the need to carefully manage quality versus costs. Evaluation of possible acceptance confidence levels (the prime determinant of accuracy) should be undertaken throughout the development cycle to assess the corresponding effect on the substitution rate and the cost in repair load so that the best balance is identified. The intelligent character recognition solution should be fine-tuned so that the best balance between quality (measured as accuracy) and cost (of character repair) is identified during development. The processing centre's operations plan should include specific quality assurance monitoring plans that continually evaluate the character substitution levels, with software confidence levels adjusted when and if required.

The repair workload will need to be managed so that resources are not wasted repairing responses that would be cheaper to process in the computer-assisted or clerical coding processes.

Adequate network capacity is critical because of the large number and size of files associated with imaging. To reduce the size of these files, a technique known as "form drop-out" can be used. This is the process of eliminating known black text from images. In some cases, using form drop-out has reduced the total size of files to one tenth of the original size (e.g., from 4,500 Gb to 450 Gb). Using drop-out colours on the census form can also assist in this process.

(*e*) *Electronic forms*

The recent expansion of the Internet has provided an opportunity for the electronic lodgement of forms through this medium. Many organizations, in both the public and private sectors, are now developing systems for the automatic capture of information through the Internet.

The use of the Internet offers opportunities for some aspects of census operations and it has a great attraction for processing because of the reduced resources necessary for form handling, data capture and coding.

However, at the time of writing the present handbook, many countries had investigated the use of the Internet for electronic lodgement of census forms but have rejected it. The reasons for doing so are as follows:

(*a*) This solution requires that respondents have a computer with Internet access. Even for developed countries the penetration of the Internet is unlikely to be much above 30 per cent in the period leading to the 2000 round of censuses;

(*b*) Management of respondents. For example tracking which households have responded once and once only is an area of concern;

(*c*) Security concerns regarding the transfer of data over the Internet and providing widespread external access to census agency networks;

(*d*) The need to build parallel processing systems (because not all forms will be submitted through the Internet) and the associated complexities of merging data from different sources.

However, use of the Internet and the development of associated applications is growing at an extremely fast rate. Agencies may wish to monitor these developments closely to take advantage of the opportunities they may present in the future.

4. *Coding*

The coding systems assign classification codes to the various written responses on the census form. These coding systems can be (*a*) clerical, (*b*) computer assisted, (*c*) automatic or (*d*) a combination of all three.

The coding systems can use different coding methodologies, including (*a*) simple, (*b*) structured and (*c*) bounded.

Simple matching can be used for those topics where coding is reasonably straightforward and limited to reference to one question on the census form. An example of this is the birthplace topic, where a limited number of words (e.g., one or two) in the response can be matched against a simple alphabetical list.

Structured coding is used for more complex topics such as occupation. To code these topics, reference may need to be made to more than one question on the census form. For example, some occupation responses can be coded by reference to the occupation title question. However, a large percentage of responses can only be coded by referring to other questions on the census form such as tasks performed and/or industry. These coding rules can be built into the structured coding system to guide the operators.

Bounded matching (sometimes referred to as hierarchical matching) is used for those topics where it is necessary to obtain different levels of detail before a code can be assigned. This method is commonly used for coding of addresses. For example, an operator may start the search at a broad geographic level (e.g., province or Zip code) and, after matching at this level, continue on to further levels (e.g., region, city, street and even street number), as necessary, to obtain a classification code.

Regardless of which system is used, they all rely on coding indexes. These indexes are lists of typical responses that are likely to be given on a census form and have an associated classification code assigned to them. An important point to note about these indexes is that they should be based on what respondents report and not simply contain the categories in the classification structure. The indexes should be regarded as a map that enables responses to be classified into the various classification structures. Respondents do not provide answers in classification terms but in everyday language, and the indexes should reflect this.

The quality of the indexes that are constructed has a direct influence on both the quality of data and the efficiency of processing. The effort and time required to build these indexes should not be underestimated and sufficient lead time should be built into census plans for this important task. These indexes are not static and will need to be updated during processing to cater for new responses.

(*a*) *Clerical*

Clerical coding involves the processor matching the response on the census form with responses contained in one or more indexes that are commonly referred to as code books. The processors then transfer the associated code from the code book onto the form for later data capture. This clerical process is tedious and can be subject to higher errors than other types of coding. Using this method, processors also tend to rely on their memories for coding which can introduce further errors into the process.

(*b*) *Computer-assisted coding*

This method involves processors using computerized systems to assist in the coding process. Similar indexes to that used in clerical coding are used but they are computer based. The processor usually enters only the first few characters of each word in the response, and the system then returns a matching list from the appropriate index. The coder then selects the matching index entry and the code can be automatically written to the data file.

An advantage with computer-assisted coding is that more coding rules can be incorporated into the system to guide the processors through several processing steps, which results in better-quality data. Computer-assisted coding is particularly suited to the structured coding approach mentioned above.

Structured coding also has the advantage of reducing the number of potential matches presented to the operator on the screen. This is done through the use of "basic" words (usually nouns) and "qualifying" words (usually adjectives), for example, a processor may enter the text string "far pou" for the response poultry farmer. The system would return a list of all basic words beginning with "far" and after the operator confirms the basic word as farmer, a list of all qualifying words beginning with "pou" would then be presented. After selecting the correct qualifying word, "poultry", the appropriate code would be written to the file. Reducing the possible number of matches on the screen reduces operator burden and results in higher-quality data.

Countries that have developed computer-assisted systems have found them to be more efficient than clerical systems and result in higher-quality data. However, the system and associated indexes are relatively complex and require a long lead time to develop. The costs of developing these systems should not be underestimated and the assistance and advice of other countries that have developed them should be sought.

(*c*) *Automatic coding*

Automatic coding uses computerized algorithms to match captured textual responses (e.g., from intelligent character recognition) against indexes without any human intervention. The matching algorithms used in automatic coding are complex and usually involve a scoring mechanism where a particular score is required before a response is regarded as

a match. There are a variety of algorithms that can be used for automatic coding and a complete handbook could be devoted to this subject. However, it should be noted that caution is needed when implementing any automatic coding matching algorithm. Faults in either the algorithm or associated indexes can result in incorrect codes being assigned. Because of the complex nature of these systems, it is recommended that agencies that are considering using automatic coding contact other countries that have developed these systems.

Depending on the algorithm used, tests have shown that automatic coding will achieve high match rates (approximately 80 per cent) for simpler textual responses such as birthplace. However, responses for the more difficult topics such as occupation and industry will achieve much lower match rates (approximately 50 per cent).

Regardless of the system used, it will not be possible to code all responses automatically. Therefore, those responses that cannot be coded automatically will need to be further processed at a later stage through either computer-assisted or clerical coding.

5. *Editing*

The introduction of more powerful and sophisticated technology has allowed agencies to implement more complex editing systems. It is important that the overall editing strategy is given particular attention during the planning phase for the census. After deciding on the overall strategy, the editing system must be rigorously tested before its implementation into processing operations.

One of the most important decisions to be made regarding the editing strategy is the extent of editing that will take place. This is a decision that needs to be made on a country-by-country basis.

However, experience has shown that the more complex editing systems are more difficult (and expensive) to implement and test and can, in fact, introduce further undetected problems into the data. It may be a preferred strategy to adopt a simpler system, which may leave slight inconsistencies in the data but reduce the risks and costs associated with complex systems. End-users of the data can be educated with respect to the reasons for these inconsistencies.

However, some type of editing of responses will be required to rectify obvious mistakes made by respondents and/or interviewers.

A recommended approach is that an editing system be:

(*a*) Minimalist (i.e., only change obvious respondent or interviewer mistakes or responses that are clearly out of range);

(*b*) Automated (clerical editing is inefficient and costly and only provides marginal improvement in the final product);

(*c*) Systematic, as this will make the system easier to build and test. Careful attention needs to be paid when specifying the edits and the order in which the edits will be in-

voked. Precise specifications will make it easier for programming staff to build the system and for subject-matter staff to test it;

(*d*) Compliant with procedures used in other statistical collections carried out by the agency to ensure comparability of data;

(*e*) Compliant with United Nations and/or International Labour Organization standards to ensure international comparability.

In a minimalist approach, only obvious errors for specific fields that are pre-determined will be adjusted. They will usually be adjusted by assuming that certain basic demographic information is correct as reported on the form. For example, the reported age (e.g., 2 years of age) may be inconsistent with another variable (e.g., attending university) and it is not obvious which of these is correct. It may be decided to consistently use the age reported as correct and adjust the other response to "not attending university".

Rather than using the minimalist approach where age is used as the cornerstone other systems that use a majority rule approach may be adopted. For example, when there is an inconsistency between two or more variables, several other variables may be examined. In these cases, the majority of variables that are consistent with one another will remain as reported, with all other variables adjusted. However, the number of different combinations that can occur make these systems extremely complex and they are more likely to introduce further errors in the data when compared to a minimalist approach.

An important message regarding the editing strategy is that experience has shown that overambitious and complex editing systems do not necessarily add value to the final product. In fact, there have been many cases where complex systems have resulted in the exact opposite, in that they have created problems with the data.

6. *Imputation*

As with editing, the introduction of more powerful and sophisticated technology has allowed agencies to implement more complex imputation systems. Imputation involves assigning values to missing data through reference to other variables. This can be done by way of reference to (*a*) look-up tables that contain typical data (e.g., age distributions) and (*b*) other records with similar characteristics. This approach is commonly referred to as "hot-deck" imputation.

Look-up tables may be used to impute variables such as age. There may be several tables for the one variable, which are broken down by gender or geographic region. These tables would contain age distributions that have been derived from previous census data, or other survey data, and used to impute age. Other information on the census form may be used to restrict the range in which age may be imputed. This may be a lower bound (e.g., must be greater than 15 years) or a range (e.g., from 30 to 55 years). For example, age may be missing for a married woman with children. The lower bound for imputing her age may be set

at the age of her oldest child plus a certain amount of years (e.g., 15). The upper range may be set with reference to other variables on the census form.

Hot-deck imputation is the most complex method. In this method, a missing value for a particular field is imputed from data from a different record. It involves searching back through the census records until a preceding similar record is found that does not have a comparable inconsistency. The values from the field in that record are then copied to the record with the missing value. For example, income may be missing for a particular record, although it contains occupation and industry responses. The system would search for a preceding record that contains the exact same combination of occupation and industry, with a stated income. The income from this preceding record is then copied to the record missing this value.

The hot-deck approach has been adopted by some agencies because it uses existing data and, as such, is regarded as statistically sound. However, hot-deck imputation methods are extremely complex and are difficult to build and test.

Which data items will be subject to imputation is a strategic decision that needs to be made early in the planning process. However, it is considered that the advantages of adopting a realistic minimalist approach that only imputes values for basic demographics far outweigh any marginal benefits that may arise from building complex systems such as hot-deck methods. Inventing data through imputation for many variables (e.g., occupation) will not add any significant value to the final product. Users should be educated to expect not stated responses in census data and the reasons for these "not stated" values.

7. *Data management*

Data management is particularly critical in a distributed processing environment where there may be hundreds, if not thousands, of PCs connected on a Local Area Network or a Wide Area Network.

Some basic considerations that are applicable to a variety of systems, regardless of the technology used, are discussed below.

(*a*) *Data storage*

During processing, data will pass through a number of sequential activities from data capture through to release of files to the dissemination phase. Each activity will refine and change the data in some way. Therefore, it is advisable to maintain copies of all versions of data for auditing and tracking purposes. This will enable easy pinpointing of where problems were introduced and where corrective actions can be taken.

The technology used for data storage depends on the architecture chosen for the data-capture and processing systems. Simple text files may be sufficient, if appropriate to the architecture. Whatever data storage system is used, a key issue is the management of large volumes of data and multiple versions of files as the data passes through each activity. The management of the data also needs to address issues such as retrieval for the various activities within specified response times. A decision on the data storage methodology will depend on the volume of data involved and the complexity of the processing system.

(*b*) *Data back-up*

In order to recover from inadvertent loss of data it is important that a back-up strategy is developed. This strategy may include frequent on-site back-ups of data, and control files, from all stages of processing, and regular off-site back-ups to protect against major disasters.

It is also important to have a recovery strategy in place to be able to reinstate all files in a consistent state after the failure of a server, corruption of data or other problems.

(*c*) *Data security*

The unit record data that is produced during processing should be subject to the same strict security rules that apply to the physical forms. This means that only authorized staff should have access to the unit record files for the purposes of processing. Network security will be required to monitor and restrict access to unauthorized staff. It will also need to provide mechanisms that prevent unauthorized tampering of the data in the files and provide audit trails of all changes.

Protection against the threat of computer viruses is another important aspect of protecting the data. The introduction, either deliberately or inadvertently, of a virus could have disastrous effects on processing. There is a variety of commercially available software that can be used to reduce this threat. However, one of the easiest and most effective ways of reducing this threat is to physically remove the diskette drives from the computers connected to the network. In a network environment, there is usually no need for the majority of staff to have access to diskette drives. Any software upgrades or transfer of data that are necessary by way of diskette can be done through a restricted number of terminals used by a restricted number of authorized staff. Up-to-date virus protection software should be installed on these computers to ensure network security.

8. *Communications*

Effective and efficient communication, both within the processing centre and between the processing centre and other stakeholders (e.g., the field operations and dissemination phases and central census agency management), is essential. If several processing centres are established in a decentralized option, special attention should be paid to establishing secure links between these centres.

The use of electronic mail, bulletin boards or discussion databases is particularly suited to processing centres. The bulletin boards or discussion databases can be used to hold copies of manuals and procedures. They can also be used to raise problems and hold discussions about various aspects of processing.

The data from the processing centres may also have to be transferred between sites or to the dissemination team for inclusion in census products. Because of the size of the census files, electronic transmission may be impossible or inefficient. If electronic transmission is used, it is recommended that file compression software be used. Validation of decompressed files will also be necessary to ensure data integrity. Security issues associated with electronic transfers will also need to be considered. Encryption software and/or hardware may be needed to protect the data during transmission.

Physical transfer of the data may be less expensive. Files can be downloaded to a variety of media, including diskettes and digital audio tapes.

V. CENSUS PRODUCTS

A. BROAD DISSEMINATION STRATEGY

1. *Introduction*

The present chapter describes the processes that lead to the creation of products that will meet the needs of users of the census data. It has been written from the view of a census agency that undertakes a considerable amount of development of products to the final stages.

In other countries, a far less ambitious output programme is employed, reflecting one or more of the following conditions:

(*a*) A policy decision by the census agency to use the skills of external entities to add value to a suite of basic tables produced;

(*b*) Lack of suitably skilled staff within the user community to utilize advanced and/or complex output products;

(c*) Lack of financial resources to fund the development of complex products within the census agency or for users to purchase them.

Where such conditions apply, it is still important that users are consulted about the range of output to be provided. In fact, if the principal form of output from the census is to be a concise set of simple and generally applicable tables, it is crucial that the content of those tables meets a high proportion of user needs. This can only be achieved if users are intensively consulted during the process of designing the tables.

It is important to recognize that there are a range of strategic issues that should be considered by the census agency before commencing the development of products.

The major issues to be considered include the following:

(*a*) Wholesale versus retail approach to dissemination;

(*b*) Pricing of census products;

(*c*) Timeliness of release of data compared to accuracy of data;

(*d*) Stages of data release;

(*e*) General or customized releases;

(*f*) Integration of census results with other products of the census agency.

2. *Wholesale versus retail approach to dissemination*

At a very broad level, it is possible to consider whether the census agency should provide detailed standard tabulations to other entities (either public agencies or private sector entrepreneurs) that will develop value-added products or provide a full range of services to end-users. Using the language of commerce, these options are often referred to as wholesaling or retailing models.

The main advantage claimed for a wholesale approach is that the census agency concentrates on its core business of collecting, analysing and disseminating statistical information. The potential distractions of marketing and related activities are avoided.

Even where a broad wholesaling approach is followed, it is likely that there will be requests for non-standard information, including consultancies, from retailers and, possibly, direct from users. Furthermore, it is probable that the census agency will be involved in resolving user queries about the interpretation of the data supplied by retailers. This will follow from the superior knowledge of the census agency in respect of the impact of the census processes on the data, and the access of the agency to unit record files for further analysis. From a census management perspective, it is important that work plans and budgets make appropriate allowance for these tasks.

The advantages claimed for a retail approach are that the census agency is best placed to understand the data and its limitations, and can thus provide the most effective service to users. Also, it can be considered that developing products in-house provides positive feedback to census staff.

It is important to note that the costs to the census agency of user liaison under a retail approach will be considerably higher than under a wholesale approach. It may be necessary for the census agency to take on staff (either as employees or consultants) with different skills for some of the retail-oriented tasks. Additional staff could include the following:

(*a*) Developers of more complex output products;

(*b*) Sales and marketing experts;

(*c*) Client support staff.

The decision about the position of the census agency with respect to this criterion should be made as far as possible in advance of census day. This reflects the central role of client's views determining the relevance of the census to users of census output, and through them, relevance to the community in general.

3. *Pricing of census products*

Countries will make the most basic decision regarding pricing. It is to be expected that each Government will determine as a matter of policy the extent to which a census will be funded by general revenue or by sales of the results of the census.

At one extreme, the Government may determine that funding will be made available through the general taxation system, with the consequence that all output will be provided at no further cost to the users of those statistics, whether they are taxpayers or not (i.e., free data for all). At the other end of the spectrum, the work of the census agency may be determined by the funding provided by users of the results (i.e., a user-pays strategy).

In practice, it could be expected that most Governments will expect the census agency to fall between these extremes. A range of output will be provided at no cost, while other elements will be seen as value-added products for which a charge will be levied. It should be noted that the full costs of a census are never recovered through the sale of data. The role of a pricing mechanism may be based on a number of criteria, including the following:

(*a*)   The need for a mechanism to ration demand for services of the census agency;

(*b*)   Encouraging users to identify, and specify, their real needs for census data;

(*c*)   Relieving taxpayers of the burden of funding elements of the census that are only utilized by a small proportion of the community.

It should be noted that, in most cases, the majority of funding for the census will be provided through general revenue. This is usually taken to imply an obligation on the census agency to return some services to the communities that have devoted time by providing information to the census agency. These services are often described as community service obligations and may include provision without charge of (*a*) basic tabulations "on demand": to all whom request them; (*b*) a basic product through major public information sources such as libraries or elected officials; (*c*) information services provided by media outlets; and (*d*) support for retailers adding value to the data.

4. *Timeliness of release compared to accuracy*

One of the most basic decisions in a census operation, and indeed a key decision about the quality of census results, is the trade-off between timeliness and accuracy. This is particularly important in designing the output strategy, in that the decision affects not only the dissemination team but all the preceding stakeholders in the census programme.

In general, it can be expected that the faster a process is undertaken the greater the level of inaccuracy in the results of that process. It is also a general rule that users of census data will expect a high level of accuracy in the information provided by an official census agency. The census agency will need to manage this trade-off.

It should be expected that the majority of users would be satisfied by an initial release of core information followed by a subsequent release of ancillary data. Where the resources of a census agency are limited, it may be found that the optimum strategy is to focus a high proportion of resources on the initial release of basic data. Other entities, such as value-adding external agencies, can be relied on to meet more complex data needs.

5. *Stages of data release*

It may be found that advantages of timeliness of release of some basic information can be achieved by splitting the release of information into two or more stages.

Some countries have adopted the practice of releasing preliminary data that are subject to later revisions. These data are usually restricted to head counts tabulated by large geographic areas and basic demographics (e.g., sex). However, this practice is not recommended, as the accuracy of the data can be poor because it is usually not subject to the same stringent quality assurance procedures that are present in the final data. This can lead to large revisions of the data.

Other countries have adopted the practice of a staged release of final data. Responses to simple questions (notably, basic demographics) could be dealt with in a first release to permit consideration of key "head count" related analyses. More complex topics, such as industry and occupation, which require considerable processing resources, could be dealt with in a second release.

Managing such a process requires consultation with users to determine which data items are required close to census day, balanced by the census agency's knowledge of the items that are difficult (and thus time-consuming) to process.

6. *General or customized releases*

A further decision has to be made between providing basic, standard data suitable for all users and providing more complex data for the needs of specialized users.

To some extent, the type of funding adopted for the census will determine this matter. It could be expected that a high proportion of funding from general revenue would be accompanied by a high priority being given to standard tables to meet a wide range of needs. Alternatively, a high proportion of user funding will be accompanied by a relatively high priority given in the dissemination phase to meeting the needs of the providers of funds.

One way of balancing these requirements is to determine that some products are community service obligations, to which resources are devoted according to the level of community funding. Other products are seen as commercial products, with resources devoted according to the level of client-specific funding (either through advance funding or through purchases of products once they have been offered for sale).

It may be found that there are advantages to developing a basic set of data tables to meet all needs. These tables can then be manipulated, or presented with more complex tools such as GIS software, to meet commercial market niches.

7. *Integration of census results with other products*

In most cases, the census results will only be one part (albeit an important part) of the product range of the statistical agency. It is important that the output produced by the census is integrated as far as possible with the output from other collections conducted by the statistical agency.

One way of achieving this, particularly if a retail philosophy is employed, will be to include the corporate dissemination or sales area as a stakeholder of the census. This should ensure that salespeople can demonstrate how to use data from across a range of collections undertaken by the statistical agency to enable users to obtain a greater understanding. This could be expanded to include integration in terms of statistical standards, dissemination structures and computing systems such as those for tabulation and/or manipulation of data and for statistical mapping.

In addition, the use of other authoritative data for the country to validate the census data will help ensure that the census data are seen as part of a larger package, and not simply a self-contained set of numbers. Such validation is a key element of the quality circle described in chapter I, section C.

B. User consultation process

1. *Introduction*

The user consultation process discussed in the present chapter complements that which takes place when determining the content of the census (see chap. I, sect. A).

The user consultation process in terms of census products is a major factor in the development of a dissemination programme. The work done at this stage of the census is important in achieving the objective that the census is relevant to users. As indicated in the quality assurance section of chapter I, this is a major indicator of the quality of the census.

The overall aim of the dissemination phase is to provide information to assist users to make more informed decisions. In working towards this objective, the dissemination phase should use the results of the evaluation of the output from one census to consolidate and improve the product range for the next census. The focus should be on data relevance, quality and timeliness of delivery.

It is likely that the user consultation process will commence with the census agency stating its view on the nature of output to be produced. This view can be developed from the evaluation of the previous census and enhanced by the knowledge of recent developments. However, there will need to be some flexibility to adapt the range of products and services to meet current and emerging needs in the market place that only become identified in the consultation process.

2. *Managing the process*

(*a*) *Objectives*

The aim of the user consultation process should be to inform census users of the census agency's strategies for developing the products and services of the next census. It should also seek their views on the strategic goals and directions for the census dissemination phase. This overall aim can be broken down into three objectives as follows:

(*a*) To better understand overall user reactions to the current broad direction of the dissemination phase;

(*b*) To understand user reactions to specific products and services;

(*c*) To report on the outcome of the research and make recommendations to users and census agency management for the dissemination phase.

The process described below consists of several stages, in which a range of tools can be used; these tools are described in table V.1.

(*b*) *Stages of the process*

The consultation process can be carried out in two stages.

(*i*) *Stage 1. Consultation on the broad directions*

It is recommended that the dissemination strategy be provided in publication form, accompanied by a questionnaire. The publication and the questionnaire will usually be in hard-copy form, although some countries may wish to supplement this with an Internet publication, supported by e-mail responses.

This first publication can provide the goals, the strategies to achieve the goals and the broad directions of the dissemination phase. The self-enumerated questionnaire can comprise two parts:

(*a*) Questions relating to the client's use of current census products and services;

(*b*) Questions relating to the strategies proposed by the census agency for the products and services of the next census.

To facilitate later work, users should also be asked whether they wish to be involved in later rounds of the consultative process.

The hard-copy publication can be mailed to existing and potential clients. For the convenience of clients, a reply-paid envelope can be included in the mail-out.

As indicated above, much of the information sought in this stage will be qualitative commentary. Information may be available on the quantity of products purchased (or accessed, if products are not sold) by each user. This information can be used to develop some weighted measures of the strength of views according to the nature of the client.

Table V.1. Tools used in user consultation process

Stages	Qualitative studies	Quantitative studies	Comments on Prototypes
Use of current products and services	Major use	Minor use	Not applicable
Broad strategies planned for next cycle	Major use	Major use	Not applicable
Detailed design of specific products	Major use [a]	Minor use [a]	Major use

[a] These ratings reflect the likelihood that, by the detailed design stage, much of the client contact and negotiation will be based on the quantitative information determined in the previous stages.

(*ii*) *Stage 2. Consultation on specific products and services*

Based on the results of the stage 1 consultation, more specific proposals can be developed. A second publication and questionnaire can be mailed out (or supplied through the Internet, as appropriate) to those clients that expressed interest in further consultation. This publication presents the proposed content of products and services that will become available, indicative prices and indicative release dates. The questionnaire can seek detailed information on the content of specific products.

In addition to the mail-out of publications and questionnaires, face-to-face sessions can be conducted with key users, where possible, to obtain more detailed feedback.

The returned questionnaires can be categorized either by client sector and industry or by client's status (heavy user or ad hoc user), and the results analysed using standard spreadsheet software.

(*c*) *Information required*

Reactions from clients can be sought against a number of specific criteria, such as the following:

(*a*)   Content and functionality;

(*b*) Views on, and reactions to, pricing of products and services;

(*c*) Importance of timeliness;

(*d*) Client support;

(*e*)   Usefulness and appropriateness of the census data and products.

(*i*) *Content and functionality*

The range of issues to be covered under this heading is extremely broad and will be determined by many factors, including the range of topics on which data are to be collected, and the strategic issues covered in section A above.

However, the following list of broad topics may be of assistance to countries in planning this phase of user consultation:

(*a*)   Data:

  (*i*)   Quality;

  (*ii*)   Comprehensiveness and breadth;

  (*iii*)   Reliability;

(*b*)   Software (if provided):

  (*i*)   Quality and performance;

  (*ii*)   Ease of use and intuitiveness (user-friendly);

  (*iii*)   Level of functionality;

  (*iv*)   Technical support and training;

(*c*)   Service delivery:

  (*i*)   Timeliness and predictability of release;

  (*ii*)   Range of media and formats;

  (*iii*)   Presentation and packaging;

  (*iv*)   Pricing and value for money;

  (*v*)   Client support, awareness and training;

  (*vi*)   Usefulness of data or product;

  (*vii*)   Appropriateness of the product (standard versus customized).

(*ii*) *Views on, and reactions to, pricing of products and services*

In the discussion that follows, the terms "services" and "products" are used interchangeably. This reflects the fact that in many cases there is an arbitrary choice by the census agency as to whether a range of data are provided through a specific (usually, generally available) product or by a value-added service.

To some extent, the issues raised by this topic will be predetermined by the policies applicable in a country, as described in section A above. Within this broad set of parameters, users' reactions to pricing are likely to vary according to their circumstances and their view of the official policies. However these views can be influenced by a number of factors, including the following:

(*a*) Whether it is a standard product or a customized service;

(*b*) Timeliness of the product or service;

(*c*) Comprehensiveness, accuracy, breadth and relevance of the data included in a product or service;

(*d*) Scope and content of the product and the range of media in which it is disseminated;

(*e*) Level and effectiveness of the training and support provided;

(*f*) Breadth of functionality of the software (where applicable), and its quality and performance;

(*g*) Complexity and ease of use of the software.

All of the above factors will influence the client's perception of whether the product represents value for money.

(*iii*) *Importance of timeliness*

Many users of census data have unrealistic expectations of the timeliness that can be achieved for release of accurate census data. An important role of managing a census is to manage users' expectations of this aspect of quality so that the output programme is not threatened by unreasonable demands for early data.

The time required to undertake the following activities should be drawn to users' attention:

(*a*) Quality assurance in the field;

(*b*) Transporting forms from enumeration staff to the data-processing centres;

(*c*) Data capture of the information from the forms;

(*d*) Coding textual responses;

(*e*) Validation of the unit record file;

(*f*) Compilation of the output files and preparation of products.

(*iv*) *Client support*

This item refers to the services that the census agency may provide to support users in their application of the data or use of the product. This may range from an inquiry service to a product-support facility similar to that offered by computer software companies. The level of sophistication will rely on the funding available to the census agency and the needs of users.

The position adopted by a country in regard to this item will depend on the range of products the census agency produces, with considerable weight given to whether the country is oriented towards retailing or wholesaling statistical information.

(*v*) *Usefulness and appropriateness of the census data and products*

This information should be of great value to the census agency in determining the priority afforded to providing specific products.

Information collected under this topic will need to be integrated with and compared to that collected under other items in this section. It is, however, a key measure of the relevance of the data and/or product under consideration.

3. *Tools to be used*

The user consultation process can take place in three phases, some of which will overlap. These are:

(*a*) Qualitative studies;

(*b*) Quantitative studies;

(*c*) Detailed product design.

While the research should commence well before the enumeration period, it may be possible for detailed product design (for more complex products) to be undertaken during the processing period. However, it would be desirable for the detailed design of the basic output products to be completed in sufficient time to minimize the lag between completion of validation of processing and release of the product.

It is important that clients and/or stakeholders within the census agency are involved as a matter of course in all phases of the consultation process. They should be given the opportunity to reply to questionnaires and participate in the detailed product proposals at the contemplative stage. Focus groups and workshops for internal clients provide an effective forum for innovation and generating proposals for new products, as well as providing internal staff with the chance to have input into the final product design.

(*a*) *Qualitative studies*

Qualitative studies are most commonly undertaken in the form of focus groups (i.e., small group discussions moderated by a market research specialist).

Focus groups can be established to obtain qualitative information about the performance of current products and services. Detailed current product plans provide the starting point. The groups are usually general in nature, covering a range of clients and products. However, there may be the need for more specialized groups to deal with key market segments, as well as with individual products, in particular flagship or premium commercial products. An ex-

ternal consultant can be employed to assist in the process, although the census agency should be heavily involved in the development of the specifications to be provided to the consultant.

Where appropriate, larger-scale conferences and/or workshops can be held to allow consultation with clients and users from the central and regional offices of the census agency.

The aim of the qualitative research is to better understand the reactions of clients to the current census dissemination programme, including products, services and their delivery. This contributes to recommendations for the next census dissemination programme.

The major tasks are as follows:

(*a*) Prepare detailed specifications;

(*b*) Contract external consultants;

(*c*) Organize focus groups;

(*d*) Prepare interim report (for the evaluation phase);

(*e*) Prepare final report.

Approximately six months should be allowed for this phase of consultation.

(*b*) *Quantitative studies*

Quantitative studies and the detailed product design will have some overlap and will give a broader base to client contacts.

Quantitative studies may make use of client mailing lists that have been built up by the census agency over the past census cycle (e.g., client databases and newsletter subscriber lists).

A variety of questionnaires may be required, including a general questionnaire and others focusing on:

(*a*) A particular product or service;

(*b*) Particular market segments or industry sectors;

(*c*) Users' technical requirements (available formats and media and industry standard software in use).

A user's newsletter is a useful avenue to provide a forum for feedback.

The major tasks in the quantitative research phase are:

(*a*) Determine detailed methodology;

(*b*) Develop questionnaires, covering letters, newsletter articles the response mechanisms;

(*c*) Conduct surveys;

(*d*) Analyse and prepare reports.

Approximately 8 to 10 months should be allowed for this phase of consultation.

(*c*) *Detailed product design*

Based on the results of the qualitative and quantitative studies, decisions will need to be made on the appropriate product mix.

Within the census office, approval should be sought for the detailed product design, along with submissions for appropriate funding (where this is required from government funding rather than being obtained through user-pays arrangements).

Prototypes of the various products can be prepared and follow-up user consultation undertaken through seminars and mail-outs. Consultation will also need to take place on the classification details clients require from the census, some of which (such as income ranges) have an impact on the final census form design.

The major tasks in the detailed product design phase are:

(*a*) Determine overall product mix;

(*b*) Develop product plans for corporate approval;

(*c*) Develop prototypes;

(*d*) Devise classification proposals;

(*e*) Consult users;

(*f*) Finalize product design.

Approximately 12 months should be allowed for this phase.

4. *The business plan*

A business plan is developed after extensive consultation with external clients and the agency's stakeholders. Even if the census results are not being sold on the open market (i.e., no revenue is required or expected), a plan should be created showing the costs, the expected number of units to be created and the expected principal users of the products and services.

A management steering group can be established to review on a regular basis the development of the plan and to monitor revenue and expenditure under the plan. The business plan should cover the costs of the full range of dissemination activities. These include the costs associated with data validation, output systems development and product development and production. Costs associated with marketing and ongoing support of all census products through the complete census cycle should also be included.

C. PRODUCT DEVELOPMENT

1. *Introduction*

The challenge to census planners is to achieve continuous improvement in all aspects of data quality. This includes the provision of a flexible and client-focused census dis-

semination programme and service. In terms of the dissemination programme, the key goal will be the development of a user-driven and predictable programme, with the development of effective dissemination systems and procedures within budget and on time.

To ensure predictability of release (i.e., that the announced release dates are adhered to), resourcing and timetabling of the dissemination programme must be carefully considered and be realistic and achievable.

2. *Product planning*

The following procedures should precede the development of products and services:

(*a*) Review of the products and services from the previous census. In particular, attention should be paid to content and method of production, and content of standard products, with a view to improving timeliness and use;

(*b*) Targeted user consultation and market testing;

(*c*) Review of the method for protecting confidentiality of individual responses to improve data additivity and consistency (as determined by user requirements);

(*d*) Review of the mix of hard-copy and computer-based platforms for the dissemination of census data;

(*e*) Investigation of cost-effective internal and/or external suppliers of information technology services to the census dissemination phase.

(*a*) *Review of method of production*

An evaluation of the method of production from the previous census should be conducted to identify successful elements in the process that can be carried over to the next cycle. More importantly, problem areas need to be identified and addressed to improve the process.

(*b*) *User consultation and market testing*

The public consultation work, which ensures the relevance of this element of the census programme is described broadly in section B above.

In addition to the consultation needed to establish users' views of the current output and to define their requirements for the next census, ongoing consultation and market testing should be conducted throughout the product design stage. This will allow the census agency to review and refine the tables until the proposed output meets a majority of users' needs.

(*c*) *Method for protecting confidentiality*

A technique for protecting confidentiality must be developed and applied to ensure not only that users receive high-quality data, but also that information provided by individuals cannot be identified from the data included in the output.

To meet this requirement, various countries have adopted a wide range of procedures. In many cases, the required outcome is achieved by randomly changing output cells with small numbers (e.g., less than 3) to reduce the probability of an individual being identified. The precise nature of such procedures (e.g., what is a "small number"?) should be determined by the census agency, bearing in mind its circumstances, including its stated objectives in relation to confidentiality.

A confidentiality algorithm used to determine whether the information in a table can be released can be included in these confidentiality procedures. Where applicable, the method of protecting confidentiality should be applied in the tabulation program itself (i.e., the algorithm is built into the program).

No tables that have not been subject to these procedures should be released to people or organizations outside the census agency.

(*d*) *Hard copy or electronic dissemination*

In many countries, some users of census results will not have access to computers and will prefer output to be delivered in paper bulletins. Even in the most advanced countries, many users (for example, community organizations and individuals interested in the population profile of their local area) will wish to receive information in this format. Equally, in countries with relatively low use of computers, it is likely that central Governments and international agencies will prefer to receive information in a computer-readable form.

The challenge for the census agency is to develop systems that allow flexibility in output media. For example, it is possible to develop a standard set of commonly requested tables for each enumeration area and store these electronically. Simple systems can be developed that allow the user to specify the enumeration area, combination of enumeration areas or other specified statistical areas that are of interest. The census agency can then deliver the tables for the requested enumeration areas either in hard copy or in electronic form. This method of dissemination also avoids the need to preprint large numbers of paper bulletins for areas in which there may be only limited interest.

Where a computer-based delivery mechanism is chosen, an investigation into the data formats and media used by clients should be included in the user consultation process. Output should be made available in industry standard data formats such as ASCII. Where research has shown that a large number of clients are using particular software (for example, a common spreadsheet or tabulation package such as EXCEL), these options should also be provided. Media could include floppy disc, CD-ROM, cartridge or magnetic tape. Because of the diversity of data formats and media available, it will not be cost-effective to provide data in a manner to suit all clients.

The Internet can also be used to disseminate data.

(*e*) *Suppliers of information technology services*

Where a computer-based product is not going to be developed entirely in-house (for example, because of limited expertise within the census agency), a process of seeking expressions of interest from external developers needs to be conducted. The submissions, often received through a tendering process, should be evaluated using a specific set of criteria, including experience of external developers, their ability to comply with the specifications and meet deadlines, potential return on investment to the census agency and proposed payment arrangements (see chap. I, sect. G, for details on managing outsourcing).

3. *Production strategy*

The production strategy for dissemination products should include a description of the aggregation and retrieval systems used to compile the basic tabulations and references to the use of these systems. These could include PC-based tabulation systems such as PC-SAS, IMPS or Supercross. Some agencies may still use mainframe systems such as TPL (table-producing language), although these systems are gradually being phased out in preference to PC or mid-range systems. A similar description of the system (e.g., UNIX-based or PC-based) to be used to disseminate the tabulated data also needs to be included.

The key production activities include the following:

(*a*) Development of geographic elements;

(*b*) Classifications;

(*c*) Data products;

(*d*) Software products.

(*a*) *Development of geographic elements*

A key attribute of census data in most countries is that it provides information relating to small areas (such as EAs, or aggregations of small numbers of EAs). To maximize the usefulness of such information it is important that the following are developed:

(a) Geographic database;

(b) Time series concordance;

(c) Map dissemination system.

(*i*) *Geographic database*

The geographic database should store data relating to census geography. The data stored on this geographic database should be primarily the codes and labels that relate to the geographic regions used to output census data. Other data items can also be stored, such as the following:

(*a*) Comparability codes to indicate comparability between a current enumeration area and its counterparts in earlier censuses (see below);

(*b*) Latitude and longitude of the centroid of the enumeration area;

(*c*) Total area of the enumeration area (sq km).

(*ii*) *Time series concordance*

A time series concordance can be used to align enumeration areas from earlier censuses to the current census boundaries. Changes to enumeration area boundaries will impact on comparability of data across censuses.

(*iii*) *Map dissemination system*

A map dissemination system can be provided to satisfy requests for hard-copy and/or digital maps. An on-demand map printing service, which could provide bound sets or single maps, may also be outsourced. The digital boundaries (where relevant to user needs) could be made available in common industry formats and the agency may choose to outsource this service to maximize the choice of file formats for clients. The census agency may also choose to include a topographic map base in products to add value to the analysis and display of statistical data.

(*b*) *Classifications*

A key attribute of the work of a national statistical agency should be to produce output that presents the data according to standard classifications. A starting point for the consideration of these standards should be international classifications that have been issued by various organizations. Examples include the International Standard Classification of Occupations (ISCO), issued by the International Labour Organization, and the International Standard Classification of Education (ISCED), issued by the United Nations Educational, Scientific and Cultural Organization.

Within these guidelines, it must be understood that output information can never be more detailed than the information collected from respondents and transformed by coding in the processing phase. For example, some responses may not be able to be coded to the most detailed level of a particular classification because the level of detail in the response is not sufficient. In these cases, a higher-level code in the classification (e.g., at minor or major group) may be allocated.

In developing the output classifications, the following steps should be covered:

(*a*) Review of classifications to cover new topics and changes in concepts;

(*b*) Development of a directory of classifications to enable effective access by users;

(*c*) Development of a dictionary of census terms to assist users' understanding of the data items.

(*c*) *Data products*

Data products refer to the tabulations, and the products containing them, that are produced from the final census data.

Standard products are those developed to satisfy the majority of census data users who want basic, easy to access data (e.g., publications) for distinct geographic areas, such as provinces or capital cities, or administrative areas such as regions. The tabulations in these publications provide

basic cross-classified data on subjects such as age and sex, labour force characteristics and family composition. Electronic format should also be provided for users who want to extract from these tabulations, or add data from other sources.

Subpopulation or thematic products are those designed to focus on particular populations of interest to more specialist users. These products are again sets of standard defined tabulations that provide the data in easily accessible formats such as publications, and often include some descriptive information.

Customized output is provided for users whose requirements are more specialized and cannot be satisfied by standard tabulations. These users provide the specifications for the tabulations they require, and the data output is produced on a consultancy basis.

Production of data products includes the following:

(*a*) Development of prototypes based on results of user consultation. This may be an iterative (or dynamic) process, with ongoing revisions being applied as further consultation takes place. It is important that the outcome of each iteration is fed back to all participants to ensure all users are satisfied with the final outcome;

(*b*) Coding and production of prototype tables using test data. This will also serve as a test for the production and output systems;

(*c*) Finalizing tabulation content. It is important to set a definite date for this and to adhere firmly to this date;

(*d*) Live data production for standard output;

(*e*) Release of the consultancy service (for customized tabulations, where appropriate);

(*f*) Specialized table production for specific products.

(*d*) *Software products*

This section relates to the software developed to accompany and/or deliver products based on computer platforms. In most cases, it is expected that the statistical material included in these products will be based on the basic tables compiled for the standard products.

Developing software includes the following tasks:

(*a*)   Identify the broad nature, structure and content of the product;

(*b*)   Determine software developers (internal and/or external consultants);

(*c*)   Specify the detailed design and functionality of the software;

(*d*)   Acquire necessary hardware;

(*e*) Develop and test software with test data (where possible, involving end-users in processes such as beta version testing);

(*f*) prepare training programmes/tutorials to accompany the product, such as computer-based training material, context-sensitive help files and hard-copy user manuals.

4. *Quality assurance*

It is essential that the data flowing from a census and the products that include such data are of the highest possible quality (particularly with respect to accuracy). It is therefore recommended that a first step in the management of the dissemination phase of a census is development of a quality assurance strategy.

The following points have been identified as critical to ensuring that the required quality data and products are delivered to clients.

The accuracy of information provided by respondents and coded by the processing system cannot be improved by the dissemination system. The objective of the quality assurance system should be to prevent the introduction of error at this stage in the cycle.

However, even in the best-managed census, errors may be detected in the dissemination phase. Decisions will need to be made about how to deal with these errors. The decisions will need to be made with regard to the nature and extent of the errors. In some cases, it may be decided to leave insignificant errors in the final data rather than delay the release of data, which will impact on the timeliness aspect of overall data quality.

(*a*) *Documentation*

All production and validation procedures should be fully documented to ensure census agency staff follow appropriate procedures and fully understand these procedures. This documentation, together with quality assurance check sheets compiled for each product, will readily assure users that they are receiving a high-quality product.

The production team must understand the quality assurance strategy's purpose. The team should not see it as a mechanical application of procedures that may or may not continue to be appropriate but as a key component of its work.

(*b*) *Skilled staff*

The production team should be fully trained in the production and/or tabulation and output platforms, with clearly defined objectives and deliverables. Procedures should be discussed and clarified. Team members should be encouraged to suggest improvements.

(*c*) *Validation procedures*

Procedures for data validation and systems and/or software acceptance testing must be implemented to ensure the detection and correction of any defects contained in the data or software. The strategies should be oriented towards es-

tablishing a system with the objective of preventing errors or defects from occurring. In contrast to earlier stages of the cycle, it is probable that any errors identified in the output quality assurance process indicate a failing of the system. Thus, if (or when) errors are identified, the system must be checked and revised and tables rerun to remove all errors.

One useful approach to this phase is the development of a set of standard tables against which the output for specific areas can be compared. These tables could be developed so that they are used at all levels of geography (e.g., enumeration area, region and province) the first time such a level becomes available. If no errors are identified, it can be assumed that the system is functioning correctly and a sampling approach be followed for validating later production at that level. Where it is expected (or suspected) that a change between areas (for example, from one province to another) may increase the probability of systemic error, it may be desirable to reuse the standard tables, again at each level of geography.

(*d*) *Timeframe*

As indicated elsewhere in the present handbook, timeliness is a key attribute of quality. The timetable for, and activities involved in, the validation and production processes should be developed in consultation with all staff members working in the dissemination projects of the census (and other projects that are stakeholders of dissemination). The procedures should also be fully documented.

(*e*) *Dependencies*

Any problems that have the potential to affect the schedule (for example, in earlier projects on which the dissemination phase depends) should be identified and solutions put in place as soon as possible.

In particular, where agencies have distinct sections responsible for the various tasks associated with product development, it is important that dependencies are identified and communication strategies put in place to ensure a smooth flow of data through the processes. For example, critical elements such as geography or classifications may be developed and produced by other stakeholders in the statistical agency. Therefore, clearly defined objectives and ongoing communication are essential to ensure that deadlines are met.

There are a number of issues relating to standard classifications that will impact on the preparation of the data and these should be clearly defined and understood by the dissemination project team prior to commencing production. These may include the following:

(*a*) New concepts and variables. New topics that are collected in the census may result in additional classifications and/or new variables. Census concepts and classifications can change over time, often owing to the requirement to follow international or the agency's own standards;

(*b*) Modified classifications. The need for different output categories is often highlighted by responses received from census tests and dress rehearsals; questions that elicit obscure or widely varied answers may be restructured to avoid respondent confusion.

New and changed classifications will affect comparability with data from earlier censuses and will thus impact on the production of any time series data. Where the changes to classifications are significant, concordances should be developed to assist users to compare census data over time.

5. *Development and testing of procedures*

Once plans for the overall dissemination cycle and the quality assurance strategy have been established, the development and testing of the dissemination system can proceed. Recommended procedures for the identification of user requirements for dissemination have been described in section 2 above. The present section describes the management of a development path to be followed, which will ensure that those needs are satisfied according to the prescribed standards of quality.

It is recommended that a maximum level of testing of dissemination systems and procedures be conducted using data obtained from the final test (dress rehearsal) conducted for the current census. If this dress rehearsal strategy is employed, the data presented for testing from the dress rehearsal will have been subject to the full range of "main event" processes. That is, the dress rehearsal processes will have been geared to the nature and content of the census itself and will provide data for the majority of data items, with a considerable range of values for each data item.

If dress rehearsal data is not available, or does not satisfy these requirements, then data from any of the census tests should be used. The key management objective should be to ensure that all processes used in the production of output from the census itself should have been tested before their use in a production environment.

6. *Presentation guidelines*

While not necessarily agreeing that the "medium is the message", there is a vast amount of published material in the field such as communications theory. This indicates that the way in which information is presented will have a considerable impact on the way in which readers of the material will interpret (or misinterpret) it. It is beyond the scope of the present handbook to review this body of work, but the points below are suggested as matters for consideration in setting more detailed objectives for an output programme.

It is noted that, in some countries, there will already be established standards for the presentation of statistical material by the statistical agency. In these cases, the census products should follow these guidelines as far as possible. The incorporation of these standards into census products will be greatly assisted if standard style sheets are available.

A key point to note is that many of the issues to be considered will be crucially affected by the systems, notably computer systems, available for the production of census output. There will be far more flexibility available under a full desktop publishing system than with a combination of off-the-shelf word-processing and spreadsheet packages. However, it may be the case that the latter are quite sufficient to meet the core needs of users in a timely and cost-effective manner.

The detailed issues that follow require consideration in the light of each country's circumstances. They will generally be more applicable to hard-copy publications than to electronic dissemination processes (which, prima facie, implies a relatively sophisticated information technology environment with associated flexibility). They include:

(*a*) Landscape or portrait orientation, which depends on individual table requirements, for example:

    (*i*) A cross-classification with a relatively small number of columns may well fit in a portrait format, whereas a larger number of columns indicates a landscape orientation;

    (*ii*) There are well-recognized difficulties in linking the data in more distant columns back to the stubs describing that data;

    (*iii*) If there are many rows in a table, the need for more frequent repetition of the table stubs may add considerably to the number of pages in (and, thus, cost of) a publication;

(*b*) Explanatory notes should be provided in all releases of information to ensure that users of the census data are aware of the following:

    (*i*) Important contextual information such as details about the collection of the information;

    (*ii*) The scope and coverage of the collection;

    (*iii*) Interpretation of technical terms used in the publication and any limitations affecting the accuracy of the data;

(*c*) Further assistance to users of the data will be provided by presentation of a detailed table of contents and, where the product is large, an index. The extent of these elements of the product will be influenced by both the production facilities available to the census agency and the resources devoted to the individual product;

(*d*) To give an authoritative and professional look and feel to the products, a professional cover page should be designed. This will assist in creating a link to the authority of the census agency.

7. *Storage issues*

It is desirable that a retention period is specified for all computer-readable data, supporting programmes and documentation to ensure that a service can be offered to clients in the future. This should be the responsibility of the area of the census agency that produces the data, which could include:

(*a*) Statistical data for internal (census agency) use, that is, current data retained because of a need for further use in processing, back-up and/or input to other areas;

(*b*) Copies of base material produced for output products to enable re-compilation of those products, if required, for disaster recovery or other functions;

(*c*) Non-statistical data, that is, programs, test packs, metadata and reference data required to support statistical data systems or as an information source.

The details of such a strategy will be greatly influenced by a wide range of factors, including the information technology culture and facilities of the country and the census agency. The nature of the data files created in the dissemination phase and the laws of the country relating to storage of official records will also have an influence. In view of this complexity, no suggestions are made in the present handbook relating to these strategies.

8. *Management of intellectual property*

Where a country uses a dissemination strategy based heavily on cost recovery, especially where this is combined with the heavy use of computer-based products, it is desirable for the census agency to ensure that its rights in respect of ownership of intellectual property are properly protected.

Census software development should comply with the standard intellectual property protection practices of the agency. For internally developed products, written assignment of intellectual property rights signed by the agency's employees who create them should be procured. For externally developed products, ownership of intellectual property rights must be clearly defined in the contract.

Conditions of sale documents, copyright and trademark notices should appear on the software and the packaging and in user manuals. Any licence agreement to be signed by clients must be in accordance with the agency's policy on ownership and licencing of intellectual property.

D. Marketing strategy

1. *Introduction*

Marketing has not been one of the traditional functions of statistical agencies. However, many Governments now require that agencies recover some of the costs of their operations through charging for statistical products and services. Some of the reasons why pricing has been introduced include the following:

(*a*) To enable the demand for statistical products to be used as a reliable indicator of how resources should be used;

(*b*) To encourage users to address their real needs for statistical products and services;

(*c*) To relieve the general taxpayer of those elements of the cost of the statistical service that have a specific and identifiable value to particular users.

In general, where pricing has been introduced, policies need to be developed regarding who is to be charged, how prices are to be calculated and the provision of access to data by the general community as part of a community service obligation. In this regard, basic statistics can still be made available through such means as press releases and copies of statistical publications and output in libraries and local community centres.

With the introduction of pricing has come the need to undertake marketing. Many people view marketing as advertising and selling of particular products. In fact these are only a small component of marketing. Marketing is seeing the entire business of the statistical agency from the client's (the users of the data) point of view. Marketing management is the planning, implementation and control of programmes designed to create and maintain relationships with target markets for the purpose of achieving organizational goals.

Marketing involves finding out what the client needs, and planning and developing a product or service that will satisfy those needs. It is the process of conception, pricing, promotion and distribution of products and services that satisfy individual and organizational objectives. Sales are one part of promotion and an important component of the marketing mix. The sales strategy is discussed in section E below.

2. *The marketing strategy*

The census agency's marketing department, or a contracted marketing consultant, should have the responsibility for the development and implementation of a coordinated marketing strategy and promotional programme. In addition to undertaking market research and providing feedback for the product development team, the marketing department should report on the progress of individual promotional activities, evaluate the effectiveness of these activities and adjust the marketing programme as required.

The aim of the marketing strategy should be to position the census agency and its products and services as the primary source of quality demographic and socio-economic information on the population. The major objectives of the strategy can be to increase the use of census data in the community and to generate revenue within specific time-frames within a set budget. Strategies to achieve these objectives may include the following:

(*a*) Maintain the relationship with the existing user (or client) base and further explore other identified market segments;

(*b*) Extend the market through focused promotion to high-potential untapped sectors where the census agency has only achieved low penetration to date;

(*c*) Develop new census products and services to meet emerging needs in the market by extending the existing product range;

(*d*) Educate potential users about the census product and service range and possible benefits and applications of census data in research, planning and decision-making;

(*e*) Make the data widely accessible to members of the community through public and educational libraries.

3. *Marketing activities*

Marketing activities commence with seeking to understand users and their needs, and conclude with providing relevant services. The key features of marketing activities include the following:

(*a*) The market, both existing and potential users;

(*b*) Market research;

(*c*) Product development, production and pricing;

(*d*) Strategic marketing plan;

(*e*) Dissemination;

(*f*) Sales plan;

(*g*) Promotion;

(*h*) Public relations;

(*i*) Product launch;

(*j*) Evaluation and ongoing review.

(*a*) *The market*

In broad terms, the market for census products and services can be defined as any person, organization or business enterprise interested in demographic or socio-economic information. This may be for the community as a whole or any group within the community, or for a particular geographic location.

The identification of major user segments can be based on the buying behaviour and the type of relationship these users seek with the census agency. These segments may include the following:

(*a*) Key users;

(*b*) Subscribers;

(*c*) Ad hoc users;

(*d*) The media sector;

(*e*) Competition users.

(*i*) *Key users*

These users are important to the census agency from a strategic and/or business point of view. It is important that the agency establishes a close ongoing relationship and regu-

lar contact with these users. The client service logic that underpins this group includes a combination of understanding, empathy and sharing of user needs. Flexible, creative solutions should be used that call upon the full capability of the organization to service those needs. The key user segments may include other government departments, educational institutions, finance and other business sectors, and market research-consulting sectors.

A special category of key users is "lifeline" users. These are defined as strategically important organizations that have the potential to influence continuing political or opinion leader support for the agency and/or contribute significantly to revenue raising.

(ii) Subscribers

These are users that regularly do business with the agency but usually in a repetitive manner and whose needs are for the most part satisfied through the regular supply of standard products and services. The client service logic that underpins this group includes reliable, predictable and consistent service, supported by a loyal, stable and long-term relationship. The subscriber's segment comprises users subscribing to publications and other standard regularly released products or services such as on-line statistics.

(iii) Ad hoc users

These are users that make occasional or one-time contact or whose requirements are easily met through the provision of individual products or customized services. The client service logic that underpins this group includes quick, reliable, predictable, consistent, responsive, informative and accurate service.

(iv) The media sector

There is a need to have strong and coordinated links with the working media to promote broad public awareness of the agency and its products and to contribute strongly to "public good" outcomes. This sector may be dealt with as part of media liaison through a public relations unit within the agency.

(v) Competition users

Competition users are those that have a number of choices to satisfy their information needs. Potential competitors may include:

(*a*) Market research organizations that are able to tailor their services to satisfy the needs of individual users;

(*b*) Consultancy service providers that are able not only to provide data but also to conduct analysis and interpret results;

(*c*) Secondary distributors that either distribute census data or package the data into applications developed for user-specific needs (e.g., client profiling and location analysis).

(b) Market research

Market research prior to the development and design of a product or service is essential to ensure that output is aligned with the needs of the market. Market research can monitor the performance of products and services and measure and analyse consumer attitudes. It can also analyse competition, and gather intelligence to feed into the redesign of products and services and the development of new products and services. In many cases, appropriate information may already exist in previous research that has been carried out (which can include user consultation).

(c) Product development, production and pricing

A good knowledge of the demands of the intended target market, as a result of market research, will dictate the way in which the product or service is designed, produced and delivered. Product development should not proceed before a comprehensive business plan (as discussed in sect. B above), which incorporates the findings from market research is formulated. Individual product business plans will provide the information necessary to determine funding requirements and thus form the basis of pricing for the product.

(d) Strategic marketing plan

The marketing plan can provide a strategy to communicate effectively with target market segments. A sound understanding of the potential market is necessary before a marketing plan can be developed. A strategic plan highlights opportunities within the market and expands the use of the products and services. Promotional plans flow from the strategic marketing plan and they represent a measurable implementation of this plan. A consistent marketing approach will ensure that users receive the right products at the right price in the right place, with promotion appropriate to the product and the market.

(e) Dissemination

The most appropriate methods of dissemination are those that directly meet the needs of the market. A distribution process should be established to deliver products and services in the most useful, timely and cost-effective manner. It should also offer users alternative methods of delivery, which may include regular post, door-to-door courier, collection from a bookshop or personal delivery by sales staff.

(f) Sales plan

A sales plan is contingent on the outcomes of the strategic marketing plan and is driven by the market. It articulates how a census agency intends to sell its range of major products and services to the market; this is discussed in section E below.

(g) Promotion

The promotional implementation plan should aim at increasing the awareness of products and services within the market place and communicating their benefits. It provides

details of promotional strategies and tactics, and the promotional material that will be made available. Promotional activities may include direct mail and advertising campaigns, attendance at trade shows, conferences and user seminars, promotion through the Internet and public relations activities. Promotional materials can include brochures, posters, demonstration disks and case-study examples. These can form the basis of sales kits for use in the selling programme.

A useful promotional tool is a regular newsletter. A newsletter provides a means of communicating with users and, through response to various articles and questionnaires, a better understanding of their needs. An added benefit is that the subscriber list can be built upon and become a depository of useful user information. The list can be segmented and used to tailor approaches.

(*h*) *Public relations*

A public relations unit is generally established to achieve a high positive profile for the census agency in the media and the community. It can assist with improving public awareness and understanding of statistics, and enhance and coordinate the agency's corporate image. The public relations unit generates product media releases, monitors and manages media enquiries, liaises with journalists and other media personnel, and undertakes promotional launches and public awareness campaigns (see chap. III, sect. A, for further details).

(*i*) *Product launch*

This is the stage at which products and services enter the market place. Products and services should be launched into the market to ensure maximum community awareness of data availability. Both the marketing and the public relations departments generally coordinate product launches. A high-profile government or business personality may be invited to open the proceedings to ensure maximum media attention.

(*j*) *Evaluation and ongoing review*

Evaluation allows the agency to monitor the performance of products and services within the market place and to ensure that market needs are met. It is therefore essential that the interaction of all products and services within the market place is evaluated. It is also important that evaluation is undertaken for every stage of the marketing cycle. With evaluation and ongoing review, the agency can keep up with changes in the market place and identify improvements and other opportunities.

4. *The marketing plan*

An effective marketing plan is the cornerstone of a successful dissemination programme. The key factors of a marketing plan are to assess the internal and external situation, to define goals that are qualitative and quantitative and to extrapolate from those goals definitive action plans.

Marketing planning is both strategic and operational. Strategic planning focuses on long-range issues such as how the mix of products can vary in different stages in the life cycle of the product range. The operational plan is short ranged. It should be results oriented and deal with facts rather than theory. There are likely to be a number of operational plans associated with a strategic plan, with a distinct operational plan for each key or flagship product.

The following attributes should be considered in the development of a marketing plan:

(*a*) Realistic. Undue optimism can lead to unrealistic expectations by management. The acceptance and use of a marketing plan occurs only when the costs and sales targets are realistic;

(*b*) Comprehensive. Detailed analysis of market conditions and selecting appropriate strategies and detailed tactics will ultimately be reflected in the sales figures;

(*c*) User-friendly. A marketing plan is a communication tool and, as such, it should be easy to read and understand, with the major points well-defined. While other areas within the organization, or external consultants, may assist in the development of the plan, those who have the responsibility for its implementation should write it;

(*d*) Organizational commitment. The marketing plan is not for the exclusive use of the marketing department. While management will have the final approval of a marketing plan, the commitment of all stakeholders within the organization who use the marketing plan will impact on the results;

(*e*) Ongoing review and improvement. The market is dynamic, and regular monitoring and review of the plan is necessary to ensure its continued success. New marketing opportunities and challenges can exist in those markets previously regarded as inactive. Economic, political and competitive environments require different objectives and strategies. Revisions to the marketing plan should reflect any changes in these environments.

The key elements of a marketing plan are as follows:

(*a*) An analysis of strengths, weaknesses, opportunities and threats;

(*b*) Planning assumptions;

(*c*) Marketing objectives and strategies;

(*d*) Marketing mix decisions;

(*e*) Prices;

(*f*) Distribution;

(*g*) Promotion;

(*h*) Programme timetable;

(*i*) Budget and expected revenue;

(*j*) Monitoring and evaluation.

(*a*) *Analysis of strengths, weaknesses, opportunities and threats*

An analysis should be conducted of the strengths and weaknesses of the census programme, its products and services, and opportunities and threats that are present in the market place. Such an analysis is based on information gained from the user consultation process, market research results, and experience with and knowledge of the market place.

(*i*) *Strengths and weaknesses*

These can be determined from internal factors such as the size and structure of the agency, the market share currently held, cost structures and marketing information.

Strengths may include the corporate image of the agency as a reliable and authoritative data source, the comprehensive nature and quality of census data and the availability of free technical support. Any strengths identified should be, at the least, maintained and, ideally, improved upon.

Weaknesses may include the time lag between the collection and the release of data, a public perception that prices are too high, and product limitations such as lack of user-friendliness. Any factors identified as weaknesses should be addressed and responded to as soon as practicable.

(*ii*) *Opportunities and threats*

These are determined from external factors such as overall market size, competitive products, political or social influences and technological developments.

Opportunities may include growing market awareness and wider acceptance of analytical techniques in planning, research and decision-making. This will lead to a greater need for data, and a corresponding growth in the use of the Internet to provide a viable on-line delivery channel.

Threats may include a perception that the information provided by government organizations should be free of charge. They may also include the uncontrolled reselling or distribution through computer networks of census products that are delivered on compact disks, floppy disks or on-line.

(*b*) *Planning assumptions*

During development of the marketing plan, a number of assumptions are made. The recommendations in the marketing plan are based on information from historical research, evaluation and experiences of earlier census output programmes, user consultation and market research. The marketing plan expands on the broad strategic direction outlined in the census business plan, and the financial estimates and revenue projections contained therein. The plan acknowledges that the key areas for improvement identified through user consultation have been addressed. An assumption that the current broad economic conditions will prevail during the output cycle can also be made, although this assumption should be subject to continued scrutiny.

(*c*) *Marketing objectives and strategies*

The marketing plan should clearly define the objectives and contain detailed sales and revenue goals. A number of strategies may be adopted to achieve the objectives. A growth strategy may be to explore other identified market segments to attract new clients and to extend the market through focused promotion to high-potential untapped sectors. A competitive strategy may be to differentiate census products and services along the unique dimensions that are widely valued by existing users.

(*d*) *Marketing mix*

The range of census products and services to be developed should be predicated by user demand, that is, in response to the results of the user consultation process. The range should be designed to cater to the demands of as many users as possible. It may be found that a range of electronic products are more suitable than an all hard-copy output range, or that less data or more limited functionality are provided to allow faster delivery.

Each product will have its intended audience, for example:

(*a*) Reference publications, such as a census dictionary, are intended for users who need specific information on census definitions of terms and classifications (i.e., most census data users);

(*b*) Statistical publications containing summary statistics for large geographic areas are generally suitable for subscribers, the media and libraries;

(*c*) Geography products, such as maps and digital boundaries, are targeted at both government and private sector users and educational and research organizations;

(*d*) Electronic products that provide basic tabulation software may be useful for educational organizations and libraries. The more complex products, which provide sophisticated manipulation and mapping software, are aimed at users who need access to census information for small areas for detailed analysis;

(*e*) Consultancy services are targeted at users whose needs cannot be satisfied by standard census products and services, generally from government departments and the research community.

(*e*) *Prices*

An existing pricing policy may dictate the recommended retail prices for census products and services. The price of a product could also depend on whether it is considered a community service obligation, in which case it may be made freely available through libraries. Alternatively, it may be considered a commercial product, the price of which could be determined on a full cost-recovery basis. Market research may be required to determine users' price sensitivity for these commercial products.

(*f*) *Distribution*

Distribution is market coverage, or the channels used to get the product to its market. The physical distribution is the flow of materials such as transportation, warehousing and inventory control.

The following are examples of channels that may be used to disseminate census products and services to the end-users:

(*a*) Subscription support units, which fulfil subscription orders for census publications;

(*b*) User managers, who are staff recruited to develop and maintain relationships with key users;

(*c*) Sales force, for the delivery of major products and field support for the user managers;

(*d*) Statistical support units, which deliver standard census services and customized data consultancies;

(*e*) Bookshops within the agency, which can provide over-the-counter and mail order-sales of census publications;

(*f*) Libraries, which are a source of free census information for the general public;

(*g*) Public relations unit to service the media sector;

(*h*) Internet for on-line dissemination of census data.

(*g*) *Promotion*

A generic promotional message could focus on the benefits of using census products and services and how different needs for demographic and socio-economic data on the population can be satisfied by the agency. The message can focus on the fact that the information is readily available in the form suited to specific requirements. This can be detailed or summarized information, with extensive choice of geographical coverage and media delivery options. Specific promotional messages can be developed for individual campaigns of key products and services.

Promotional activities may include the following:

(*a*) Direct mail and advertising campaigns for general awareness raising and product-specific promotions aimed at specific target groups;

(*b*) Trade shows, conferences and seminars. Suitable venues can be selected that can be used to distribute census promotional materials, demonstrate the census product range and outline possible applications and benefits of census data to specific user groups;

(*c*) Public relations activities. These can introduce census products to the broad community and involve media liaison, coordination of press releases and official census product launches;

(*d*) Personal contact, which is an integral part of the total promotional effort. Visits to users by sales staff and user managers can be used to gain a better understanding of specific user needs, to demonstrate product options and to provide recommendations on best solutions;

(*e*) An Internet Web site. This medium can provide extensive information on census products and services, their applications and benefits.

Publication covers, packaging and other promotional material should be designed to allow easy brand identification. A creative consultant may need to be contracted for this exercise. A wide range of promotional materials can be produced, including the following:

(*a*) Brochures, posters, demonstration disks, case-study examples and sales kits;

(*b*) Reference materials, such as pricing documents and detailed product briefs;

(*c*) A directory of census products and services, which can be used as a main reference document to educate prospective buyers about the range available;

(*d*) A newsletter, which can be used to promote these products and services;

(*h*) *Programme timetable*

The marketing department's primary responsibility is to determine and prioritize essential marketing activities. A timetable should be developed and strictly monitored to cover the key phases of the marketing programme and major product releases. This is essential to ensure that key activities are completed as scheduled. It is recommended that regular progress reviews be held to uncover problems that may have arisen, and that corrective action be taken before they become an obstacle to achieving the marketing objectives.

(*i*) *Budget*

The marketing department should prepare a proposed budget that reflects projected costs associated with the proposed marketing plan and that reflects existing market conditions and opportunities. The budget allocated for the execution of the census-marketing plan should be strictly monitored in a management information system. This should detail all expenditure associated with promotional activities and materials, and all sales revenue generated. Some examples of items to be included are:

(*a*) Advertising;

(*b*) Sales promotion (trade shows and conferences);

(*c*) Market research;

(*d*) Creative concepts;

(*e*) Promotional material (brochures, posters and packaging);

(*f*) Human resources development;

(*g*) Administration costs.

The marketing department may choose to design a budget that reflects monthly budget forecasts rather than quarterly or annual budget forecasts.

(j) Monitoring and evaluation

The effectiveness of the marketing programme must be objectively evaluated against key performance indicators, and the analysis of the information should be used to adjust the marketing programme as required. Key areas to be monitored are:

(*a*) Sales volume and value of each product and/or service;

(*b*) Response rate to promotional activities and conversion rate;

(*c*) Technical assistance queries;

(*d*) Research on census data users within key target sectors;

(*e*) Market feedback and competitor activity.

It is recommended that these evaluations take place on a monthly or quarterly basis. The use of regularly scheduled evaluations provides an opportunity to revise tactics to ensure that the objectives will be met. Measuring objectives against actual results identifies where variances have occurred; corrective action can then be taken to bring projected and actual results into line.

E. Sales strategy

1. *Introduction*

The intention of the present section is to provide guidance to those agencies that may be in a position whereby they can sell census products to clients. It is recognized that some of the techniques outlined in this section may not be appropriate for some countries but agencies can adapt them to suit their own circumstances.

The major objective of a sales strategy is to create an overall approach to the selling of major products and services by a sales team. The use of professional selling techniques, and selling the product suite or related services best suited to the client's needs, is essential to the success of a sales strategy. In terms of marketing, sales is a vital component of promotion. A detailed marketing, promotional and communication strategy should be in place to support the agency's sales force.

Making a sale should be seen as the beginning or the continuance of a client relationship, not the end, and adequate resources should be provided in the sales budget to create and maintain this relationship.

2. *The sales strategy*

Sales strategies generally focus on the sale of particular products to the wider community. However, while any selling activity is primarily associated with products or a product range, the strategy may be to better understand the different buying logic of the various segments in the market place, and the needs of the clients and sectors within those segments. Understanding clients' motivation, their application of the data and, hence, their buying logic, are all fundamental to improved marketing performance.

The sales teams should focus on satisfying the total needs of clients, not just achieving product targets. Specific campaigns should be designed to increase the volume of leads for packaged products. In some cases, the market for a particular product is narrow and this can be pursued with an individual campaign.

(a) Market segmentation

The primary market segments need to be identified for the management and focusing of sales activities (e.g., key clients, subscribers and education). The segments are determined by examining the "buying or client service logic" of various groups of the agency's clients, and then clustering those with common elements into main groups.

Segment management plans should be prepared for each identified segment, focusing on the various objectives, strategies and processes necessary to achieve the sales outcomes required for each segment, and to ensure the new market opportunities are fully explored. The sales effort should closely align and support these segment management plans, as well as support the various lower-level sector and product marketing plans. The sales strategies may therefore be different for each of the segments.

Each segment or product plan should outline the broad issues related to the particular segment and/or the sale of the particular product. The plans follow the same broad outline, including product targets for the year and product- and/or segment-specific strategies. These strategies include tactics for sales to both new and existing clients. A specific promotional timetable for each product should be developed.

(b) Distribution channels

A sales system generally depends on a sales team but may also employ other means of selling such as direct mail or telemarketing. Channels of distribution can change over time and the use of new channels of distribution offers an opportunity to gain a competitive edge over other providers. It is neither efficient nor wise to limit distribution to face-to-face personal selling.

(c) Sales and client databases

Direct interaction with prospective clients has replaced mass marketing. With the advent of database marketing, detailed profiles of clients can be developed using geographic and demographic characteristics and their purchasing history. Special products, services or offers can be tailored to increase return on investment and client satisfaction. Direct advertising not only invites a response from prospective clients but also serves to increase general awareness of the agency and its product range.

A sales and client database can be established to build up an understanding of clients' needs and their purchasing patterns. This database will provide information crucial to both the marketing section and the product developers. The client database can be used for the following purposes:

(*a*) To stimulate repeat sales. If the product fits the clients' needs, they may purchase additional copies for different departments or regional offices;

(*b*) To increase the success of product line extensions. A new product, using a successful brand name, can be easily launched to an existing market;

(*c*) To cross-promote different products. By introducing clients who purchase one type of product to other opportunities, perhaps by distributing a catalogue of the full product range;

(*d*) To build client loyalty. By offering other products, services or benefits that are especially selected to fit their individual requirements.

Sales can be achieved through product directories or catalogues, which provide response mechanisms for clients to order a product direct, to express interest in further information or to request a personal product demonstration to be carried out in their own office.

(*d*) *Cross selling*

A strategy to institute a programme of cross selling to existing clients should also be explored. Many existing clients, particularly in the private sector, may use only one (or few) products or services. Sales staff should be encouraged to call on any existing client base with the objective of cross selling products and services.

3. *The sales plan*

The aim of a sales plan is to describe how the agency intends to sell its range of major products and services to the market.

The sales plan should provide details of a sales strategy for each major product and service, and recommend an evaluation approach to these strategies. The selling process must (*a*) satisfy the needs of the client (*b*) aake the sale, that is, convert the prospective client's interest into a purchase; (*c*) develop an ongoing relationship.

The sales plan should continue to evolve and be sufficiently flexible to accommodate movements in the market, variations in promotional strategies and changes in the agency's product line and corporate direction. It should be reviewed in the light of sales data analysis, marketing plans and information on the market.

The major aims of a sales plan are as follows:

(*a*) To outline the responsibilities of the sales unit;

(*b*) To create an overall strategic approach to the selling of major products and services;

(*c*) To detail a sales strategy for each major product and services.

(*a*) *Sales objectives*

The sales objectives should work directly towards fulfilling the major marketing objectives. Objectives should be broken down so that each sales area, each salesperson and each product or product line has objectives that must be met. The objectives should be time and quantity, for example, to obtain a certain amount of sales (either quantity or revenue) by the end of June 2000. Objectives must be clearly defined so that results can be easily measured. For example, indicating the month or quarter for each of the following can establish sales objectives:

(*a*) All products and/or all services;

(*b*) Strategically critical products;

(*c*) All distribution channels;

(*d*) By regional sales team;

(*e*) By each salesperson.

The principal objective of any sale is client satisfaction. This is not achieved until the client receives and successfully uses the product or service. To ensure this, the agency's salespersons should track the order through the organization, keep the client informed of progress, possibly participate in the delivery, installation and training, and provide fast responses to any client questions or complaints. With this service effort, a solid relationship for future business or referrals can be built.

The following are examples of sales objectives:

(*a*) Achieve and exceed revenue targets for key products;

(*b*) Implement an effective programme to cross sell major products and services to the existing client base;

(*c*) Increase understanding of major products and services within selected sectors to increase client base;

(*d*) Continue to expand the retail bookseller market for selected publications.

To achieve these objectives, it is necessary to adopt sales and promotional strategies that will allow the agency (*a*) to generate new business and find new clients (growth component), and (*b*) to compete successfully in the market place (competitive component).

Some general sales strategies to help achieve sales objectives may include:

(*a*) Developing the sales presentation skills of the sales staff, and ensuring that there is adequate product training and infrastructure support in the sales centrres;

(*b*) Using direct marketing techniques to generate sales leads;

(*c*) Setting up sales demonstrations in-house and at the client's premises.

4. *The selling process*

(*a*) *The selling function*

Personal selling is a highly selective form of communication that allows the agency to tailor a message to the specific needs of an individual client. As the salesperson is a source of vital information, some clients rely on the salesperson as a reliable and credible source of product information.

Knowing about the product is important, but knowing about the client is more important. It is what the product can do for the client that is important. Sales personnel must build clients' confidence and anticipate future needs. Knowledge of the data and products, backed by prompt service, builds clients' confidence. Building rapport and developing knowledge of clients' business leads to sales.

Secondary providers, or resellers, take raw data and resell it after value adding. As a rule, secondary providers possess a great deal of skill in manipulating and using statistical data, so the effort in servicing this sector is largely at the front end (i.e., negotiating a fair price and providing the required data or service in a timely fashion).

In general, the selling effort requires contact at several levels within an organization. This requires the sales representative to be knowledgeable of a number of industries and the information requirements of these industries. The buyers also tend to be sophisticated and professional in their buying practices; to be effective, the sales representative must match these skills. This area requires the most creative selling skills as well as a complete knowledge of the agency's products and services.

Salespersons who have clients in the professions (e.g., medical, legal, social work, accounting and architecture) have a different sales responsibility. They must relate to these individuals not as users or purchasers but as specifiers or influencers of buying decisions. Selling to these professionals requires a strong problem-solving orientation, a professional presence and the ability to maintain personal motivation while awaiting long-term results.

(*b*) *Personal selling*

There are traditionally two types of personal, or face-to-face, selling. The first is cold calling, where no prospect names have been provided by the marketing department, and there has been little or no advertising to support the salesperson. The second is selling to a prospect lead list generated by direct or other forms of advertising. The second type is, of course, more efficient and cost-effective. The client has already been made aware of the product range and activated into responding, and may even have received additional literature to further convert the client's inquiry into a sale even before a personal visit during which the salesperson can "close the sale". This, however, is not the end of salesperson and client contact. Salespersons should develop a relationship with the client, and make it easy for the client to reach them with complaints, questions or requests for more information.

Personal selling involves a sequential process that applies to all types of selling tasks and all classes of clients. The process is as follows:

(*a*) Prospecting. Generating leads and qualifying the prospect;

(*b*) Planning the initial contact and the sales presentation;

(*c*) Processing. Making the sale and following up.

(*i*) *Prospecting*

The vital factor in any selling effort is an ongoing source of new prospective clients. There is always an attrition among existing clients over time, so new buyers must emerge to maintain and expand the client base if the organization is to grow in the market place.

Marketing activities should provide leads, but the sales office should develop as many lists (by industry sectors) as possible to ensure a supply of leads for the sales staff.

There is a subtle distinction between suspects (leads) and prospects. A suspect, or lead, is someone who might buy; a prospect is someone who can or will buy from the salesperson or another supplier. As the time of salespersons is limited, and costly, they must be able to sort prospects from suspects as quickly as possible. This activity is called qualifying the prospect. There are four criteria to apply in the qualification process: existence of need or want of the product or service, ability to buy, motivation to buy and eligibility to buy.

(*ii*) *Planning the initial contact and presentation*

Professional salespeople help clients make buying decisions. Planning the first contact with the prospective client is essential, as is the sales presentation. A classical sales presentation has several stages but the effort within each stage can be tailored to suit individual client organizations. The first part of the presentation should not involve any selling; it should aim at getting to know the client and the client's business and gaining an understanding of what the client needs. With this information, the features and benefits of the product range can start to provide a solution to the client's problems. The final stage is closing the sale, which should be seen as helping people make decisions that are good for them. It is important to note that there is not one presentation that will work with all clients; each presentation may need a different focus or emphasis and a different communication style.

The information required for planning falls into three categories: prospect's business, buying influences and competition (direct and indirect). To the extent the prospect has been qualified, as discussed earlier, and the buying influences determined, it is then essential to weigh the advantages and disadvantages of the product and competitive products in satisfying the client's needs. With this insight, the sales representative organizes the presentation to emphasize strengths and minimize weaknesses. The final element of the planning effort is the organization of the information leading to the presentation.

The presentation is the high point of the sales process. It is here that the sales representative translates the prospecting and the planning into results. The presentation may be highly structured or flexible and tailored to the individual prospect's needs in a problem-solving sales environment.

(*iii*) *Processing*

Closing the sale is necessary because prospects, despite their desire to buy, are ambivalent about the decision. They want the advantages and benefits of the product, but may fear that the purchase involves risk or that purchasing the item means forgoing something else.

Despite the prospect's strong affirmative response to the close, the sale may not be completed. There are several administrative tasks that the salesperson must fulfil as well, such as completing order forms, obtaining authorized signatures, receiving necessary deposits or advance payments and ensuring the delivery schedule.

5. *Sales targets*

Techniques for projecting sales range from complex statistical methods to simple estimates. In general, the use of historical data provides an idea of trends, and a common method of projecting is simply to multiply the previous cycle's figures by "x" per cent. However, sales teams may be asked to provide their projections based on the sales targets that are provided in the marketing plan; sales managers may feel that their organization can produce sales in excess of the targets.

Sales objectives are unlikely to be met without continuous planning and control. Monitoring in the sales field is essential to ensure that the total number of sales meets monthly sales targets. The sales manager generally sets annual or quarterly sales targets, and it is preferable for each salesperson to be assigned a monthly target. In sales, monthly, weekly and even daily objectives help to achieve optimal results, and weekly reviews are advisable. If sales targets are not met, the situation must be analysed and corrective action taken as quickly as possible. Exceeding sales targets acts as a great motivator to salespeople, who should be encouraged to establish personal sales objectives above the target.

It is important to note that sales targets represent a minimum level of expected sales, not a maximum. Sales targets can vary depending on the experience of the salesperson or they may reflect the greater or lesser market potential of the sales territory. Sales targets may be set for individual products, and an emphasis may be placed on achieving sales for a premium or flagship product.

The sales history of each product needs to be examined and new targets framed in line with the results over the past year or census cycle. Input from regional offices should be taken into consideration, as they have knowledge of local market conditions.

6. *Sales reporting/ evaluation/ performance indicators*

Regional sales managers should complete sales reports for each region on a monthly basis. This information could be compiled into a national monthly sales report. The major purpose of this report is to assess performance against sales targets and to assess the levels of activity both nationally and in regional offices.

The national sales manager should prepare a quarterly report of sales information. This information will focus on the success of strategies outlined in the national sales plan, including penetration into sectors. The information will be incorporated into the next quarter's sales plan, which will be produced at the same time. An annual report should be compiled to provide information on performance. This could be coordinated by the national sales manager but should involve contributions from all major stakeholders. This report will also feed into the annual sales planning process.

As part of the reporting system, feedback on product design, unmet needs, new product ideas and competition, as well as general feedback from clients, should be included in sales reports.

The monitoring and evaluation of the sales efforts requires systems to evaluate the individual salesperson and the regional or national effort.

Reporting by sales representatives is an important component in the overall evaluation of the sales programme, as well as being a tool for sales managers to evaluate the performance of salespersons and to correct any deficiencies, such as low call rate, low sales conversion rate or poor planning.

A set of criteria that can be used to evaluate salespersons is given below. It falls into two categories: quantitative (measurable) standards and qualitative ones, which are far more difficult to measure apart from observation. It is up to individual sales managers to dedcide how these evaluation methods are reported.

Quantitative performance standards are as follows:

(*a*) Sales volume. Monetary or percentage increase, market share, achieving quota and conversion rate;

(*b*) Sales calls per day;

(*c*) New business obtained;

(*d*) Client "penetration" achieved;

(*e*) Sales:cost ratio.

Qualitative performance standards are as follows:

(*a*) Personal attributes. General attitude towards clients, empathy with clients, liaison with other team members and staff, team spirit, motivation to improve, and self-improvement undertaken;

(*b*) Selling skills. Product knowledge, understanding features and benefits, understanding selling formats, presentation skills, questioning skills, handling objections, and closing skills;

(*c*) Territory management. Time-management skills, record keeping, relationship building with key clients, and market intelligence gathering.

As selling is rarely observed, it is difficult to get a realistic measure of performance. Sales managers are encouraged to work alongside their staff in the field on a regular basis, for example, one day every month. The sales manager's role is to observe and analyse all the positive and negative aspects of the sales event and then to prepare an objective analysis. This analysis allows sales managers to help improve the performance of their sales staff.

7. *Sales team organization*

The main objective of organizing a sales team is to get results. It is assumed that other organizational functions are in place to allow the sales team the maximum selling time. Sales managers need to ensure that:

(*a*) Sales staff have adequate product knowledge and training;

(*b*) Promotional material is available;

(*c*) Sales administration arrangements are in place;

(*d*) Sales staff have well-defined territories to work, and all territories targeted have suitable staff;

(*e*) Sales staff actually service their defined territories.

8. *Sales territory management*

A defined selling territory provides the operational boundaries for a sales representative. It is imperative that the territory possess sufficient potential to allow the representative to sell a good mix of products and services.

The reasons for using a territory structure are as follows:

(*a*) To cover the market thoroughly;

(*b*) To evaluate market response;

(*c*) To evaluate the performance of salespersons;

(*d*) To minimize sales expenses;

(*e*) To provide the salesperson with clear working guidelines;

(*f*) To improve client contact;

(*g*) To best match salespersons to the market place.

The following factors can be used in sales territory design:

(*a*) State or regional boundaries;

(*b*) Provincial towns and cities;

(*c*) Known major trading areas;

(d) Places where clients exist.

9. *Sales roles and responsibilities*

The roles and responsibilities of all sales personnel should be established in terms of the following:

(*a*) Overall management and leadership of the sales effort on a national basis;

(*b*) Development of a national sales plan;

(*c*) Ensuring that sales plans are aligned to marketing activities;

(*d*) Development and implementation of sales policies and procedures;

(*e*) Providing input into the product review process;

(*f*) Providing regular sales reports on product performance, buying trends and market conditions;

(*g*) Maintaining an effective working relationship with marketing and public relations in planning, implementation and monitoring of plans;

(*h*) Providing information on markets, accounts and promotional activity back to marketing and public relations;

(*i*) Providing sales support to other areas of the agency.

10. *Training*

Sales training is an important element of the sales plan and one that must be incorporated into the recruitment, training and retraining of all sales staff. Relationship selling will be increasingly important to the agency's sales teams as more competitors establish products in the market. In addition, an effective relationship will assist sales staff to achieve good results through cross selling line extension and other products and services.

A base level of sales training should be regularly provided on a national basis for all sales staff. Each regional office should provide additional sales training, depending on the needs of the region, and on-the-job training.

Listed below are the basic skills of the sales profession; they will need constant upgrading and reinforcement regardless of how experienced the salesperson is:

(*a*) Planning skills, including time management;

(*b*) Prospecting;

(*c*) Presentation skills;

(*d*) Communication skills, including listening and questioning;

(*e*) Negotiation skills;

(*f*) Closing techniques;

(*g*) Client/market knowledge;

(*h*) Technical training;

(*i*) Broader business skills.

Product training may also be required and this should be provided to sales teams annually, in liaison with product development areas.

VI. EVALUATION

A. Introduction

Like any other project, the census needs to be evaluated to ensure that the effort and investment of resources have been worthwhile. With so many different activities involved, the evaluation of such a project is a complex exercise.

The census represents a rich source of information about contemporary populations. It is widely used by government administration and large numbers of users outside the Government. Therefore, evaluation of the census should make fundamental measurements of data quality in order to assist users and judge the success of the operation.

The evaluation can be viewed as having two broad objectives. These are to ensure (*a*) that the quality of results meets the requirements of the key users of census data and (*b*) that each process in the operation contributes in a cost-effective way to achieving the desired level of quality.

The outcomes of the evaluation process should be communicated to the users of census data, as well as to the managers of the census.

A soundly managed census will include quality assurance and improvement procedures in each of the major phases of the census (i.e., field operations, processing and dissemination). These procedures are crucial to monitor performance during the operation and make certain that any tendency to fall below pre-set standards is corrected as work proceeds.

In addition, a standard feature of census evaluation should be a review of each of the major phases upon completion. This can identify strengths and weaknesses and make recommendations for investigation or redevelopment in the following census cycle.

The evaluation of census data can be undertaken at two levels; these are (*a*) basic measurements of the overall quality, at a broad level, and (*b*) a more detailed level of investigation, where in-depth analysis of selected topics is performed.

Each of these is discussed in more detail in the following sections.

B. Basic measurements of overall quality

At this broad level of data evaluation, two aspects can be considered (*a*) coverage and (*b*) accuracy.

(*a*) Coverage

It is normal practice for a census to aim to cover 100 per cent of the population. However, in practice this will rarely be achieved. In order for the results of the census to have validity, some attempt should be made to assess the extent to which the count has missed or duplicated people. The best way to do this is to conduct an independent survey immediately after the census enumeration activity to determine the number of persons who have been missed (undercount) or counted more than once (overcount). Such surveys are known as post-enumeration surveys and may include questions to evaluate census questions as a means of checking the content of the census.

The main reasons for undercount and overcount are:

(*a*) Incomplete or inaccurate mapping and access difficulties;

(*b*) Population in transit or difficult to enumerate;

(*c*) Errors in communicating census requirements to the public;

(*d*) Misunderstanding of definitions and instructions by enumeration staff owing to inadequate training;

(*e*) Lack of quality assurance in the enumeration activity, including inadequate coordination and supervision.

Completeness of mapping, as well as accurate delineation of areas to be enumerated, is of high importance to the final population count. People can be missed if parts of the country have been excluded from the mapping system owing to poor coverage. Similarly, duplication may occur in overlapping enumeration areas. Inadequate mapping of urban areas may cause omission of private dwellings that are hidden in non-residential or relatively sparsely populated areas.

Some households may also be missed owing to difficulties in access. This predominantly applies to remote communities and floodaffected or inaccessible mountainous areas.

The possibility of omission is high for populations in transit, homeless persons and households with more than one place of residence. Populations in transit include the following:

(*a*) Nomadic populations;

(*b*) Highly mobile sections of the population (typically, younger people);

(*c*) People who change residence during census enumeration;

(*d*) People living temporarily in hotels or boarding houses.

Alternatively, highly mobile or young persons may be included on the census form in more than one household if they are perceived, by the members of both households, to be usual occupants.

Censuses based on place of enumeration may suffer from overcount owing to the erroneous inclusion of persons abroad or staying elsewhere during census enumeration. Additionally, if there is a long enumeration period, the chances of duplication owing to population mobility are increased.

Lack of understanding of the census instructions may also result in undercount. Examples include misinterpretation of the coverage instructions, resulting in exclusion of infants, the elderly, visitors or servants. In some cases, this may reflect cultural beliefs and should therefore be managed at an aggregate level rather than by field operations.

In countries where persons are enumerated on the basis of usual residence, the failure to include members of the household who are temporarily absent will add to the undercount. For example, this could include persons on short periods of work away from home; away from home on holiday; in hospital or in prison (for relatively short periods) or with no fixed address.

On the other hand, overcount may occur as a result of erroneous inclusion of households or persons not entitled to be enumerated. These are often the opposite of those listed above. Some examples of groups commonly included erroneously are the following:

(*a*) People on long term stays in hospitals or prisons;

(*b*) Members of defence forces on long-term postings away from their families;

(*c*) People on long-term holidays;

(*d*) Foreign diplomats and their families;

(*e*) Persons who died before census day.

Furthermore, confidentiality concerns contribute considerably to the undercount. In countries with military conscription, these concerns may result in a significant undercount of young males.

Good organization and supervision will minimize undercount owing to the erroneous assessment of dwellings in the following situations:

(*a*) Where households are mistakenly classed as unoccupied;

(*b*) Owing to non-contact with occupants, in cases where the occupants are usually away when the census enumerator calls.

It should also solve problems with possible duplication owing to lack of coordination between enumerators of adjacent areas.

Post-enumeration survey

In general, there are more people missed than double-counted in a census. The difference is called the net undercount. By ascertaining a few basic characteristics in the post-enumeration survey, it is possible to establish the nature of the population missing from the count. This is useful both in estimating the size of the population missed and in revising procedures such as public communications to improve the count of these groups in the next census.

As the post-enumeration survey provides an independent validation of the census count, efforts must be made to ensure that the survey is independent from the census. At the least, no census field staff should work on the post-enumeration survey in the area in which they enumerated during the census. It is preferable that the survey workforce have no involvement with the census. A further assurance of independence is given if the post-enumeration survey is conducted without reference to census forms. Being able to refer to these forms and resolve inconsistencies may offer insights into the reasons for discrepancies but presents a risk of bias in measuring the net undercount.

The post-enumeration survey must be representative of the entire country and of all population groups. To achieve this, the use of appropriate sampling techniques is crucial. The collection should be independent of the census enumeration itself and preferably conducted as soon as possible after census enumeration. However, it should not be so close that it interferes with census enumeration. This will ensure minimal changes in population owing to mobility and the cooperation of the public owing to the impact of census publicity.

Finally, household and person records from the post-enumeration survey have to be reconciled with the census data. A process involving searching for corresponding census household forms and matching each survey household member with an appropriate census person record should be used, where possible. This process will greatly benefit from accurate recording of names and addresses during both collections. However, examining information common to both the census and the post-enumeration survey, such as age, sex, birthplace and relationship to other members in the household, will also aid the identification process.

It should be noted that accurate reporting of names and addresses may pose particular difficulties in areas where the population is nomadic, living in a tribal situation or living in shanty towns (with no formal addresses). These situations have to be addressed in overall census planning. The key point is to include the post-enumeration survey and other evaluation processes in that planning.

Coverage assessment using the post-enumeration survey can be valuable for both census management and clients. The census agency can use the information to modify and improve procedures that might reduce undercounting. Users of the data can make use of the information if it is relevant to their use of the census results.

(*b*) *Accuracy*

The second aspect of a broad-level census data evaluation programme consists of assessing the reliability of the data beyond merely establishing the extent of coverage. It is relatively straightforward to collate some information at the aggregate level, but it is more difficult to establish the accuracy of individual responses. A system of benchmarks can be established to determine data reliability.

Benchmarking

Benchmarks can be established for each variable to track the contributions of question non-response, editing and imputation to final data quality. Simple benchmarks may consist of a basic table comparing non-response rates between censuses. A complex benchmark can include detailed tables broken down by population or geographic region. These tables can show responses before and after processing, as well as listing edits, imputations and coding procedures involved in the compilation of final data for each variable.

To minimize the resources required, benchmarks can be produced using a sample representative of census data. Production of complex benchmarks requires access to data from various stages during processing. This will provide a complete picture of responses provided on the forms and the impact of the processing system on those responses.

Ideally, benchmarking should be completed before the release of census data. However, time and staff constraints may delay this task. Benchmarking not only permits comparisons of quality between successive censuses, it also allows the effectiveness of the form design and processing activities to be assessed. Decisions can be made about appropriate procedures for the next census on the basis of such assessments.

Where the statistical system of a country is well developed it may also be possible to utilize information from other elements of the statistical system to benchmark the census. For example, a survey of employers may give indicative information about the size of the labour force in a country (or a region). It would be unlikely to get an exact match, but if both collections are well managed it would be possible to indicate that the results are in broad agreement. If they are not in agreement, the factors that have caused this (e.g., difference in concept or question design, changes in processing or changes introduced by differing collection methodologies) can be noted.

C. Detailed analysis

While all countries should aspire to evaluate their census data and set benchmarks at the broad level, as shown above, it may prove too costly to proceed to this next level of analysis.

The evaluation process should be flexible enough to respond to queries and issues identified by the census staff and the census data users. Investigation of these issues may vary from short data interrogations to prolonged topic or process studies. The benchmarking process should identify issues that may require more detailed analysis. Other topics for detailed examination should be determined on the basis of:

(*a*) Continuing interest in the topic;

(*b*) Lack of recent examination of a topic;

(*c*) Considerable change since the previous census;

(*d*) Concerns raised during the development of the next census.

Issues of continuing importance will vary from country to country. Some examples of such issues are:

(*a*) Housing;

(*b*) Labour force status;

(*c*) Education and qualifications;

(*d*) Enumeration of ethnic or indigenous populations.

Each of these issues should be prioritized, and suitable investigations undertaken within the allocated resources and time-frames. In-depth investigation of selected topics should include comparisons between censuses and other data available from surveys or administrative collections. It is presumed that some data from household surveys will be available for each topic to be investigated. Comparing census results with other data at the aggregate level is much more efficient than comparison at an individual record level. However, such surveys need to be based on compatible standards and should be conducted close to the time of census enumeration.

Detailed investigation of selected population characteristics may be based on direct and indirect demographic techniques. Validity of comparison of census data with administrative records such as the registers of births, deaths or marriages is highly dependent on the quality and accuracy of the latter and will vary among countries. Countries with poor registration systems may employ indirect demographic techniques to evaluate their census data. These techniques may include a study of age-sex distribution, a stable population analysis or a component method utilizing high-quality data from other countries.

Some topics may be covered more accurately and frequently by data collections other than the census. Topics that were not evaluated during previous censuses should be seriously considered for detailed investigation. This will ensure that there is no degradation in the level of data quality established by previous censuses.

D. Changes to census processes

Changes to any of the census processes have the potential to impact on the quality of the final data. The census evaluation team should assess all changes to the form and major phases of the census. Assessment of changes to the form may amount to a simple task if there are minor changes to wording or instructions. However, the inclusion of a new topic should warrant a thorough investigation of the new data and establishment of benchmarks for future reference.

Changes to the enumeration process and processing systems, including coding, edits and derivations, should be closely monitored throughout the census. Ongoing data-quality management and continuous quality-improvement practices are discussed in chapter I, section C. The role of the census evaluation team is to review data-quality management reports from major phases of previous census cycles and compile lists of recommendations for improvements for the next census.

The evaluation team should seriously consider concerns raised in the planning and preparatory phases for the next census. If data are available, an assessment of past practices should reveal strengths and weaknesses of the system. Alternatively, if there is no available data, new strategies to monitor identified points of weaknesses should be developed. Subsequently, the information obtained through the new monitoring strategies should be evaluated prior to the development of the next census. All issues identified in any of the phases of the census should be reviewed prior to the development of the next census.

E. Communicating quality issues

The census agency must take a proactive role in communicating the reliability and shortfalls of the census data to enable informed use of census data. Users should be fully aware of the limitations and strengths of the final data. It is important that users understand the impact of any changes made to census procedures on any analysis they may wish to perform. Therefore, the outcomes of evaluation have to be disseminated effectively.

There are two ways to approach this task. A formal approach involves compiling publications addressing various issues, preferably published in a series of census evaluation papers or fact sheets. This type of dissemination may take advantage of different media, including emerging technologies such as the Internet.

Informal communications will include ad hoc reports, presentations given to interest groups, articles in census newsletters or census updates, and answering queries from users. To fulfil the last requirement, it is recommended that complete evaluation reports be accessible to staff dealing with users. This can be facilitated by a computerized database, where the census documentation can be permanently stored and easily accessed when needed.

ANNEX I

**COMPOSITION AND TERMS OF REFERENCE OF THE NATIONAL
CENSUS COMMITTEE OF ZAMBIA FOR THE 1990 CENSUS**

A. COMPOSITION

The National Census Committee shall comprise:

1. The Secretary of the Cabinet (Chairman)

2. The Director of Census and Statistics (Secretary)

3. The Director-General, National Commission for Development Planning

4. The Senior Permanent Secretary, Ministry of Finance

5. The Permanent Secretary (Economics), Cabinet Office

6. The Permanent Secretary, Personnel Division, Office of the Prime Minister

7. The Permanent Secretary, Decentralization Division, Office of the Prime Minister

8. The Permanent Secretary, Ministry of Defence

9. The Permanent Secretary, Ministry of General Education, Youth and Sport

10. The Permanent Secretary, Ministry of Home Affairs

11. The Permanent Secretary, Ministry of Agriculture

12. The Permanent Secretary, Ministry of Cooperatives

13. The Permanent Secretary, Ministry of Health

14. The Permanent Secretary, Ministry of Labour, Social Development and Culture

15. The Permanent Secretary, Ministry of Works and Supply

16. The Permanent Secretary, Ministry of Power, Transport and Communication

17. The Permanent Secretary, Ministry of Information, Broadcasting and National Guidance

18. The Permanent Secretary, Ministry of Legal Affairs

19. The Secretary, Election and Publicity Committee of the Central Committee

20. The Secretary, Economic and Finance Committee of the Central Committee

21. The Chairman, National Housing Corporation

22. The Permanent Secretary, Central Province

23. The Permanent Secretary, Copper Belt Province

24. The Permanent Secretary, Eastern Province

25. The Permanent Secretary, Luapula Province

26. The Permanent Secretary, Lusaka Province

27. The Permanent Secretary, Northern Province

28. The Permanent Secretary, North-western Province

29. The Permanent Secretary, Southern Province

30. The Permanent Secretary, Western Province

B.   TERMS OF REFERENCE

The terms of reference for the National Census Committee were:

To report to the Prime Minister and make proposals for appropriate action to be taken on the following matters:

(a)   Fixing the date for the 1990 Census of Population, Housing and Agriculture;

(b)   The nature of information to be collected in the 1990 Census of Population, Housing and Agriculture;

(c)   Administrative, financial and logistical arrangements for holding the Census, processing of data and dissemination of results;

(d)   Methods to ensure the fullest public cooperation;

(e)   Any other matters deemed necessary by the Committee.

The National Census Committee shall have powers to:

(a)   Co-opt representatives of any other organization for specific purposes;

(b)   Form subcommittees to deal with specific aspects of the census programme.

ANNEX II

EXAMPLE OF A MODEL CENSUS PROJECT TIMETABLE

Number	Task	Start	Finish	Work	Duration
1	Coordination Branch	Thu 01/04/99	Tue 30/04/02	0 hrs	804 days
		Thu 01/04/99	Thu 01/04/99		
1.1	Communications Network	Mon 03/05/99	Fri 29/12/00	0 hrs	435 days
1.1.1	Develop Organisation Chart	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
1.1.2	Develop Contact Lists	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
1.1.3	Design Key Reports System	Mon 03/05/99	Fri 30/07/99	0 hrs	65 days
1.1.4	Monitor Activities	Mon 03/05/99	Fri 29/12/00	0 hrs	435 days
1.2	Printing	Mon 17/05/99	Tue 29/02/00	0 hrs	207 days
1.2.1	Pilot Test Materials	Mon 17/05/99	Mon 30/08/99	0 hrs	76 days
1.2.2	Pilot Test Census Form	Mon 02/08/99	Tue 31/08/99	0 hrs	22 days
1.2.3	Supervisor/Enumerator Man.	Mon 01/11/99	Fri 31/12/99	0 hrs	45 days
1.2.4	Main Census Form	Mon 01/11/99	Tue 29/02/00	0 hrs	87 days
1.3	Publicity	Mon 03/05/99	Fri 28/07/00	0 hrs	325 days
1.3.1	Develop Strategy	Mon 03/05/99	Fri 24/12/99	0 hrs	170 days
1.3.2	Pilot Test	Mon 02/08/99	Fri 24/09/99	0 hrs	40 days
1.3.3	Census	Mon 03/05/99	Fri 28/07/00	0 hrs	325 days
1.4	Notable Events Book	Mon 03/05/99	Thu 30/09/99	0 hrs	109 days
1.4.1	Revise Previous Version	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
1.4.2	Despatch New Version	Thu 01/07/99	Thu 30/09/99	0 hrs	66 days
1.5	Despatch of Materials	Tue 01/06/99	Fri 12/05/00	0 hrs	249 days
1.5.1	Preparation	Tue 01/06/99	Thu 30/09/99	0 hrs	88 days
1.5.2	Pilot Test	Mon 02/08/99	Fri 20/08/99	0 hrs	15 days
1.5.3	Census	Mon 10/04/00	Fri 12/05/00	0 hrs	25 days
1.6	Recruitment	Tue 01/06/99	Wed 31/05/00	0 hrs	262 days
1.6.1	Preparation	Tue 01/06/99	Thu 30/09/99	0 hrs	88 days
1.6.2	Pilot Test	Mon 16/08/99	Tue 31/08/99	0 hrs	12 days
1.6.3	Census	Mon 01/05/00	Wed 31/05/00	0 hrs	23 days
1.7	Training	Mon 03/05/99	Fri 07/07/00	0 hrs	310 days
1.7.1	Develop Methods	Mon 03/05/99	Thu 30/09/99	0 hrs	109 days
1.7.2	Pilot Test	Mon 16/08/99	Fri 27/08/99	0 hrs	10 days
1.7.3	Train the Trainers	Mon 01/05/00	Wed 31/05/00	0 hrs	23 days
1.7.4	Census	Wed 21/06/00	Fri 07/07/00	0 hrs	13 days
1.8	Enumeration Start	Mon 30/08/99	Wed 31/05/00	0 hrs	198 days
1.8.1	Pilot Test	Mon 30/08/99	Fri 17/09/99	0 hrs	15 days
1.8.2	Census	Mon 01/05/00	Wed 31/05/00	0 hrs	23 days

Number	Task	Start	Finish	Work	Duration
1.9	Enumeration End	Mon 02/08/99	Thu 31/08/00	0 hrs	284 days
1.9.1	Pilot Test	Mon 02/08/99	Fri 31/12/99	0 hrs	110 days
1.9.2	Census	Mon 20/09/99	Fri 24/09/99	0 hrs	5 days
1.9.3	Return Census Forms	Fri 21/07/00	Thu 31/08/00	0 hrs	30 days
1.10	Processing Preparation	Thu 01/04/99	Fri 30/06/00	0 hrs	327 days
1.10.1	System Design	Wed 01/09/99	Fri 17/12/99	0 hrs	78 days
1.10.2	Hardware/Software Design	Mon 01/11/99	Fri 28/01/00	0 hrs	65 days
1.10.3	System Build/Test	Wed 01/12/99	Fri 28/04/00	0 hrs	108 days
1.10.4	System Install/Test	Wed 01/03/00	Fri 30/06/00	0 hrs	88 days
1.10.5	Recruitment	Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
1.10.6	Training	Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
1.11	Processing Start	Wed 22/09/99	Fri 29/09/00	0 hrs	268 days
1.11.1	Pilot Test Forms to DP	Wed 22/09/99	Thu 30/09/99	0 hrs	7 days
1.11.2	Census Forms to DP	Tue 01/08/00	Fri 29/09/00	0 hrs	44 days
1.12	Processing 1	Tue 01/08/00	Fri 12/10/01	0 hrs	314 days
1.12.1	Flow Control	Tue 01/08/00	Fri 28/09/01	0 hrs	304 days
1.12.2	Data Entry	Fri 01/09/00	Fri 28/09/01	0 hrs	281 days
1.12.3	Editing/Validation	Mon 11/09/00	Fri 12/10/01	0 hrs	285 days
1.13	Processing 2	Tue 01/08/00	Wed 31/10/01	0 hrs	327 days
1.13.1	Quality Assurance	Mon 11/09/00	Fri 12/10/01	0 hrs	285 days
1.13.2	Data File Input Validation	Mon 11/09/00	Fri 12/10/01	0 hrs	285 days
1.13.3	Store/Disposal Census Forms	Tue 01/08/00	Wed 31/10/01	0 hrs	327 days
1.14	Dissemination Preparation	Thu 01/04/99	Mon 28/02/00	0 hrs	238 days
1.14.1	Outputs Design	Mon 02/08/99	Mon 28/02/00	0 hrs	151 days
1.14.2	User Consultation	Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
1.14.3	Anaysis Design	Mon 02/08/99	Mon 28/02/00	0 hrs	151 days
1.14.4	Product Development	Mon 02/08/99	Tue 30/11/99	0 hrs	87 days
1.14.5	Product Testing	Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
1.15	Dissemination	Thu 01/04/99	Mon 31/12/01	0 hrs	718 days
1.15.1	Data File Output Validation	Fri 01/12/00	Thu 30/08/01	0 hrs	195 days
1.15.2	Product Quality Assurance	Fri 01/12/00	Thu 30/08/01	0 hrs	195 days
1.15.3	Outputs Production	Thu 01/02/01	Wed 31/10/01	0 hrs	195 days
1.15.4	Analysis Production	Thu 01/02/01	Mon 31/12/01	0 hrs	238 days
1.15.5	Client Support	Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
1.16	Evaluation	Mon 02/08/99	Tue 30/04/02	0 hrs	717 days

Number	Task	Start	Finish	Work	Duration
1.16.1	Develop Evaluation Plans	Mon 02/08/99	Thu 31/05/01	0 hrs	479 days
1.16.2	Pilot Test Evaluation	Fri 15/10/99	Fri 29/10/99	0 hrs	11 days
1.16.3	Census Evaluation	Tue 01/08/00	Tue 30/04/02	0 hrs	456 days
1.16.4	Overall Census Eval. Report	Fri 01/02/02	Tue 30/04/02	0 hrs	63 days
1.17	Financial Management	Thu 01/04/99	Fri 13/08/99	0 hrs	97 days
1.17.1	Develop Budgets	Mon 02/08/99	Fri 13/08/99	0 hrs	10 days
1.17.2	Budget Approval Process	Mon 21/06/99	Wed 23/06/99	0 hrs	3 days
1.17.3	Budget Training	Wed 23/06/99	Wed 30/06/99	0 hrs	6 days
1.17.4	Budget Management	Mon 09/08/99	Wed 11/08/99	0 hrs	3 days
1.17.5	Budget Reviews	Thu 01/04/99	Thu 08/04/99	0 hrs	6 days
2	Development	Thu 01/04/99	Fri 28/09/01	0 hrs	652 days
		Thu 01/04/99	Thu 01/04/99		
2.1	User's Consultation	Thu 01/04/99	Fri 23/07/99	0 hrs	82 days
2.1.1	Agency Views on Topics	Thu 01/04/99	Fri 23/04/99	0 hrs	17 days
2.1.2	Users Information Paper	Thu 01/04/99	Fri 23/04/99	0 hrs	17 days
2.1.3	Establish Cons. Forums	Mon 12/04/99	Fri 16/04/99	0 hrs	5 days
2.1.4	Meeting No. 1	Thu 24/06/99	Thu 24/06/99	0 hrs	1 day
2.1.5	Minutes No. 1	Thu 24/06/99	Mon 28/06/99	0 hrs	3 days
2.1.6	Meeting No. 2	Tue 20/07/99	Tue 20/07/99	0 hrs	1 day
2.1.7	Minutes No. 2	Tue 20/07/99	Fri 23/07/99	0 hrs	4 days
2.2	Design of Census Form	Mon 12/04/99	Fri 29/10/99	0 hrs	145 days
2.2.1	Evaluation of Past Topics	Mon 12/04/99	Wed 30/06/99	0 hrs	58 days
2.2.2	Topic Selection	Mon 12/04/99	Wed 30/06/99	0 hrs	58 days
2.2.3	Format of Questionnaire	Mon 12/04/99	Wed 30/06/99	0 hrs	58 days
2.2.4	Census Form Draft 1	Mon 12/04/99	Wed 30/06/99	0 hrs	58 days
2.2.5	Census Form Draft 2	Mon 12/07/99	Fri 23/07/99	0 hrs	10 days
2.2.6	Pilot Census Form	Mon 16/08/99	Fri 27/08/99	0 hrs	10 days
2.2.7	Final Census Form	Mon 27/09/99	Fri 29/10/99	0 hrs	25 days
2.3	Questionnaire Testing	Mon 28/06/99	Fri 17/09/99	0 hrs	60 days
2.3.1	Pretest No. 1	Mon 28/06/99	Wed 30/06/99	0 hrs	3 days
2.3.2	Pretest No. 2	Mon 12/07/99	Tue 20/07/99	0 hrs	7 days
2.3.3	Pilot Test	Wed 01/09/99	Fri 17/09/99	0 hrs	13 days
2.4	Enumeration Strategy	Mon 19/04/99	Fri 29/10/99	0 hrs	140 days
2.4.1	Develop Special Enum. Strat.	Mon 19/04/99	Fri 24/09/99	0 hrs	115 days
2.4.2	Special Enumeration Manual	Mon 06/09/99	Fri 29/10/99	0 hrs	40 days

Number	Task	Start	Finish	Work	Duration
2.5	Documentation	Mon 19/04/99	Fri 29/10/99	0 hrs	140 days
2.5.1	Concepts & Definitions	Mon 19/04/99	Fri 11/06/99	0 hrs	40 days
2.5.2	Enumerator Manual	Mon 19/04/99	Fri 27/08/99	0 hrs	95 days
2.5.3	Field Supervisor Manual	Mon 19/04/99	Fri 10/09/99	0 hrs	105 days
2.5.4	Trainers Manual	Mon 19/04/99	Fri 17/09/99	0 hrs	110 days
2.5.5	QA/Editing Manual	Mon 19/04/99	Thu 30/09/99	0 hrs	119 days
2.5.6	Coding Manual	Mon 19/04/99	Fri 08/10/99	0 hrs	125 days
2.5.7	Output Product Procedures	Mon 12/07/99	Fri 08/10/99	0 hrs	65 days
2.5.8	Finalise All Training Manuals	Mon 06/09/99	Fri 29/10/99	0 hrs	40 days
2.6	Printing of Documents	Mon 19/04/99	Fri 28/01/00	0 hrs	205 days
2.6.1	Printing Estimates	Mon 19/04/99	Fri 24/09/99	0 hrs	115 days
2.6.2	Census Form	Mon 04/10/99	Fri 26/11/99	0 hrs	40 days
2.6.3	Training Materials	Mon 11/10/99	Fri 28/01/00	0 hrs	80 days
2.6.4	Enumerator Manual/Materials	Mon 18/10/99	Fri 28/01/00	0 hrs	75 days
2.6.5	Supervisors Manual/Materials	Mon 25/10/99	Fri 28/01/00	0 hrs	70 days
2.6.6	Processing Manuals	Mon 01/11/99	Fri 28/01/00	0 hrs	65 days
2.6.7	Dissemination Materials	Mon 08/11/99	Fri 28/01/00	0 hrs	60 days
2.7	Training Program	Mon 03/05/99	Fri 28/01/00	0 hrs	195 days
2.7.1	Develop Training Program	Mon 17/05/99	Fri 28/01/00	0 hrs	185 days
2.7.2	Train Master Trainers	Mon 03/05/99	Fri 21/05/99	0 hrs	15 days
2.8	Evaluation	Mon 26/07/99	Fri 26/01/01	0 hrs	395 days
2.8.1	Develop Evaluation Plan	Mon 26/07/99	Fri 26/05/00	0 hrs	220 days
2.8.2	Conduct PES (If applicable)	Mon 13/11/00	Thu 30/11/00	0 hrs	14 days
2.8.3	Conduct Census Evaluation	Mon 14/08/00	Fri 26/01/01	0 hrs	120 days
2.9	Data Analysis	Mon 21/06/99	Fri 28/09/01	0 hrs	595 days
2.9.1	Develop Analysis Plan	Mon 21/06/99	Fri 31/03/00	0 hrs	205 days
2.9.2	Undertake Analysis	Mon 01/01/01	Fri 28/09/01	0 hrs	195 days
3	Field Operations	Thu 01/04/99	Fri 24/11/00	0 hrs	432 days
		Thu 01/04/99	Thu 01/04/99		
3.1	Methods/Procedures	Thu 01/04/99	Fri 30/04/99	0 hrs	22 days
3.1.1	Urban Listing Procedures	Thu 01/04/99	Fri 30/04/99	0 hrs	22 days
3.1.2	Rural Listing Procedures	Thu 01/04/99	Fri 30/04/99	0 hrs	22 days
3.1.3	Enumeration Procedures	Thu 01/04/99	Fri 30/04/99	0 hrs	22 days
3.1.4	Training Procedures	Thu 01/04/99	Fri 30/04/99	0 hrs	22 days
3.2	Regional Workshops	Thu 01/04/99	Fri 20/08/99	0 hrs	102 days

Number	Task	Start	Finish	Work	Duration
3.2.1	Regional Schedules	Thu 01/04/99	Tue 22/06/99	0 hrs	59 days
3.2.2	Regional Budgets	Thu 01/04/99	Tue 22/06/99	0 hrs	59 days
3.2.3	Conduct Regional Workshops	Thu 01/04/99	Fri 20/08/99	0 hrs	102 days
3.3	Train/Recruit Listers	Thu 01/04/99	Thu 30/09/99	0 hrs	131 days
3.3.1	Recruit Field Staff	Thu 01/04/99	Thu 30/09/99	0 hrs	131 days
3.3.2	Train Master Trainers	Wed 30/06/99	Fri 02/07/99	0 hrs	3 days
3.3.3	Train Regional Trainers	Mon 05/07/99	Fri 27/08/99	0 hrs	40 days
3.3.4	Train Supervisors & Listers	Mon 19/07/99	Fri 24/09/99	0 hrs	50 days
3.4	Listing & Mapping Oper.	Mon 02/08/99	Fri 17/12/99	0 hrs	100 days
3.4.1	Workload Preparation	Mon 02/08/99	Fri 27/08/99	0 hrs	20 days
3.4.2	Workload Distribution	Mon 09/08/99	Fri 26/11/99	0 hrs	80 days
3.4.3	Complete Listing Forms	Mon 16/08/99	Fri 26/11/99	0 hrs	75 days
3.4.4	Complete Sketch Maps	Mon 23/08/99	Fri 26/11/99	0 hrs	70 days
3.4.5	Field Coverage Checks	Mon 30/08/99	Fri 10/12/99	0 hrs	75 days
3.4.6	Return Workloads	Mon 06/09/99	Fri 17/12/99	0 hrs	75 days
3.5	Process Listing Workloads	Mon 20/09/99	Fri 31/03/00	0 hrs	140 days
3.5.1	Form Registration	Mon 20/09/99	Fri 31/12/99	0 hrs	75 days
3.5.2	Manual Checks & Edits	Mon 27/09/99	Fri 28/01/00	0 hrs	90 days
3.5.3	Compile Head Counts	Mon 04/10/99	Fri 28/01/00	0 hrs	85 days
3.5.4	Compile Enum. Workloads	Mon 25/10/99	Fri 31/03/00	0 hrs	115 days
3.6	Produce Base Maps	Thu 01/04/99	Fri 31/03/00	0 hrs	262 days
	Check Sketch Maps	Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
3.6.1	Form EAs & Boundaries	Thu 01/04/99	Fri 28/01/00	0 hrs	217 days
3.6.2	Provincial Updates	Thu 01/04/99	Fri 31/12/99	0 hrs	197 days
3.6.3	Produce Base Maps	Thu 01/04/99	Fri 31/03/00	0 hrs	262 days
3.6.4	EA Sketch Maps	Mon 23/08/99	Fri 31/03/00	0 hrs	160 days
3.7	Test Operations	Mon 05/07/99	Fri 17/09/99	0 hrs	55 days
3.7.1	Prepare Test 1	Mon 05/07/99	Fri 09/07/99	0 hrs	5 days
3.7.2	Pretest 1	Mon 12/07/99	Tue 20/07/99	0 hrs	7 days
3.7.3	Prepare Test 2	Mon 26/07/99	Fri 06/08/99	0 hrs	10 days
3.7.4	Pretest 2	Mon 09/08/99	Fri 20/08/99	0 hrs	10 days
3.7.5	Prepare Pilot Test	Mon 23/08/99	Tue 31/08/99	0 hrs	7 days
3.7.6	Pilot Test	Wed 01/09/99	Fri 17/09/99	0 hrs	13 days
3.8	Train/Recruit Census Staff	Mon 06/12/99	Fri 30/06/00	0 hrs	150 days
3.8.1	Recruit Field Staff	Mon 06/12/99	Fri 23/06/00	0 hrs	145 days

Number	Task	Start	Finish	Work	Duration
3.8.2	Train Master Trainers	Mon 03/04/00	Fri 28/04/00	0 hrs	20 days
3.8.3	Train Regional Trainers	Mon 01/05/00	Fri 26/05/00	0 hrs	20 days
3.8.4	Train Supervisors/Enum's.	Mon 19/06/00	Fri 30/06/00	0 hrs	10 days
3.9	Census Enumeration	Mon 03/07/00	Fri 25/08/00	0 hrs	40 days
3.9.1	Workload Distribution	Mon 03/07/00	Mon 10/07/00	0 hrs	6 days
3.9.2	Complete Enumeration	Mon 03/07/00	Fri 14/07/00	0 hrs	10 days
3.9.3	Complete Summary Forms	Mon 10/07/00	Fri 21/07/00	0 hrs	10 days
3.9.4	Field Coverage Checks	Mon 17/07/00	Fri 28/07/00	0 hrs	10 days
3.9.5	Return Forms to Regions	Mon 24/07/00	Fri 11/08/00	0 hrs	15 days
3.9.6	Return Forms to Agency	Mon 31/07/00	Fri 25/08/00	0 hrs	20 days
3.10	Agency Rec. of Cen. Forms	Mon 31/07/00	Fri 27/10/00	0 hrs	65 days
3.10.1	Registration of Forms	Mon 31/07/00	Fri 01/09/00	0 hrs	25 days
3.10.2	Manual Checks & Edits	Mon 04/09/00	Fri 15/09/00	0 hrs	10 days
3.10.3	Compilation of Head Counts	Mon 18/09/00	Fri 13/10/00	0 hrs	20 days
3.10.4	Forms to Data Processing	Mon 04/09/00	Fri 27/10/00	0 hrs	40 days
3.11	Post Enumeration Survey	Wed 08/03/00	Wed 30/08/00	0 hrs	126 days
3.11.1	Develop Recruitment Strategy	Wed 08/03/00	Wed 03/05/00	0 hrs	41 days
3.11.2	Recruit PES Field Staff	Thu 01/06/00	Fri 30/06/00	0 hrs	22 days
3.11.3	Train PES Staff	Mon 03/07/00	Fri 07/07/00	0 hrs	5 days
3.11.4	Conduct PES	Mon 17/07/00	Fri 28/07/00	0 hrs	10 days
3.11.5	Return Forms to Regions	Mon 31/07/00	Fri 04/08/00	0 hrs	5 days
3.11.6	Return Forms to Agency	Mon 07/08/00	Fri 18/08/00	0 hrs	10 days
3.11.7	FOB Process Forms	Mon 21/08/00	Fri 25/08/00	0 hrs	5 days
3.11.8	Forms to Data Processing	Mon 28/08/00	Wed 30/08/00	0 hrs	3 days
3.12	Evaluation	Thu 01/04/99	Fri 24/11/00	0 hrs	432 days
3.12.1	Develop Evaluation Plan	Mon 31/01/00	Fri 25/02/00	0 hrs	20 days
3.12.2	Census Operations Evaluation	Mon 01/11/99	Fri 26/11/99	0 hrs	20 days
3.12.3	Prepare Final Report	Fri 24/11/00	Fri 24/11/00	0 hrs	1 day
		Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
4	Publicity	Thu 01/04/99	Fri 27/10/00	0 hrs	412 days
		Thu 01/04/99	Thu 01/04/99		
4.1	Strategy/Budget	Mon 21/06/99	Fri 09/07/99	0 hrs	15 days
4.1.1	Develop Publicity Strategy	Mon 21/06/99	Wed 30/06/99	0 hrs	8 days
4.1.2	Develop Publicity Budget	Mon 28/06/99	Fri 09/07/99	0 hrs	10 days
4.2	Publicity Committee	Mon 14/06/99	Fri 07/04/00	0 hrs	215 days

Number	Task	Start	Finish	Work	Duration
4.2.1	Identify Members	Mon 14/06/99	Fri 25/06/99	0 hrs	10 days
4.2.2	Meeting No. 1	Wed 30/06/99	Wed 30/06/99	0 hrs	1 day
4.2.3	Minutes No. 1	Thu 01/07/99	Mon 05/07/99	0 hrs	3 days
4.2.4	Meeting No. 2	Wed 13/10/99	Wed 13/10/99	0 hrs	1 day
4.2.5	Minutes No. 2	Wed 13/10/99	Fri 15/10/99	0 hrs	3 days
4.2.6	Meeting No. 3	Wed 02/02/00	Fri 04/02/00	0 hrs	3 days
4.2.7	Meeting No. 4	Wed 05/04/00	Wed 05/04/00	0 hrs	1 day
4.2.8	Minutes No. 4	Wed 05/04/00	Fri 07/04/00	0 hrs	3 days
4.3	Preparations	Mon 07/02/00	Fri 10/03/00	0 hrs	25 days
4.3.1	Press Materials	Mon 07/02/00	Fri 25/02/00	0 hrs	15 days
4.3.2	TV/Radio Materials	Mon 07/02/00	Fri 25/02/00	0 hrs	15 days
4.3.3	Other Materials	Mon 07/02/00	Fri 25/02/00	0 hrs	15 days
4.3.4	Distribution	Mon 21/02/00	Fri 10/03/00	0 hrs	15 days
4.4	Evaluation	Thu 01/04/99	Fri 27/10/00	0 hrs	412 days
4.4.1	Develop Evaluation Plan	Mon 06/03/00	Fri 24/03/00	0 hrs	15 days
4.4.2	Conduct Evaluation	Mon 04/09/00	Fri 29/09/00	0 hrs	20 days
4.4.3	Prepare Evaluation Report	Mon 02/10/00	Fri 27/10/00	0 hrs	20 days
		Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
5	Data Processing	Thu 01/04/99	Wed 14/11/01	0 hrs	685 days
		Thu 01/04/99	Thu 01/04/99		
5.1	Software Selection	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
5.1.1	Data Entry	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
5.1.2	Data Tracking	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
5.1.3	Editing	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
5.1.4	Tabulation	Mon 03/05/99	Mon 31/05/99	0 hrs	21 days
5.2	Hardware Selection	Thu 01/07/99	Fri 14/07/00	0 hrs	272 days
5.2.1	Quotes - Pilot	Thu 01/07/99	Thu 15/07/99	0 hrs	11 days
5.2.2	Purchase - Pilot	Thu 15/07/99	Fri 30/07/99	0 hrs	12 days
5.2.3	Installation - Pilot	Wed 28/07/99	Fri 06/08/99	0 hrs	8 days
5.2.4	Testing - Pilot	Fri 30/07/99	Fri 06/08/99	0 hrs	6 days
5.2.5	Quotes - Census	Mon 17/04/00	Mon 15/05/00	0 hrs	21 days
5.2.6	Purchase - Census	Mon 15/05/00	Wed 31/05/00	0 hrs	13 days
5.2.7	Installation - Census	Thu 01/06/00	Fri 30/06/00	0 hrs	22 days
5.2.8	Testing - Census	Thu 15/06/00	Fri 14/07/00	0 hrs	22 days
5.3	System Design/Dev.	Thu 01/07/99	Fri 30/06/00	0 hrs	262 days

Number	Task	Start	Finish	Work	Duration
5.3.1	Data Entry	Thu 01/07/99	Tue 30/05/00	0 hrs	239 days
5.3.2	Data Tracking	Thu 01/07/99	Tue 30/05/00	0 hrs	239 days
5.3.3	Edits	Mon 02/08/99	Tue 30/05/00	0 hrs	217 days
5.3.4	Tabulations	Mon 02/08/99	Wed 31/05/00	0 hrs	218 days
5.3.5	Quality Assurance	Mon 02/08/99	Wed 31/05/00	0 hrs	218 days
5.3.6	Testing	Wed 01/09/99	Fri 30/06/00	0 hrs	218 days
5.4	Recruitment	Thu 15/06/00	Mon 31/07/00	0 hrs	33 days
5.4.1	Develop Selection Process	Thu 15/06/00	Fri 30/06/00	0 hrs	12 days
5.4.2	Advertise	Wed 21/06/00	Fri 30/06/00	0 hrs	8 days
5.4.3	Selection	Mon 03/07/00	Fri 14/07/00	0 hrs	10 days
5.4.4	Recruitment	Mon 10/07/00	Mon 31/07/00	0 hrs	16 days
5.5	Training	Mon 03/04/00	Wed 14/11/01	0 hrs	423 days
5.5.1	Develop Training Strategy	Mon 03/04/00	Fri 28/04/00	0 hrs	20 days
5.5.2	Develop Training Manuals	Mon 01/05/00	Fri 30/06/00	0 hrs	45 days
5.5.3	Flow Control Training	Mon 17/07/00	Tue 15/08/00	0 hrs	22 days
5.5.4	Supervisor Training	Mon 17/07/00	Tue 15/08/00	0 hrs	22 days
5.5.5.	Basic Computer Training	Mon 17/07/00	Mon 31/07/00	0 hrs	11 days
5.5.6	Data Entry Training	Tue 01/08/00	Mon 14/08/00	0 hrs	10 days
5.5.7	Computer Edits Training	Thu 01/11/01	Wed 14/11/01	0 hrs	10 days
5.6	Flow Control	Mon 03/04/00	Wed 31/10/01	0 hrs	413 days
5.6.1	Develop FC Procedures	Mon 03/04/00	Fri 28/04/00	0 hrs	20 days
5.6.2	Develop Control Forms	Mon 01/05/00	Wed 31/05/00	0 hrs	23 days
5.6.3	Procedures Manual	Thu 01/06/00	Fri 30/06/00	0 hrs	22 days
5.6.4	FC Operations	Mon 03/07/00	Wed 31/10/01	0 hrs	348 days
5.7	Data Entry	Tue 01/08/00	Fri 13/04/01	0 hrs	184 days
5.7.1	Data Entry	Tue 01/08/00	Fri 30/03/01	0 hrs	174 days
5.7.2	Verification	Tue 01/08/00	Fri 13/04/01	0 hrs	184 days
5.8	Computer Edits	Thu 14/09/00	Tue 31/07/01	0 hrs	229 days
5.8.1	Edits 1	Thu 14/09/00	Thu 31/05/01	0 hrs	186 days
5.8.2	Edits Quality Assurance	Thu 14/09/00	Thu 31/05/01	0 hrs	186 days
5.8.3	Final Edits	Wed 01/11/00	Tue 31/07/01	0 hrs	195 days
5.8.4	Final Quality Assurance	Wed 01/11/00	Tue 31/07/01	0 hrs	195 days
5.9	PES Processing	Tue 01/08/00	Fri 29/09/00	0 hrs	44 days
5.9.1	Search/Match	Tue 01/08/00	Wed 30/08/00	0 hrs	22 days
5.9.2	Data Entry	Mon 14/08/00	Thu 14/09/00	0 hrs	24 days

Number	Task	Start	Finish	Work	Duration
5.9.3	Editing	Mon 21/08/00	Thu 21/09/00	0 hrs	24 days
5.9.4	Quality Assurance	Mon 21/08/00	Fri 29/09/00	0 hrs	30 days
5.10	Tabulation	Wed 01/09/99	Fri 31/08/01	0 hrs	523 days
5.10.1	Strategy	Wed 01/09/99	Fri 31/12/99	0 hrs	88 days
5.10.2	Procedures	Mon 03/01/00	Tue 30/05/00	0 hrs	107 days
5.10.3	Revise Strategy/Procs	Mon 02/10/00	Thu 30/11/00	0 hrs	44 days
5.10.4	Preliminary Tables	Fri 01/12/00	Fri 29/06/01	0 hrs	151 days
5.10.5	Preliminary QA	Fri 01/12/00	Fri 29/06/01	0 hrs	151 days
5.10.6	Final Tables	Mon 02/04/01	Fri 31/08/01	0 hrs	110 days
5.10.7	Final QA	Mon 02/04/01	Fri 31/08/01	0 hrs	110 days
5.11	Evaluation	Thu 01/04/99	Fri 12/10/01	0 hrs	662 days
5.11.1	Develop Evaluation Plan	Wed 01/09/99	Thu 30/09/99	0 hrs	22 days
5.11.2	Pilot Test Evaluation	Thu 14/10/99	Fri 29/10/99	0 hrs	12 days
5.11.3	Revise Evaluation Plans	Thu 01/02/01	Fri 30/03/01	0 hrs	42 days
5.11.4	Census Processing EvaluationMon 03/09/01		Fri 28/09/01	0 hrs	20 days
5.11.5	Prepare Final Report	Mon 01/10/01	Fri 12/10/01	0 hrs	10 days
		Thu 01/04/99	Thu 01/04/99	0 hrs	1 day
6	Dissemination	Thu 01/04/99	Wed 30/04/03	0 hrs	934 days
		Thu 01/04/99	Thu 01/04/99		
6.1	User's Committee	Mon 01/11/99	Fri 11/05/01	0 hrs	400 days
6.1.1	Agency Views on Outputs	Mon 01/11/99	Wed 15/12/99	0 hrs	33 days
6.1.3	Identify Members	Mon 17/01/00	Tue 08/02/00	0 hrs	17 days
6.1.4	Meeting No. 1	Wed 23/02/00	Wed 23/02/00	0 hrs	1 day
6.1.5	Minutes No. 1	Wed 23/02/00	Fri 25/02/00	0 hrs	3 days
6.1.6	Meeting No. 2	Wed 04/10/00	Wed 04/10/00	0 hrs	1 day
6.1.7	Minutes No. 2	Wed 04/10/00	Fri 06/10/00	0 hrs	3 days
6.1.8	Meeting No. 3	Wed 07/02/01	Wed 07/02/01	0 hrs	1 day
6.1.9	Minutes No. 3	Wed 07/02/01	Fri 09/02/01	0 hrs	3 days
6.1.10	Meeting No. 4	Wed 09/05/01	Wed 09/05/01	0 hrs	1 day
6.1.11	Minutes No. 4	Wed 09/05/01	Fri 11/05/01	0 hrs	3 days
6.2	Outputs Development	Tue 01/08/00	Fri 02/02/01	0 hrs	134 days
6.2.1	Specify Outputs	Tue 01/08/00	Fri 15/09/00	0 hrs	34 days
6.2.2	Design Outputs	Mon 16/10/00	Fri 15/12/00	0 hrs	45 days
6.2.3	Develop Production Process	Mon 27/11/00	Fri 02/02/01	0 hrs	50 days
6.3	User Workshops	Mon 02/07/01	Fri 29/03/02	0 hrs	195 days

Number	Task	Start	Finish	Work	Duration
6.3.1	Develop Workshop Content	Mon 02/07/01	Mon 30/07/01	0 hrs	21 days
6.3.2	Prepare Training Materials	Wed 01/08/01	Fri 31/08/01	0 hrs	23 days
6.3.3	National Workshop	Mon 03/09/01	Fri 26/10/01	0 hrs	40 days
6.3.4	Regional Workshops	Mon 19/11/01	Fri 29/03/02	0 hrs	95 days
6.4	Provisional Census Counts	Fri 01/12/00	Fri 28/09/01	0 hrs	216 days
6.4.1	Preparation	Fri 01/12/00	Fri 31/08/01	0 hrs	196 days
6.4.2	Quality Assurance	Fri 01/12/00	Fri 14/09/01	0 hrs	206 days
6.4.3	Release to Regions	Mon 01/01/01	Fri 28/09/01	0 hrs	195 days
6.4.4	Release National Count	Wed 01/08/01	Fri 28/09/01	0 hrs	43 days
6.5	Census Tables	Fri 01/09/00	Fri 14/12/01	0 hrs	336 days
6.5.1	Generate Tables	Fri 01/09/00	Fri 30/11/01	0 hrs	326 days
6.5.2	Check Tables	Fri 01/09/00	Fri 14/12/01	0 hrs	336 days
6.6	Main Census Report	Mon 02/07/01	Mon 15/10/01	0 hrs	76 days
6.6.1	Prepare Draft	Mon 02/07/01	Tue 31/07/01	0 hrs	22 days
6.6.2	Circulate & Revise	Wed 01/08/01	Fri 31/08/01	0 hrs	23 days
6.6.3	Print Main Report	Mon 03/09/01	Fri 14/09/01	0 hrs	10 days
6.6.4	Release Main Report	Mon 01/10/01	Mon 15/10/01	0 hrs	11 days
6.7	Provincial Census Reports	Wed 01/08/01	Wed 31/10/01	0 hrs	66 days
6.7.1	Prepare Draft	Wed 01/08/01	Fri 31/08/01	0 hrs	23 days
6.7.2	Circulate & Revise	Mon 03/09/01	Fri 28/09/01	0 hrs	20 days
6.7.3	Print Provincial Reports	Mon 01/10/01	Mon 15/10/01	0 hrs	11 days
6.7.4	Release Provincial Reports	Tue 16/10/01	Wed 31/10/01	0 hrs	12 days
6.8	PES Results	Fri 01/10/99	Thu 15/11/01	0 hrs	555 days
6.8.1	Analyse PES Results	Mon 02/10/00	Mon 02/10/00	0 hrs	1 day
6.8.2	Draft PES Findings	Wed 01/11/00	Thu 30/11/00	0 hrs	22 days
6.8.3	Prepare PES Report	Fri 01/10/99	Wed 31/10/01	0 hrs	544 days
6.8.4	Release PES Findings	Thu 01/11/01	Thu 15/11/01	0 hrs	11 days
6.9	Specialised Analysis	Mon 02/07/01	Fri 28/03/03	0 hrs	455 days
6.9.1	Appoint Inter-Agency Teams	Mon 02/07/01	Tue 31/07/01	0 hrs	22 days
6.9.2	Conduct Specialised Analysis	Mon 03/09/01	Fri 28/03/03	0 hrs	410 days
6.9.3	Document Results	Mon 03/09/01	Fri 28/03/03	0 hrs	410 days
6.9.4	Conduct Seminars	Fri 01/03/02	Fri 28/03/03	0 hrs	281 days
6.10	Monographs/Reports	Mon 02/07/01	Wed 30/04/03	0 hrs	478 days
6.10.1	Assess Requirements	Mon 02/07/01	Fri 28/09/01	0 hrs	65 days
6.10.2	Assign Responsibility	Mon 03/09/01	Mon 15/10/01	0 hrs	31 days

Number	Task	Start	Finish	Work	Duration
6.10.3	Prepare Reports	Mon 01/10/01	Fri 29/03/02	0 hrs	130 days
6.10.4	Prepare Region Profiles	Mon 02/07/01	Fri 28/03/03	0 hrs	455 days
6.10.5	Print & Distribute Reports	Wed 01/08/01	Wed 30/04/03	0 hrs	456 days
6.10.6	Prepare Other Reports	Thu 01/11/01	Fri 28/03/03	0 hrs	367 days
6.11	User Services	Tue 01/01/02	Fri 28/03/03	0 hrs	324 days
6.11.1	Equip User Service Unit	Tue 01/01/02	Fri 29/03/02	0 hrs	64 days
6.11.2	Establish Unit in Agency	Tue 01/01/02	Fri 29/03/02	0 hrs	64 days
6.11.3	Develop Procedures	Tue 01/01/02	Fri 29/03/02	0 hrs	64 days
6.11.4	Recruit/Train Staff	Thu 28/02/02	Fri 31/05/02	0 hrs	67 days
6.11.5	Service User Requests	Mon 01/04/02	Fri 28/03/03	0 hrs	260 days
6.12	Evaluation	Mon 01/07/02	Thu 31/10/02	0 hrs	89 days
6.12.1	Develop Evaluation Plan	Mon 01/07/02	Fri 30/08/02	0 hrs	45 days
6.12.2	Conduct Evaluation	Mon 02/09/02	Mon 30/09/02	0 hrs	21 days
6.12.3	Prepare Evaluation Report	Tue 01/10/02	Thu 31/10/02	0 hrs	23 days

NOTE: The present example was provided by the Australian Bureau of Statistics. The timetable was produced using Microsoft project 98 software.

ANNEX III

EXAMPLE OF A MODEL PROJECT GANTT CHART
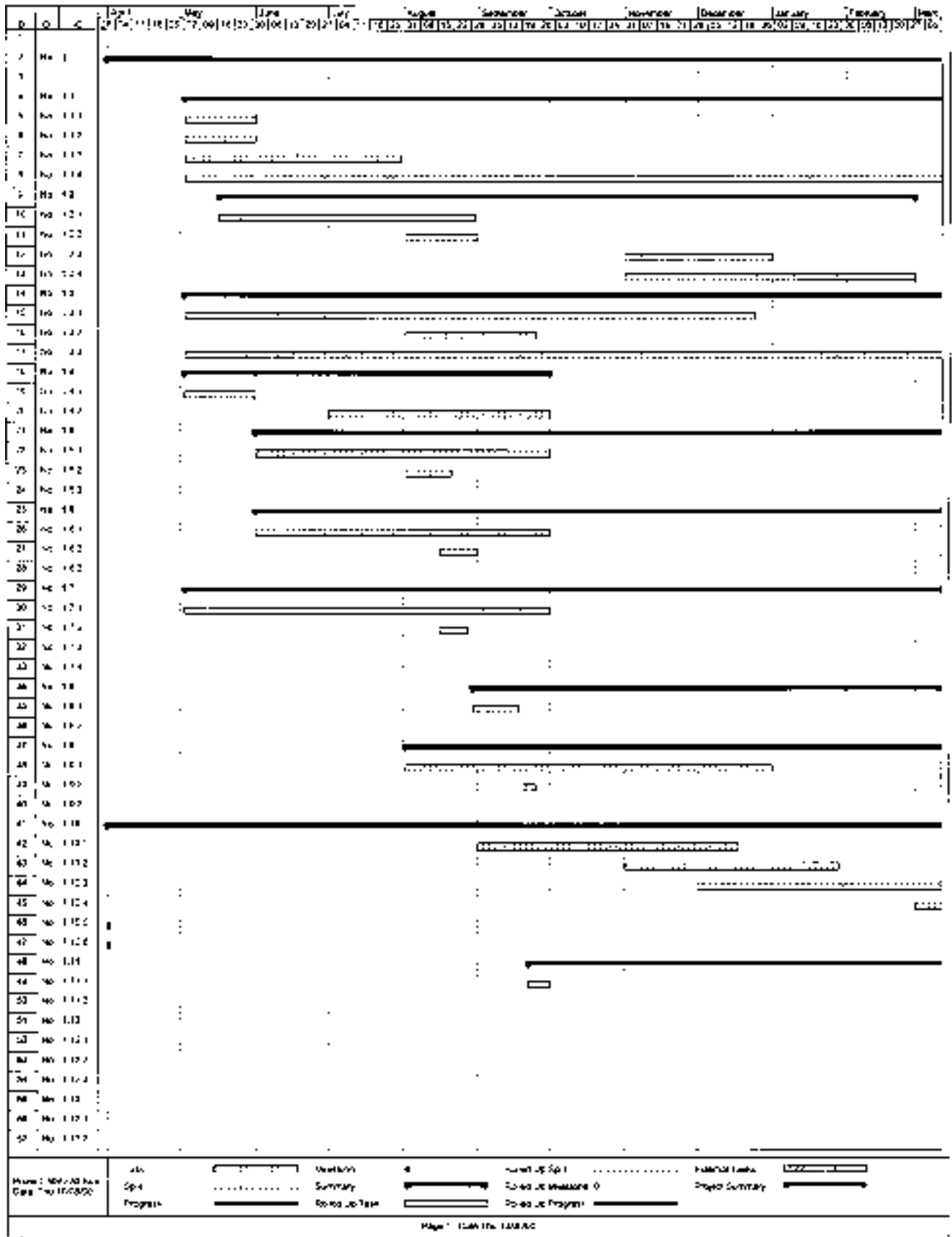
NOTES: The present example was provided by the Australian Bureau of Statistics.
The information contained in this annex was produced using Microsoft project 98 software.
Descriptions of the ID codes included in this chart can be found in annex II.

ANNEX IV

1996 CENSUS PROCESSING: A PRACTICAL EXAMPLE OF
A QUALITY MANAGEMENT STRATEGY

1. SUMMARY

There are many sources of potential error in census data. This paper outlines procedures used to minimize processing error by the implementation of a total quality management approach to the operation of a large-scale processing center.

2. BACKGROUND: OUTLINE OF PROCESSING

The Australian census is conducted by a delivery pick-up method, with a collector responsible for a unit of work called a collection district (CD) consisting of about 200 dwellings. The forms are returned to the processing center in CD lots which is the basic workload used during processing and for which data are available as output.

The census is processed at a central location, which employs up to 1300 staff and takes a year. About 1100 of these staff are temporary employees and are generally organized into teams of 12 Processors, headed up by a Section Leader. Team Leaders manage about five sections and undertake day-to-day management and staff supervision. Group Leaders manage two or three teams and are responsible for the management of the overall process. Group Leaders and Team Leaders are permanent public servants recruited from throughout Australia for the duration of census processing.

The processes involved are:

Precapture: Receipt of material, reconciliation with collectors records, preparation of forms for optical mark reading.

Optical Mark Reading: "tick box" responses are automatically coded.

First Release Processing: Check that all forms for the CD are captured, verification of not stated tick boxes and on-line automatic coding of write-in questions (e.g., birthplace, language and religion), family coding for households with complex family relationships.

Second Release Processing: on-line automatic coding (in some cases using structured coding approaches) for complex questions, e.g., occupation and qualification.

Editing is largely automated and is made up of consistency and legality checks. Only a small percentage of records require manual inspection after editing to reconcile inconsistencies between family coding and individual details.

Imputation for missing values is only undertaken for age, sex, marital status and the statistical local area of usual residence. Most other missing values are left as "not stated" in the final data.

3. QUALITY OF CENSUS DATA

Data Quality

Timeliness

Budget

Quality at its broadest level of definition is multidimensional and involves elements of data quality, budget, and timeliness. The aim of the approach to quality management during processing of the Australian Census is to improve all three elements. It may be necessary to improve one element at the expense of another; for example, additional procedures may be required to improve data quality at the expense of budget allocation and timeliness. Census management will be responsible for balancing these three quality criteria. Processing tests have indicated that the processing operations are likely to proceed according to budget and agreed timetables, therefore the major focus of the quality management strategy during the processing of the 1996 Census will be data quality.

4. THE TOTAL QUALITY MANAGEMENT PHILOSOPHY

* PROCESS responsible for most errors in output

* CONTINUOUS QUALITY IMPROVEMENT

* TEAMS

* MEASURES of quality

* IDENTIFY CAUSES of quality problems

NEED TO ENSURE THE QUALITY OF DATA FOR EVERY CD-QUALITY ASSURANCE POINTS

The Total Quality Management philosophy is founded on the belief that errors in the output of a process are primarily the result of deficiencies in the process itself, rather than the actions of individuals working in that process. This means that processing managers must take responsibility for throughput and data quality, as they are ultimately responsible for the process in which their staff works. This is in contrast to many traditional approaches to quality, which target individuals as the cause of quality problems rather than the process.

Implicit in this philosophy is the belief that most peoples want to work and that the rate and quality of their work are determined by the process. Staff working on the process are also a very valuable resource, in that they are in the best position to advise on improvements to the process.

While most data quality problems will be the result of deficiencies in the process, it must also be recognized that the Census data for a Collection District (or CD) is a differentiated product, i.e., if a user of census data wants the data for one CD, and this data is of poor quality, it cannot be substituted with the data for another CD of higher quality. Therefore the quality of the data for each Collection District must be of at least a minimum, acceptable standard. It is for this reason that a series of quality assurance points have been put in place which every CD must go through during processing.

Continuous Quality Improvement is a core component of Total Quality Management. The fundamental difference between Continuous Quality Improvement and classic quality control, is that instead of aiming to achieve a specified average quality limit, Continuous Quality Improvement aims

to continue to improve the quality of the output of a project throughout the life of that project. Continuous Quality Improvement will determine the quality of the data produced over and above the minimum standard ensured by the quality assurance points.

The other core components of the Total Quality Management approach are;

   (i)   Using teams of processing staff to identify and resolve quality problems,

 (ii)   The use of quantitative measures of quality based on discrepancies in the output of the process, and

(iii)   The priority given to identifying and addressing the root causes of these discrepancies.

5. PROCEDURES

*   ADHERENCE is critical

*   MANAGEMENT RESPONSIBLE for procedures

In a processing environment such as the Census Processing center, with approximately 1,000 Processors, each responsible for coding individual Collection Districts, adherence to procedures is critical. At the same time, Processors should have the widest possible discretion to make decisions in accordance with established procedures.

Managers are responsible for the procedures, including identifying deficiencies and reviewing procedures, to ensure accurate and consistent processing. Procedures can be incomplete, inconsistent or misleading to staff. A source of information on the effectiveness of procedures and training is needed, and that source is the staff.

6. TRADITIONAL QUALITY CONTROL SYSTEMS AND QUALITY MANAGEMENT

TRADITIONAL QUALITY CONTROL SYSTEMS

The objectives of traditional Quality Control systems, which use experts to inspect the work of mainstream operators, are;

   (i)   To ensure that errors in the output do not exceed some specified level,

 (ii)   To improve the quality of the individual's work by providing feedback, and

(iii)   To prevent the Processor from deliberately deviating from procedures, through the threat of inspection.

Quality Control systems also usually involve the reworking or correction of rejected units of work.

Criticisms of this approach are that;

   (i)   It adds significantly to the cost of the operation,

 (ii)   Those errors in the inspection process can fail to detect true errors or falsely identify errors,

(iii)   The correction process can introduce errors into the data,

 (iv)   Operators take less responsibility for the quality of their work, believing it to be the responsibility of the inspectors,

 (v)   Where not all units are inspected, the quality of data is only ensured for those units that are selected.

1996 Census Quality Management

At the core of the quality management process is the measurement of the quality of the data. While this shares many of the features of the process used for traditional QC systems, many of the operational aspects and the uses to which the data are put are quite different

1996 CENSUS PROCESSING QUALITY MONITORING SYSTEM

The Quality Monitoring System in use during census processing is a conventional inspection system in many respects. A sample of each Processor's work is selected for reprocessing by a Processor from another Section. The data files produced by the two iterations are compared, and any mismatches between these two files are resolved by an Adjudicator from a third Section, who determines what the "correct" code or balancing should have been. A discrepancy is where either the original or QM Processor's code does not agree with the Adjudicator's code. The Adjudicator also has the opportunity to provide feedback to the individual concerned. Quality Monitoring processing will all take place in the main processing environment.

The Quality Monitoring System differs from traditional Quality Control systems in that "rejected" CDs will not be reworked. The rationale behind not reprocessing CDs except in disaster situations is that the benefit of correcting all discrepancies is not justified by the cost. For example, if the overall error rate for Occupation coding is 10%, and our Quality Monitoring sample rate for Occupation is 10%, correcting all the discrepancies which are discovered for Occupation could only reduce the overall error rate for that field to 9%. The effects of errors in the inspection process would further reduce the actual improvement in the error rate for Occupation, and errors introduced during correction.

Clearly the resources required to recode all discrepancies is not justified. However, as mentioned earlier, CDs are a differentiated product, reprocessing will be required where Quality Monitoring processing identifies severe data quality problems. This will particularly apply when we find major problems in the Balancing of a CD, which determines the record structure of the data file, for example where a large number of dwellings have not been inserted.

Another feature of the Quality Monitoring System, which differs from traditional Quality Control systems, is that processing staff in the main production areas will be used to perform the Adjudication of discrepancies rather than expert coders. The main reason for this is that experts tend to use their expert knowledge and extraneous information rather than following procedures to get a "correct" code. The aim of the quality management process is the implementation and promotion of consistent adherence to correct procedures.

Discrepancy rate data produced by the Quality Monitoring System will show the discrepancy rate for both the original and QM Processor, for each field coded, for each CD coded through the Quality Monitoring System. It's important to note that these are not error rates, they are measures of inconsistency in processing.

7. THE CONTINUOUS QUALITY IMPROVEMENT CYCLE

The following four-step cycle for implementing Continuous Quality Improvement will be used:

Step 1 of the cycle is to **measure quality**

Step 2 is to **identify the most important quality problems**

Step 3 is to **identify the root causes of these important quality problems**

Step 4 is to **implement corrective action and measure quality once again**

8. STEP 1 - MEASURE QUALITY

* QMS Discrepancy Rate Data

* Accept - Reject Scheme

* Control Charts

The Quality Monitoring System outline above is used to produce discrepancy rates.

An Accept - Reject scheme will produce a report of CDs where the error rate for any field is above that defined as acceptable by the Quality Assurance Manager. This allows the identification of those Processors who require some form of re-training, either through on-the-job training by their Section Leader, or formal training.

CONTROL CHART - OCCUPATION

Control Charts will also be produced from the discrepancy rate data. These charts plot the discrepancy rates on a week-by-week basis against the same acceptable error rate used by the Accept - Reject scheme, and warning and control limits, as in this example for Occupation from the Dress Rehearsal.

These charts allow the monitoring of fluctuations in the discrepancy rate for the coding of a particular field.

9. STEP 2 - IDENTIFY THE MOST IMPORTANT QUALITY PROBLEMS

The Quality Monitoring System will also produce discrepancy profile data, which will be used to identify which particular codes are being assigned incorrectly. This data can be presented using standard Management Information System (MIS) reports.

Step 2 of the Continuous Quality Improvement cycle requires the identification of the most important quality problems. The discrepancy rate data will be used to determine which fields will need to be targeted, and then the discrepancy profile data will be used to identify what the most important data quality problems are for these fields.

DRESS REHEARSAL DISCREPANCY PROFILE OCCUPATION— ALL DISCREPANCIES

Individual Frequency: 1 Total Discrepancies: 1558

Total Frequency: 1

The first stage of this step is to determine what the most frequent discrepancies are. This example using Occupation discrepancy data from the Dress Rehearsal gives an indication of how a discrepancy profile report looks when all discrepancies are considered. This report is in fact thirty-odd pages long.

The Total Frequency is the sum of the discrepancies in which this was the correct code. The Individual Frequency is the number of times this was the incorrect code for the correct code being profiled. Even using the data from the small number of CDs selected for QM processing at the Dress Rehearsal, this is not a very useful profile. It's very difficult to see what the most frequent discrepancies are.

PARETO ANALYSIS

* Total Frequency
* Individual Frequency

What is needed is some form of Pareto analysis, which will allow the identification of the most prevalent discrepancies. The MIS allows noise to be filtered from the data, through the removal of discrepancies below user-specified frequency minima.

DRESS REHEARSAL DISCREPANCY PROFILE OCCUPATION

Individual Frequency: 4 Total Discrepancies: 1256

Total Frequency: 20

This is a much more useful profile.

The severity of the discrepancy also has to be considered. Occupation coding assigns a six-digit code, but one could argue that discrepancies at the Major Group, or one-digit level, are more serious than discrepancies at the six-digit level. For example, whether a person's occupation is coded to a manager or a clerk is a very significant discrepancy.

DRESS REHEARSAL DISCREPANCY PROFILE OCCUPATION—1 DIGIT

Individual Frequency: 4 Total Discrepancies: 639

Total Frequency: 20

The MIS also allows the data to be stratified by specifying which level of discrepancies are of most interest. If the report is specified at the one-digit level, it can be seen that nearly half of the original Occupation discrepancies have been coded to different major groups. The most prevalent of these discrepancies in this example are between Major Groups 6 and 8 ("Intermediate Clerical, Sales and Service

Workers" and "Elementary Clerical, Sales and Service Workers"). This suggests that Processors are having trouble differentiating between these two groups.

10. STEP 3 - IDENTIFY THE ROOT CAUSES OF THESE IMPORTANT QUALITY PROBLEMS

* Case Reporting Forms

* Adjudication Feedback Reports

* Section Leaders

* Query Resolution

* Validation

* Quality Improvement Teams

In order to perform step 3 of the cycle, identifying the root causes of these problems, more information is needed from a variety or sources.

10.1 *Case Reporting Forms*

Staff working in a process are in the best position to advise on how that process can be improved. Processors will be provided with Case Reporting Forms, which allow them to describe problems they have with a procedure, processing system or coding index. They're also a vehicle for any suggestions they might have as to how processes can be improved.

10.2 *Adjudication Feedback Reports*

It was mentioned earlier that Adjudicators will have the opportunity to provide feedback to individuals, on the discrepancies between the code they assign and what the Adjudicator feels is the correct code, through Adjudication Feedback Reports. The major objective of these reports is to alert Processors to where they are not following procedures correctly.

Adjudicators will be trained to only provide feedback to the individual Processor, in the form "you coded the response to X when procedure N says to code the response to Y using these steps". This is important, because most of the discrepancies found would be the results of deficiencies in the process, and not the responsibility of the individual Processor, and the Adjudication Feedback Reports mustn't send a contradictory message to our staff.

Processors will also have access to a coding simulator. Where appropriate, the Adjudicator will enter the response in the feedback, so that the individual can use the coding simulator to see how to arrive at the correct code for that response.

Another benefit of these reports is that they encourage the person performing the Adjudication to think about why these discrepancies are occurring. This will enable them to make a valuable contribution to identifying the root causes of the important data quality problems identified through step 2 of the Continuous Quality Improvement cycle.

10.3 *Section Leaders*

The Section Leaders are crucial to the success of our Quality Assurance Strategy. Section Leaders will be recruited before Processors, so that they can become proficient with the procedures before their staff start, and will be in a position to reinforce, on the job, what the Processors are taught in training.

Section Leaders will do most of the adjudication and through this process and the provision of feedback to their staff, they will also be in an ideal position to advise us on deficiencies in our training, procedures, processing systems and coding indexes.

It is vital that Section Leaders have an expert knowledge of procedures, and are able to effectively communicate these procedures to the Processors. If Section Leaders do not fully understand a procedure, they could potentially give the wrong direction to Processors in their own Section and to those of the other two Sections, which they provide with Adjudication Feedback.

10.4 *Query Resolution*

Information on every query raised will be stored on a database by the Query Resolution System. This information includes the response on the Census form, the code assigned, and an indicator of why the response required a query to be raised. By stratifying the queries according to this indicator, we'll be able to see where we can improve the process so that fewer queries are raised. As the raising of queries is time-consuming, any reduction in the number of queries raised will have a positive effect on throughput and the morale of Processors. This will also provide a very useful reference source for improving the design for the next cycle.

One of these indicators identifies those responses that could have been coded using existing procedures. Analysis of these responses will give us an indication of which procedures need to be reinforced through retraining or the circulation of procedural reminders.

10.5 *Validation*

The data released from Census Processing to Census Output will be fully validated. This will be done by comparing 1996 Census data with data from previous censuses and other sources such as other surveys undertaken by the ABS and administrative data. Problems identified during the ongoing validation of the data for a state will feed into the Continuous Quality Improvement process, and action taken to address these problems.

10.6 *Quality Improvement Teams*

The use of teams to identify and propose solutions to quality problems is central to the Total Quality Management approach. During processing, Quality Improvement Teams will be responsible for the following areas:

   (i)   Precapture,

(ii)   Balancing,

(iii)   Samples and Address coding,

(iv)   Family coding,

(v)   Business coding (Industry, Industry Sector, Journey to Work),

(vi)   Occupation and Qualifications coding, and

(vii)   Work Environment.

The focus of these teams is to provide a formal mechanism through which processing staff on the floor can contribute to improving the process in which they work. Each team will be made up of Processors and Section Leaders, with a Group Leader in the role of facilitator and classification experts where appropriate. Quality Improvement Teams will meet once a week to start off with, but meetings may be held less frequently once the major problems with the process are addressed. Participation by staff in these Quality Improvement Teams will be encouraged and some rotation of members may be required.

QUALITY IMPROVEMENT TEAMS INFORMATION FLOWS

The function of these teams will be to perform step three of the Continuous Quality Improvement cycle; to identify the root causes of the important quality problems, and to recommend corrective action to address these problems. All of the sources of information mentioned will be flowed into these Quality Improvement Teams. Members will also be encouraged to liaise with staff in their area to identify problems not raised through formal channels.

It is expected that the discussions in the Quality Improvement Teams will be wide-ranging and members must feel free to raise any issues they think are relevant. It is important that individuals are provided with information about the process if they request it, otherwise they wont be in a position to make sound suggestions for improving the process and will be less willing to contribute to Continuous Quality Improvement.

The minutes of the QIT meetings will be distributed to Processors through their Section Leaders. Changes to be implemented should be seen to come from the QIT, rather than from Census management.

11.   STEP 4 - IMPLEMENT CORRECTIVE ACTION AND RETURN TO STEP 1

*   Quality Improvement Team Reports

*   Quality Management Steering Committee

*   Corrective Action

  (i) Procedures

  (ii) Coding Indexes

  (iii) Processing Systems

  (iv) Training

*   Continue Measuring Quality

The first part of step four of the cycle is to implement corrective action to address the root causes of the quality problems identified in step three.

Each Quality Improvement Team will produce a report outlining the issues covered at each meeting, including any suggestions for corrective action. These reports will be considered by the Quality Management Steering Committee headed by the Quality Assurance Manager. Any proposed changes will be examined by the Quality Management Steering Committee before implementation, as the ramifications of these changes must be predictable and fully understood beforehand and be prioritized.

The Quality Management Steering Committee will provide feedback to the Quality Improvement Teams on the issues raised in their reports and any proposed corrective action. It's important that the contribution of Processors and Section Leaders is acknowledged, otherwise this contribution may not continue.

In the context of Census processing, the forms of corrective action available include:

  (i)   Changes to procedures,

  (ii)   Changes to coding indexes

  (iii)   Changes to the processing systems

  (iv)   Retraining, additional training or procedural reminders.

The second part of step four is to continue to measure quality and evaluate the effectiveness of the corrective action implemented. As the most important quality problems are resolved, the cyclical approach will continue and go on to target the next most important set of problems, so that the quality of the process is being continuously improved.

12.   THE ROLE OF LINE MANAGEMENT

*   Explain Total Quality Management Philosophy

*   Consistency

*   Promote Continuous Quality Improvement

Line management has responsibility for quality, firstly by ensuring that staff understand the management philosophy. It is important that the rationale behind the Total Quality Management approach is explained when temporary staff are employed and are introduced to the Quality Monitoring System, as it is in some ways counter- intuitive. For example, staff do not always understand how so much emphasis can be placed on data quality, yet "errors" detected through QM processing are not corrected.

Line management must ensure that their behavior is consistent with the Total Quality Management philosophy, as staff soon pick up on inconsistencies between what managers practice and what managers preach. This approach to management is based on placing trust in staff to do a good job, which is often inconsistent with some managers' desire to exercise total control over the process.

Census processing managers need to ensure that staff comments and observations are fed into the Continuous Quality Improvement process. The belief that it is the process rather than the individual that determines the quality of output needs to be reinforced though the whole approach to management. Managers should ensure that both formal and informal means are used to encourage staff to contribute to Continuous Quality Improvement, and that staff are comfortable in giving their opinions.

A culture in which everyone has the opportunity to contribute to Continuous Quality Improvement at the Census Processing center needs to be created. The temporary staff will perform basically repetitive clerical and screen based tasks, and it is up to managers to motivate them and to encourage them to assume some ownership of their work. This can be done by promoting a commitment to the Total Quality Management philosophy, and by adopting a consistent and thematic approach to management.

NOTE: The present example was provided by the Australian Bureau of Statistics.

ANNEX V

**TIME AND EQUIPMENT ESTIMATIONS FOR MANUAL CENSUS DATA ENTRY
AND SCANNER CENSUS DATA ENTRY**

Traditional data entry

1	Population:	**25,000,000**	
2	Housing:	**6,345,000**	
3	Estimated average household size:	**5.5**	Characters
4	Estimated population information length:	**55**	Characters
5	Estimated housing information length:	**37**	Characters
6	Estimated enumeration areas:	**80,000**	
7	Geographical identification fields:	**20**	Characters
8	Population **6** years and over:	**85**	Percentage (from total population)
9	Population **15** years and over:	**59**	Percentage (from total population)
10	Female population **15** years and over:	**34**	Percentage (from total population)
11	Active population:	**47**	Percentage
12	Errors and retyping information:	**10**	Percentage
13	Double entry verification:	**40**	Percentage

Population/cases	Characters that need to be entered	Keystrokes	Questions related to:	Percentage
80,000	20	1,600,000	Geographical ID	100
6,345,000	**8**	50,760,000	House No. and household No.	100
25,000,000	**35**	875,000,000	Total population	100
21,250,000	**5**	106,250,000	Population 6 years and over	85
14,750,000	**2**	29,500,000	Population 15 years and over	59
11,750,000	**7**	82,250,000	Active population	47
13,250,000	**2**	26,500,000	Inactive population	53
8,500,000	**6**	51,000,000	Female population15 years and over	34
6,345,000	37	234,765,000	Housing records	100
	Subtotal	1,457,625,000		
	Errors and duplication.	685,083,750		47
	Verification	145,762,500		10

Total number of characters that need to be entered   2,288,471,250

To estimate the duration of the census data entry, the following hypothesis has been used:

22	working days per month
7,000	numeric keystrokes per hour per operator
6	productive hours per shift in an 8-hour shift
2	operator shifts per day
6	months to accomplish data entry
5	months to accomplish coding
20	total coders per shift
15	total data-entry operators per group

The time and equipment estimates needed for the census data entry are as follows:

2,288,471,250	characters at	7000	keystrokes per hour	=	326,924	hours
326,924	hours at	12	hours per day	=	27,244	days, with two shifts
27,244	days at	22	working days per month	=	1,238	months, with one microcomputer
1,238	months at a	6	month limit	=	206	microcomputers

Item	Quantity	Description
1	5	One file server per region (with large memory) Large hard disk "Ultra-2 Wide SCSI", CD-ROM/DVD, tape back-up LAN adapter, keyboard and accessories (including desks and network cable)
2	206	Workstations LAN adapter, keyboard and accessories (including desks and network cable)
3	21	Terminals for data-entry team leaders LAN adapter, keyboard and accessories (including desks and network cable)
4	2	Recordable CD-ROM/DVD unit (external)
5	58	Uninterruptible power unit 206 PCs + 21 PCs
6	5	Uninterruptible power unit, with special capabilities for the 5 servers
7	10	24 ports "hub", including cables to interconnect hubs
8	5	Windows NT or NetWare (50 users)
9	1	Miscellaneous

10	2,160	Coders (432 x 5 months), according to the following estimates: 22 working days per month 1 coder can code occupation and industry variables for 300 persons in one working day (11,750,000 active population) 1 coder can code geographical variables (place of residence, previous residence, etc.) of 3,000 people in one working day
11	108	Coders supervisors (1 supervisor x 20 coders x 5 months)
12	5	Chief of coding services 5 months
13	2,472	Data-entry operators (206 operators x 2 shifts x 6 months)
14	168	Data-entry supervisors (1 supervisor x 15 operators x 6 months)
15	60	Network administrators 5 servers x 2 shifts x 6 months
16	12	Data-processing and data-entry chiefs

DATA PROCESSING

17	4	2 fast microcomputers for data-processing tasks
		2 fast microcomputers for program development, control and support activities CD-ROM/DVD, large hard disk, floppy LAN adapter, keyboard and accessories (including desks and network cable)
18	6	2 fast laser printers and 4 standard laser printers
19	1	Miscellaneous
20	4	Network administrator (1 x 4 months)
21	30	Programmers (2 x 15 months)

1. Population: **16,000,000**

2. Housing: **4,423,000**

3. Estimated average household size: **3.5**

4. Estimated population record length: **66** characters

5. Estimated housing record length: **25** characters

6. Estimated enumeration areas: **60,000**

7. Geographical identification fields: **10** characters

8. Population 6 years and over: **90 per cent**

9. Population 15 years and over: **63.4 per cent** (from total population)

10. Female population 15 years and over: **34 per cent** (from total population)

11. Errors and retyping information: **10 per cent**

12. Double entry verification: **50 per cent**

Population/cases	Characters	Keystrokes	Comment	Percentage
60,000	**10**	600,000	Geographical ID	**100**
4,423,500	**5**	22,117,500	House number and household number	**100**
16,000,000	**44**	704,000,000	Total population	**100**
14,400,000	**2**	28,800,000	Population 6 years and over	**90**
10,144,000	**16**	162,304,000	Population 15 years and over	**63.4**
5,440,000	**4**	21,760,000	Female population 15 years and over	**34**
4,423,500	**25**	110,587,500	Housing record	**100**
	Subtotal	1,050,169,000		
	Errors and duplications	105,016,900		**10**
	Verification	525,084,500		**50**
	Total	1,680,270,400		

13.   Pages to capture: 49,000,000

-    Each questionnaire has 10 pages

-    Estimated average household size is 3.5

-    Need to process 4,900,000 questionnaires (the same as total houses + 10 per cent)

-    The four questions, place of residence, previous residence, occupation and industry have 8 fields with

14.   alphabetic characters to retrieve (120 in total per population record)

15.   Scanner speed: 100 pages "duplex" per minute (Fujitsu M3099)

16.   Working hours per day: 16 (from which only 14 show effective output)

17.   Character recognition retrieval speed: 125 per second using a Pentium 200MHz

18.   Data capture estimated duration: 4 months

19.   Necessary scanners:

49,000,000	pages at	600	pages per minute (six scanners)	=	81,667	minutes
81,667	minutes at	60	minutes per hour	=	1,361	hours
1,361	hours at	14	hours per day	=	97	days
97	days at	22	working days per month	=	4	months, with **6** scanners

Equipment estimates:

Item	Quantity	Description
1.	6	Scanner: Fujitsu model M3099 GH (or similar)
2.	6	Images retrieval software
3.	3	One microcomputer to control two scanners: INTEL Pentium II 500 MHz (or better) PCI architecture, 512KB cache, 128 MB RAM SCSI-2 controller (for scanners) 8.0 GB hard disk, diskette 1.44 MB 24xCD-ROM (or better), Ports: 1 parallel, 2 serials PCI colour card, with 2 MB memory 15" colour monitor 101 enhanced keyboard
4.	3	DAT tape back-up units "Colorado power-tape", 8.0 GB external
5.	18	Microcomputers to retrieve characters in 4 months (working 16 hours per day), with the following specifications (125 cps using a Pentium 200; there are 199 characters or marks in each population record and 38 characters or marks in housing records, in both cases without including the geographical identification that is performed only one time at the beginning of the enumeration area: INTEL Pentium III 500 MHz (or better) PCI architecture, 512KB cache, 128 MB RAM 8.0 GB hard disk, diskette 1.44 MB 32xCD-ROM (or better), Ports: 1 parallel, 2 serials PCI colour card, with 4 MB memory 15" colour monitor 101 enhanced keyboard
6.	12	Microcomputers to be used to capture manually alphabetic fields that were not retrieved properly by Nestor Reader (NCS Company): INTEL Pentium III 500 MHz (or better) PCI architecture, 256KB cache, 64 MB RAM 8 GB hard disk, diskette 1.44 MB Ports: 1 parallel, 2 serials PCI colour card with 2 MB memory 15" colour monitor 101 enhanced keyboard
7.	2	One network server to control data-entry workstations One network server to control coders workstations, with the following characteristics: INTEL Pentium III 500 MHz (or better) PCI architecture, 512KB cache, 64 MB RAM 6.0 GB hard disk, diskette 1.44 MB 24xCD-ROM, Ports: 1 parallel, 2 serials PCI colour card, with 2 MB memory 15" colour monitor 101 enhanced keyboard
8.	35	Computer desks
9.	10	UPS APC2000 (for 12 workstations and 18 PCs dedicated to image processing)
10.	5	UPS APC700 NET, with power chute smart capability (for microcomputer controlling scanner and two servers)
11.	3	2 KVA UPS for scanners
12.	3	Linkbuilder 10BT, "hub" with 12 ports
13.	2	Novell Intranet/Windows NT (25 users)
14.	3	Network cable installation
15.	2	Network interface 3COM Etherlink III 3C590 PCI 10BT
16.	3	Network interface 3COM Etherlink III 3C509 BTP
17.	1	CD-ROM recorder
18.	2	Automated data-entry system for character recognition and data processing management
19.	2	Paper cutters to split questionnaires so they can be processed by scanners
20.	1	Miscellaneous
21.	56	Scanners personnel (4 months, 2 shifts) 1 operator per each two scanners 1 operator per paper cutter
22.	24	Supervisor of scanners teams (4 months, 2 shifts)

23.	96	Data-entry operator (for those images that were unable to be retrieved by scanners) 12 operators (4 months, 2 shifts)
24.	8	Supervisor for previous operators 1 supervisor per group (4 months)
25.	10	Questionnaire reception, manual verification and storage: 90 per cent will have no major problems but 10 per cent will need 5 minutes of staff time for repair (4 months)

NB: The equipment may increase if the questionnaire requires more than one page to record one-person data.

DATA PROCESSING

Item	Quantity	Description
1.	4	2 microcomputers for data processing 2 microcomputers for program development, control tasks and support INTEL PentiumIII-500 MHz (or better) PCI architecture, 256KB cache, 128 MB RAM 8.0 GB hard disk, diskette 1.44 MB 32xCD-ROM (or better) Ports: 1 parallel, 2 serials PCI colour card with 4 MB memory 15" flat screen colour monitor (0.28mm 1280x1024) 101 enhanced keyboard
2.	4	Computer desks
3.	2	UPS APC1250 smart (for data-processing microcomputers)
4.	1	Fast laser printer
5.	4	Standard laser printers
6.	2	Network interface 3COM Etherlink III 3C509 BTP
7.	4	Network cable installation
8.	1	Miscellaneous

ANNEX VI

EXAMPLE OF A TABLE OF CONTENTS OF A MODEL CONTRACT FOR THE PROVISION OF A CENSUS PROCESSING SYSTEM

Draft agreement between
Census Agency
and
[Name to be supplied]

for the provision of a Census Processing System

Table of contents

Section 1. General issues

Section 2. Hardware acquisition and installation

228

Schedules

1.   Census agency functional specifications

2.   Diary

3.   Agreement details

4.   List of contractor-supplied equipment and prices

5.   List of census agency-supplied items acquired by contractor as agent

6.   List of census agency-supplied items not acquired by contractor as agent

7.   Project planning

8.   Implementation plan

9.   Testing acceptance

10.   Specified subcontractors

11.   Statutory declaration by subcontractor

12.   Public liability and other relevant insurance

13.   Unconditional financial undertaking

14.   Performance guarantee

15.   Intellectual property rights in contract materials

16.   Deed of confidentiality, Fidelity and ownership of intellectual property rights

17.   Escrow agreement

18.   Mechanism for variation of prices, license fees and charges

NOTE: The present example was provided by the Australian Bureau of Statistics.

ANNEX VII

EXAMPLES OF CENSUS QUESTIONNAIRE FORMS

The statistical offices of Argentina, Botswana, New Zealand, South Africa and Uruguay have provided examples of the census questionnaires used in their most recent census.

03 290 245.1

CENSO NACIONAL DE POBLACION Y VIVIENDA
ESTRICTAMENTE CONFIDENCIAL Y RESERVADO

A

Ubicación geográfica de la vivienda

CUANDO PARA UN HOGAR
SEA NECESARIO
UTILIZAR OTRA
O OTRAS CEDULAS
LLENE ESTE CIRCULO
A PARTIR DE LA
SEGUNDA CEDULA
QUE UTILICE

CALLE _____ N°: _____

PISO _____ DEPTO./PIEZA _____ LOCALIDAD _____
PARAJE _____

DEPTO. O PARTIDO: _____

PROVINCIA: _____

FRACCION □□□   RADIO □□□   SEGMENTO □□

MANZANA N°	N° DE ORDEN DE LA VIVIENDA	N° DE ORDEN DEL HOGAR EN LA VIVIENDA
⓪⓪⓪	⓪⓪	⓪⓪
①①①	①①	①①
②②②	②②	②②
③③③	③③	③③
④④④	④④	④④
⑤⑤⑤	⑤⑤	⑤⑤
⑥⑥⑥	⑥⑥	⑥⑥
⑦⑦⑦	⑦⑦	⑦⑦
⑧⑧⑧	⑧⑧	⑧⑧
⑨⑨⑨	⑨⑨	⑨⑨

Vivienda

I - CARACTERISTICAS DE LA VIVIENDA - PARA EL HOGAR UNICO O PARA EL PRIMER HOGAR

233

Nº DE ORDEN	NOMBRE
01	JEFE JEFA

234

PERSONA N°

PARA TODAS LAS PERSONAS (NO OLVIDE A LOS NIÑOS)

USO
INTERNO

1. ¿CUÁL ES EL PARENTESCO O RELACIÓN CON EL JEFE O LA JEFA DEL HOGAR?

Jefe o jefa .... ○

Residente en vivienda colectiva ...... ○

2. SEXO

Varón ○

Mujer ○

3. ¿CUÁL ES LA EDAD ACTUAL EN AÑOS CUMPLIDOS?

Menores de un año

Mayores de 99 años

IGNORADO ○

5. ¿DÓNDE VIVE HABITUALMENTE?

En esta localidad .... ○

En otra localidad argentina ...... ○

Localidad o paraje: _____

Departamento o Partido: _____

Provincia: _____

(Considere Capital Federal como una provincia)

En un país extranjero .... ○

PAÍS EXTRANJERO: _____

Ignorado .... ○

6. ¿DÓNDE VIVÍA HABITUALMENTE HACE CINCO AÑOS?

En esta localidad .... ○

En otra localidad argentina ...... ○

Localidad o paraje _____

Departamento o Partido _____

Provincia _____

(Considere Capital Federal como una provincia)

En un país extranjero .... ○

PAÍS EXTRANJERO: _____

Ignorado .... ○

7. ¿DÓNDE NACIÓ?

En esta provincia .... ○

En otra provincia argentina ...... ○

Provincia: _____

(Considere Capital Federal como una provincia)

En Bolivia, Brasil, Chile, Paraguay o Uruguay ...... ○

En otro país .... ○

País extranjero: _____

Año de llegada a la Argentina:

Ignorado ○

Ignorado .... ○

4. ¿RECIBE ALGUNA PENSIÓN O JUBILACIÓN?

SÍ ○

NO ○

IGNORADO ○

8. ¿TIENE ALGUNA OBRA SOCIAL?

SÍ ○

NO ○

IGNORADO ○

9. ¿ESTÁ ASOCIADO A ALGÚN PLAN MÉDICO O MUTUAL?

SÍ ○

NO ○

IGNORADO ○

10. ¿SABE LEER Y ESCRIBIR?

SÍ ○

NO ○

IGNORADO ○

PARA TODAS LAS PERSONAS DE 3 AÑOS O MAS

11. ¿ASISTE A ALGÚN ESTABLECIMIENTO EDUCACIONAL?

ASISTE a establecimiento público ... ○

ASISTE a establecimiento privado ... ○

NO ASISTE, PERO ASISTIÓ .... ○

NUNCA ASISTIÓ .... ○

IGNORADO .... ○

SIGA A LA VUELTA

12. ¿QUÉ NIVEL CURSA?

Jardín o Preescolar ... ○   FIN DE ESTA PERSONA

Primaria .... ○

Secundaria .... ○

Terciaria .... ○

Universitaria .... ○

Ignorado .... ○

13. ¿EN QUÉ GRADO O AÑO ESTÁ?

1° 2° 3° 4°

5° 6° 7° o mayor Ignorado

SIGA A LA VUELTA

14. ¿CUÁL ES EL NIVEL MÁS ALTO QUE CURSÓ?

Jardín o Preescolar ... ○   SIGA A LA VUELTA

Primaria .... ○

Secundaria .... ○

Terciaria .... ○

Universitaria .... ○

Ignorado .... ○

15. ¿CUÁL ES EL ÚLTIMO GRADO O AÑO QUE APROBÓ EN ESE NIVEL?

No aprobó 1° ○ SIGA A LA VUELTA

1° 2° 3° 4°

5° 6° 7° o mayor Ignorado

16. ¿COMPLETÓ ESE NIVEL?

SÍ ○

NO ○

IGNORADO ○

SIGA A LA VUELTA

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17. ¿DURANTE LA SEMANA PASADA, TRA- BAJÓ AUNQUE SEA POR POCAS HORAS ?
- SÍ ☐
- NO ☐ → PASE A PREG. 20
- IGNORADO ☐ → PASE A PREG. 20

18. ¿HIZO ALGO EN SU CASA PARA AYUDAR O AYUDÓ A ALGUIEN EN UN NEGOCIO, CHACRA O TRABAJO ?
- SÍ ☐
- NO ☐ → PASE A PREG. 20
- IGNORADO ☐ → PASE A PREG. 20

19. ¿ESTUVO DE LICENCIA POR ENFERMEDAD, VACACIONES, ETC.?
- SÍ ☐
- NO ☐
- IGNORADO ☐ → PASE A PREG. 20

20. DURANTE LAS ÚLTIMAS CUATRO SEMANAS, ¿ BUSCÓ TRABAJO ?
- SÍ ☐
- NO ☐
- IGNORADO ☐

21. EN EL TRABAJO PRINCIPAL, EN EL QUE TRABAJA MÁS HORAS , ES...
- ¿ Patrón ? (tiene obreros o empleados) .... ☐
- ¿ Obrero o empleado del sector privado ? .... ☐
- ¿ Obrero o empleado del sector público ? .... ☐
  - Nacional ☐
  - Provincial ☐
  - Municipal ☐
  - Ignorado ☐
- ¿ Empleado en servicio doméstico ? .... ☐
- ¿ Trabajador por cuenta propia ? .... ☐
- ¿ Trabajador familiar sin remuneración fija ? ☐
- Ignorado .... ☐

¿ CUÁNTOS OBREROS Y EMPLEADOS HAY EN EL ESTABLECIMIENTO DONDE TRABAJA ?
- 1 a 5 ☐
- 6 o más ☐
- Ignorado ☐

22. ¿ A QUÉ SE DEDICA O QUÉ PRODUCE EL LUGAR O ESTABLECIMIENTO DONDE TRABAJA ?
(Ej.: Fabricación de cocinas; transporte colectivo de pasajeros; fabricación de zapatos de cuero; enseñanza primaria; instalación y reparación de bombas)

_____
_____
_____

23. ¿ QUÉ TAREAS HACE EN ESE TRABAJO ?
(Ej.: Administrativo: calcula los sueldos / Chofer: maneja colectivos / Zapatero: cose zapatos de cuero con máquina eléctrica / Plomero: limpia y cuela la acequia / Peluquero: hace rizitos y mechitas para vender dinero)

_____
_____
_____

24. POR ESE TRABAJO ¿ LE DESCUENTAN PARA JUBILACIÓN ?
- SÍ ☐
- NO ☐
- IGNORADO ☐

25. ACTUALMENTE ES...
- ¿ Unido/a ? .... ☐
- ¿ Casado/a en unión legal ? .... ☐
- ¿ Separado/a de unión o matrimonio ? .... ☐
- ¿ Divorciado/a de matrimonio ? .... ☐
- ¿ Viudo/a de unión o matrimonio ? .... ☐
- ¿ Soltero/a nunca unido ? .... ☐
- Ignorado .... ☐

26. ¿ CUÁNTOS HIJOS E HIJAS NACIDOS VIVOS HA TENIDO ?
Ninguno ☐ → FIN DE ESTA PERSONA
☐ ☐ ☐ ☐ ☐ ☐ ☐
1 2 3 4 5 6 7
☐ ☐ ☐ ☐ ☐ ☐ ☐
8 9 10 11 12 13 14 15 16 o más
Ignorado ☐ → FIN DE ESTA PERSONA

27. ¿ CUÁNTOS HIJOS E HIJAS ESTÁN VIVOS ACTUALMENTE ?
Ninguno ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐
1 2 3 4 5 6 7
☐ ☐ ☐ ☐ ☐ ☐ ☐
8 9 10 11 12 13 14 15 16 o más
Ignorado ☐

28. ¿ HA TENIDO HIJAS O HIJOS NACIDOS VIVOS DURANTE LOS ÚLTIMOS 12 MESES ?
SÓLO PARA MUJERES DE 14 A 49 AÑOS
- Sí, uno .... ☐
- Sí, dos o más .... ☐
- No .... ☐
- Ignorado .... ☐

237

Statistics — Individual Form — Census 96

The Census of Population and Dwellings

Tuesday, 5 March 1996

For Census advice and information:
- Look at the Individual Help Notes
- Call the Census Helpline toll-free: **0800 80 1996**

For each question:

tick one or more circles ✓

write a number like this **4**

print an answer in capital letters like this **SANDRA LOUISE**

Follow the arrow coming from any answer you tick. For instance, if you had ticked this circle, the next question to answer would be 55.

✓ no ➤ Go to 55

One of these blue forms must be filled in for every person in New Zealand on the night of Tuesday, 5 March 1996, including babies.

The information you provide is collected under the authority of the Statistics Act (1975).

Your information will be used only for statistical purposes. Census responses will be used to select people for a disability survey (see Help Notes).

Your information remains confidential to Statistics New Zealand and is protected by the Statistics Act (1975).

Len Cook
Len Cook
Government Statistician

---

1 What is your name?

Surname or family name

All first and middle name(s), or all given name(s)

2 Where do you live – give the full address, including, if possible, all of these:
- flat number (if it is a flat)
- street number and street name
- suburb or rural locality
- city, town or district
- country

country

3 How long have you lived at the address you gave in question 2?

less than a year **OR** number of years

4 Where did you live 5 years ago, on 5 March 1991?

- not born 5 years ago
- at the address you gave in question 2
- living in NZ at another address ➤ Give that address as fully as you can
- not living in NZ ➤ Print the country you were living in

---

5 On the night of Tuesday, 5 March 1996, are you at the address you gave in question 2?

yes ➤ **Go to 6**

no ➤ Give the address where you are on Census night. Include, if possible, **all** of these:
- flat number (if a flat)
- street number & name
- suburb or rural locality
- city, town or district

6 Are you:
- male
- female

7 When were you born?

day (e.g. 29)   month (e.g. 11)   year you were born (e.g. 1963)

8 What country were you born in?

- New Zealand ➤ **Go to 10**
- Australia
- England
- Scotland
- The Netherlands
- Western Samoa
- Cook Islands
- Fiji
- other ➤ Print the present name of the country

---

9 If you live in New Zealand, answer this question. When did you first arrive to live in New Zealand?

month (if known)   year

10 Tick as many circles as you need to show which ethnic group(s) you belong to.
- NZ Maori
- NZ European or Pakeha
- other European ➤ Which of these groups?
- Samoan
- Cook Island Maori
- Tongan
- Niuean
- Chinese
- Indian
- other (such as FIJIAN, KOREAN)

Which of these groups?
- English
- Dutch
- Australian
- Scottish
- Irish
- other ➤ Print your ethnic group(s)

11 Tick as many circles as you need to answer this question. Are you:
- living in New Zealand
- working in New Zealand ➤ **Go to 12**
- NOT living in NZ and NOT working in NZ ➤ **Go to 54 at the end**

12 Tick as many circles as you need to answer this question.
In which language(s) could you have a conversation about a lot of everyday things?

- English
- Maori
- Samoan
- NZ Sign Language
- other language(s) → Name the (such as GUJARATI, language(s) ▼ CANTONESE, GREEK)

[   ]

- none (for example, too young to talk)

13 Are you descended from a NZ Maori (that is, did you have a NZ Maori birth parent, grandparent, or great-grandparent, etc.)?

- yes → **Go to 14**
- no
- don't know ⟩ **Go to 15**

14 Do you know the name(s) of your iwi (tribe or tribes)?

- yes ——→ Print the • name and • region of your iwi
- no

Iwi (tribe)	Region

15 What is your religion?

- no religion
- Christian ——→ Which of these, if any, are you?
- Hindu | Anglican
- Muslim | Presbyterian
- Buddhist | Catholic
- Jewish | Methodist
- other religion | other
  ▼ Print what it is ▼

[   ]

OR object to answering this question

■ ● ●

16 Which of these people live in the same household as you?

- your legal husband or wife → **Go to 19**
- your partner or de facto, girlfriend or boyfriend
- none of these

17 Have you ever been legally married?

- yes
- no → **Go to 20**
  ↓

18 Which one of these are you? If you have been married more than once, answer for your most recent marriage.

- widowed → **Go to 20**
- divorced or marriage dissolved → **Go to 20**
- permanently separated from your legal husband or wife → **Go to 20**
- not separated but living in a different household from your husband or wife

19 Is this your first legal marriage?

- yes
- no

20 Which of these people live in the same household as you?

- your mother
- your father
- neither of these

21 Which of these people live in the same household as you?

- your son(s)
- your daughter(s)
- none of these

22 Which of these people live in the same household as you?

- your sister(s)
- your brother(s)
- none of these

23 Apart from the people already asked about, does anyone else live in the same household as you?

- yes ——→ Print who they ALL are, for example:
- no

MY FLATMATES,
MY AUNTY &
MY COUSINS,
MY SON-IN-LAW,
MY MOTHER'S
PARTNER

[   ]

24 Tick as many circles as you need to answer this question. ■

Does a health problem, or a condition, you have (lasting 6 months or more) cause you difficulty with, or stop you doing:

- everyday activities that people your age can usually do
- communicating, mixing with others or socialising
- any other activity that people your age can usually do

OR

- no difficulty with any of these

25 Do you have any disability or handicap that is long-term (lasting 6 months or more)?

- yes
- no

26 Which of these age-groups are you in?

- under 15 years old → **Go to 54 at the end of the form**
- 15 years or older
  ↓

27 Do you smoke cigarettes regularly (that is, one or more per day)?
COUNT ONLY tobacco cigarettes
DON'T COUNT pipes, cigars or cigarillos

- yes → **Go to 29**
- no
  ↓

28 Have you ever been a regular smoker of one or more cigarettes per day?

- yes
- no

29 If you are female, answer this question.
(If you are male, go to 30.)
How many babies have you given birth to?
COUNT ONLY any who were born alive

- none

OR

[   ] number born alive

OR

- object to answering this question

30 Tick as many circles as you need to answer this question.
In the 7 days that ended on Sunday 3 March, did you:

- attend or study for a **full-time** course at school or anywhere else
- attend or study for a **part-time** course at school or anywhere else

OR

- neither of these things ■

31 Do you have a **secondary school** qualification?

◯ yes

◯ no → **Go to 33**

32 What is your highest **secondary school** qualification?

◯ NZ School Certificate in one or more subjects

◯ NZ Sixth Form Certificate in one or more subjects

◯ NZ University Entrance before 1986 in one or more subjects

◯ NZ Higher School Certificate or Higher Leaving Certificate

◯ NZ University Bursary or Entrance, or Scholarship

◯ other NZ **secondary school** qualification → Print the qualification

◯ overseas **secondary school** qualification
Print the qualification, and the country where you got it ▼ ▼

33 Do you have any other qualification, such as a trade certificate, a diploma or a degree, that you had to pass a course lasting at least 3 months full-time (or the equivalent) to get?

DON'T COUNT
• secondary school qualifications
• part of an unfinished qualification (e.g. credits towards a degree)

◯ yes

◯ no → **Go to 35**

34 Give details for each of those qualifications. If you have more than 2, give the 2 highest.

Name of qualification

Main subject(s) if any

Name of institution and country

Year you received it (had it conferred)   **1 9**

Name of qualification

Main subject(s) if any

Name of institution and country

Year you received it (had it conferred)   **1 9**

■   ■   ■

35 Tick as many circles as you need to show ALL the ways you **yourself** got income in **the 12 months ending today.**

DON'T COUNT loans, because they are not income

◯ wages, salary, commissions, bonuses, etc., paid by employer

◯ self-employment, or business you own and work in

◯ interest, dividends, rent, other investments

◯ ACC regular payments

◯ New Zealand Superannuation (National Super)

◯ superannuation, pensions, annuities (**other than** NZ Super or Veterans Pension)

◯ Unemployment Benefit

◯ Domestic Purposes Benefit

◯ Sickness Benefit

◯ Invalids Benefit

◯ Student Allowance

◯ other government benefits, government income support payments, or war pensions

◯ other sources of income. **COUNTING** support payments from people who do not live in your household

OR

◯ no source of income during that time

36 From ALL the sources of income you ticked in question 35, what will the TOTAL income be
• that you _yourself_ got
• _before_ tax or anything else was taken out of it
• in the 12 months that will end on 31 March 1996?

◯ loss

◯ zero income

◯ $1 – $5,000

◯ $5,001 – $10,000

◯ $10,001 – $15,000

◯ $15,001 – $20,000

◯ $20,001 – $25,000

◯ $25,001 – $30,000

◯ $30,001 – $40,000

◯ $40,001 – $50,000

◯ $50,001 – $70,000

◯ $70,001 – $100,000

◯ $100,001 or more

37 Tick as many circles as you need to answer this question.   ■
In the 7 days that ended on Sunday 3 March, which of the following did you do **for yourself, or for people living in the same household as you?**
DON'T COUNT any you did for pay

◯ household work, cooking, repairs, gardening, etc., for yourself or your household

◯ caring for or looking after any child, including your own, who lives in the same household as you

◯ caring for or looking after a person living in the same household as you, who is aged, ill or has a disability

OR ◯ none of these things

38 Tick as many circles as you need to answer this question.
In the last 4 weeks, which of the following have you done, without pay, for people **who do NOT live in the same household as you?**
DON'T COUNT any you did for pay

◯ looking after a child **who does NOT live in the same household as you**, unpaid

◯ unpaid household work, cooking, repairs, gardening, or looking after a person who is aged, ill or has a disability (**DON'T COUNT** work for your own household or people living there)

◯ unpaid training, coaching, teaching, giving advice or counselling, helping at school, etc.

◯ attending committee meeting, or organisation, administration, policy work, etc., unpaid, for group, church or marae

◯ unpaid fund-raising work, selling, etc., for group, church or marae

◯ other unpaid work
• for people who do NOT live in the same household as you, or
• for a group, church or marae
Print the type(s) of work you did, for example:
MOWING NEIGHBOUR'S CAR
DELIVERING MEALS ON WHEELS

OR ◯ none of this sort of work

39 If you have done any of the things asked about **in question 38**, answer this question.
In the last 4 weeks how many hours did you spend in total, doing all those things asked about in question 38?

◯ 1 – 4

◯ 5 – 14

◯ 15 – 29   Go to the back page →

◯ 30 – 59

◯ 60 or more   ■

40 Tick as many circles as you need to answer this question.

In the 7 days that ended on Sunday 3 March, which of these did you do?

- you worked for pay, profit or income for an hour or more ➤ **Go to 41**
- you worked in a family business or family farm without pay ➤ **Go to 41**
- you work in a job, business or farm, but you were absent for some reason last week ➤ **Go to 41**

OR

- none of these ➤ **Go to 51**

41 In those 7 days, did you have one job or more than one job?

COUNT ONLY
- any job(s) for pay, profit or income
- any job(s) in a family business or family farm, without pay

- one job ➤ **Go to 42**
- more than one ➤ **Answer 42 – 47 about the ONE you usually work most hours in**

42 In that job which ONE of these were you?

- a paid employee
- self-employed and not employing any other person(s)
- an employer of other person(s) in your own business
- working in a family business or family farm without pay

43 In that job, what was your occupation, for example: SHOE SHOP MANAGER, SHEEP FARMER, BUILDER'S LABOURER, PRIMARY SCHOOL TEACHER?

44 In that job, what tasks or duties did you spend the most time on, for example: RUNNING MOTEL, SERVICING AND REPAIRING CARS, ANSWERING PHONES AND TYPING?

45 Give the full name of the business or employer that you worked for in that job.

46 What is the main activity of that business or employer, for example: SHEEP FARMING, SELLING SHOES, MAKING CLOTHES?

47 In that job, did you mostly:

- work at home

OR

- work away from home ➤

  Give the full address of the place you mostly worked at. Include, if possible, all of these:
  - name of building
  - street number & street name, or name of shopping centre
  - suburb or rural locality
  - city, town or district

48 How many hours, to the nearest hour, do you **usually** work each week:

- in the job you gave details about in questions 42 – 47?
- in all OTHER jobs you counted in question 41?

49 On Tuesday 5 March, what was the ONE main way you travelled TO your work – that is, the one you used for the greatest distance.

- worked at home
- did not go to work on Tuesday, 5 March 1996
- public bus
- train
- drove a private car, truck or van
- drove a company car, truck or van
- passenger in a car, truck, van or company bus
- motor bike or power cycle
- bicycle
- walked or jogged
- other (such as taxi, ferry, aeroplane) ➤ Print the main way you travelled

50 If you have answered questions about your job, go to 54.

Otherwise, go to 51.

51 Did you look for paid work in the last 4 weeks?

- yes
- no ➤ **Go to 53**

52 Tick as many circles as you need to show all the ways you looked for paid work **in the last 4 weeks**.

- looked at job advertisements in the newspapers
- wrote, phoned or applied in person to an employer
- contacted the Department of Labour's NZ Employment Service to look for a job
- contacted friends or relatives for help in finding a job
- contacted career advisers or vocational guidance officers
- other method(s), for instance:
  - contacted other employment agency
  - placed an ad about a job
  - took steps to set up own business

53 If a paid job had been available, would you have started last week?

- yes
- no

54 Please sign this declaration. If the person whose details are on this form is unable to sign, then the person who filled in the form should sign.

I declare that the information I have given is true and complete as far as I know.

X

Please check that you have answered all the questions you should have answered.

Thank you for your time and effort.

CONFIDENTIAL

CENTRAL STATISTICAL SERVICE

CENSUS '96

SPECIMEN

It is census time and the Central Statistical Service (CSS) needs information about you and your household.
Please give particulars of each person who was present in this household AT NIGHT BETWEEN Wednesday 8 May and Thursday 9 May 1996.

The questionnaire contains columns for information on nine people. The details of ONLY ONE PERSON should be recorded in a particular column. If there are more than nine (9) people, please make use of additional questionnaires. People who are absent overnight (e.g. people working, travelling, at a church vigil, at an entertainment) should be included in the household if they return to it on Thursday 9 May, without having counted elsewhere. South African and foreign visitors and boarders who were in the household on Census night, should all be counted as part of the household. Additional information regarding the completion of the questionnaire is contained in the accompanying information sheet.

Domestic workers and live-in employees are regarded as separate households. They should therefore complete separate questionnaires.

SHOULD YOU ENCOUNTER ANY DIFFICULTIES IN THE COMPLETION OF THE QUESTIONNAIRE, PLEASE CONTACT _____ AT _____
OR PHONE THE CENSUS HOTLINE, TOLL FREE, ON 0800 11 07 54

IN COMPLETING THE QUESTIONNAIRE, CIRCLE ○ APPROPRIATE NUMBER IN THE COLUMNS

Physical address of the dwelling: _____

Suburb/village settlement: _____

City/town/farm/place name/reserve: _____

Magisterial district (name): _____

FOR ENUMERATOR USE ONLY	
Enumerator's name	How many questionnaires were completed for this household?
Return No	If more than one questionnaire, what was the number of this questionnaire? (e.g. first, second, third)
Magisterial district No	This questionnaire was completed by: The enumerator □ A household member □
Enumerator area No	Number of persons in household
Voting point No	Males
Household No	Females
	Total number of persons

242

SECTION A.

Question		
10. Is (the person) a migrant worker? (Someone who is absent from home FOR MORE THAN A MONTH each year to work or to seek work.)	1 = Yes 2 = No	1 2	1 2
11.1 Is this DWELLING (e.g. house, room, shack, flat) the place where (the person) usually lives, i.e. where (the person) spends at least four nights per week?	1 = Yes 2 = No	1 2	1 2
11.2 (If "No") Where does (this person) usually live?	Name of suburb/village/settlement: Name of city/town/farm/tribal authority: Name of magisterial district: If not South Africa, please state name of country: If no usual address, circle "3".	3	3
12.1 In which year did (the person) move to the DWELLING (e.g. house, room, shack, flat) where he/she usually lives?	Write in the year that he/she moved 19 ___ OR 1 = The person has never moved. (Lived in the dwelling since birth)	19 ___ 1	19 ___ 1
12.2 (For the person who has moved) From where did (the person) move? (Before moving into the dwelling where he/she usually lives)	Name of suburb/village/settlement: Name of city/town/farm/tribal authority: Name of magisterial district: If not South Africa, please state name of country:		
13. Does (the person) have a serious sight, hearing, physical or mental disability? (If "Yes") Circle all applicable disabilities for the person.	1 = Yes 2 = No 1 = Sight (serious eye defects) 2 = Hearing/speech 3 = Physical disability (e.g. paralysis) 4 = Mental disability	1 2 1 2 3 4	1 2 1 2 3 4
14.1 Is (the person's) own mother still alive?	1 = Yes 2 = No 3 = Don't know	1 2 3	1 2 3
14.2 Is (the person's) own father still alive? (These questions refer to the person's biological parents.)	1 = Yes 2 = No 3 = Don't know	1 2 3	1 2 3

4

QUESTION 15 SHOULD BE ANSWERED FOR ALL FEMALES IN THE HOUSEHOLD BORN BEFORE 9 MAY 1984 (12 YEARS OR OLDER) FOR OTHERS, ENTER N/A (not applicable) IN

15.1 How many children, if any, has the woman ever given birth to? (live births) [Please include her children who are not living with her and those who have died.]

If "none", enter "0" and GO TO Q 16.1
If "Don't Know", enter "DK" and GO TO Q 16.1

15.2 How many of her children are still living? (live births)

Number

15.3 When was her FIRST child born? (live birth)

Month (MM) Year (YY)

MM		YY		MM		YY	

15.4 (For those mothers born after 9 May 1946 - less than 50 years of age): How many children (live births) if any, has she given birth to IN THE LAST 12 MONTHS? (since 10 May 1995)

Number

QUESTIONS 16 - 20 SHOULD BE ANSWERED FOR EACH PERSON IN THE HOUSEHOLD, WHETHER CHILD OR ADULT, BORN BEFORE 9 MAY 1991 (5 YEARS OR OLDER)

16.1 What is the highest school class/standard that (the person) has COMPLETED?

If no schooling, or currently in Sub A/Grd 1 write "none".

1 = Yes
2 = No

16.2 Does (the person) have a technical or artisan certificate, a diploma or degree, completed at an educational institution? (e.g. teacher's diploma, BA degree or NTC III) (If "Yes") What is the highest qualification he/she has?

If Yes: Specify qualification e.g. BA, HED, NTCIII

1 = Yes
2 = No

16.3 Does (the person) presently attend school, college, technikon or university? (This includes study by correspondence but excludes creche and pre-school)

1 = Yes, full-time
2 = Yes, part-time
3 = No

1
2
3

1
2
3

17. Does (the person) work? (for pay, profit or family gain) Answer yes for formal work for a salary or wage. Also answer yes for informal work such as making things for sale or selling things or rendering a service. Also answer yes for work on a farm or the land, whether for a wage or as part of the household's farming activities. Otherwise answer no.

1 = Yes. GO TO QUESTION 19.1

2 = No. GO TO QUESTION 18.1

1 — GO TO Q 19.1

2 — GO TO Q 18.1

18.1 (For the person who is not working): Is (the person) one of the following:

1 = Unemployed and looking for work? GO TO Q 18.2
2 = Unemployed, not looking for work, but would accept work? GO TO Q 18.2
3 = Housewife/home-maker?
4 = Child not yet scholar?
5 = Scholar/full-time student?
6 = Pensioner/retired person?
7 = Disabled person?
8 = Not wishing to work?
9 = None of the above

GO TO QUESTION 20

1
2 } GO TO Q 18.2

3
4
5
6
7
8
9 } GO TO Q 20

1
2 } GO TO Q 18.2

3
4
5
6
7
8
9 } GO TO Q 20

18.2 (For the unemployed person): Focus on the type of work (the person) used to do in his/her last occupation. What would you call this occupation?

For example, plumber, street trader, cattle farmer, primary school teacher, domestic worker. Write "never worked" if no previous employment.

18.3 Describe (the person's) main duty or activity that (he/she) used to do in this occupation in more detail.

For example, installing pipes in new houses, selling fruit and vegetables, breeding cattle, teaching primary school children, cleaning and cooking. NOW GO TO QUESTION 20.

5

QUESTIONS 15.1 TO 15.4

	MM	YY				GO TO Q19.1	GO TO Q18.1	GO TO Q18.2	GO TO Q20

GO TO Q19.1 — 1
GO TO Q18.1 — 2
GO TO Q18.2 — 1, 2
GO TO Q20 — 3 4 5 6 7 8 9

19.1 (For the person who is working). Does (the person) carry out this activity full-time or part-time?

1 = Full-time
2 = Part-time

19.2 How can one best describe (the person's) activities or work status?

1 = Works for him/herself without employing anyone else (self-employed)
2 = Works for him/herself and employs other people (employer)
3 = Works for an organisation or someone else (employee)
4 = Works in family business

19.3 Focus on the occupation of (the person). What would you call this occupation?

For example, plumber, street trader, cattle farmer, primary school teacher, domestic worker.

19.4 Describe (the person's) main duty/activity in more detail.

For example, installing pipes in new houses, selling fruit and vegetables, breeding cattle, teaching primary school children, cleaning and cooking.

19.5 What is the FULL name of the business/company or organisation for whom (the person) is working?

If the person works for him/herself, and the business does not have a name, enter "Self" in appropriate column. If doing PAID domestic work in a private household, enter "Domestic Service".

19.6 Where is this place of work?

Name of suburb/village/settlement

Name of city/town/farm/tribal authority.

Name the magisterial district. If not South Africa, state name of country.

19.7 What does the business do (main economic activity)?

Describe the MAIN INDUSTRY, economic activity, produce or service of the person's employer or company, e.g. gold mining, road construction, supermarket, police service, hairdressing, banking, OR activity of the person, if self-employed e.g. subsistence farming.

20. It is important to establish the spending power of the population, in order to measure and understand the economy. Therefore the census needs information on the income of all people.

Think of the past year (1 May 1995 to 30 April 1996) and the money each person received. Please indicate each person's income category before tax. Answer this question by indicating each person's weekly, monthly or annual income. Include all sources of income, for example housing loan subsidies, bonuses, allowances such as car allowances and investment income. If the person receives a pension or disability grant, please include this amount.

For example, if the person wants to indicate a weekly income and has an income of R270 per week, circle 5 in the appropriate column under his/her name. If the person wants to indicate an annual income and has an income of R55 000 per annum, circle 9 in the column for that person.

Weekly	Monthly	Annual
1 = None	1 = None	1 = None
2 = R1 - R46	2 = R1 - R200	2 = R1 - R2 400
3 = R47 - R115	3 = R201 - R500	3 = R2 401 - R6 000
4 = R116 - R231	4 = R501 - R1 000	4 = R6 001 - R12 000
5 = R232 - R346	5 = R1 001 - R1 500	5 = R12 001 - R18 000
6 = R347 - R577	6 = R1 501 - R2 500	6 = R18 001 - R30 000
7 = R578 - R808	7 = R2 501 - R3 500	7 = R30 001 - R42 000
8 = R809 - R1 039	8 = R3 501 - R4 500	8 = R42 001 - R54 000
9 = R1 040 - R1 386	9 = R4 501 - R6 000	9 = R54 001 - R72 000
10 = R1 387 - R1 848	10 = R6 001 - R8 000	10 = R72 001 - R96 000
11 = R1 849 - R2 540	11 = R8 001 - R11 000	11 = R96 001 - R132 000
12 = R2 541 - R3 695	12 = R11 001 - R16 000	12 = R132 001 - R192 000
13 = R3 696 - R6 928	13 = R16 001 - R30 000	13 = R192 001 - R360 000
14 = R6 929 or more	14 = R30 001 or more	14 = R360 001 or more

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PLEASE ANSWER QUESTIONS RELATED TO THIS HOUSEHOLD

SECTION B:

1.1 Think of any additional money that this household generates, and that has not been included in the previous section. (For example, the sale of home-grown produce or home-brewed beer or cattle or the rental of property. Please indicate this total amount, if anything, during the past year. (1 May 1995 - 30 April 1996). If none enter "0".

R............... for the year

1.2 If this household receives any remittances or payments (for example money sent back home by someone working or living elsewhere or alimony). **Please** indicate the total received during the past year. (1 May 1995 - 30 April 1996). If none enter "0".

R............... for the year

1.3 Are there any persons who are usually members of this household, but who are away for a month or more because they are migrant workers? (A migrant worker is someone who is absent from home for more than a month each year to work or to seek work).

Yes = 1
No = 2

(If "Yes") Indicate the person's particulars

Person	Age in years	Gender	Relationship to the head of household		Where is (the person) living
1		Male = 1 Female = 2	Head of Household = 1 Husband/wife/partner = 2 Son/daughter = 3 Brother/sister = 4 Father/mother = 5	Grandparent = 6 Grandchild = 7 Other relative = 8 Non-related person = 9	Name of suburb/village/settlement: .... Name of city/town/farm/tribal authority: .... Name of magisterial district: .... If not South Africa, state name of country: ....
2		Male = 1 Female = 2	Head of Household = 1 Husband/wife/partner = 2 Son/daughter = 3 Brother/sister = 4 Father/mother = 5	Grandparent = 6 Grandchild = 7 Other relative = 8 Non-related person = 9	Name of suburb/village/settlement: .... Name of city/town/farm/tribal authority: .... Name of magisterial district: .... If not South Africa, state name of country: ....
3		Male = 1 Female = 2	Head of Household = 1 Husband/wife/partner = 2 Son/daughter = 3 Brother/sister = 4 Father/mother = 5	Grandparent = 6 Grandchild = 7 Other relative = 8 Non-related person = 9	Name of suburb/village/settlement: .... Name of city/town/farm/tribal authority: .... Name of magisterial district: .... If not South Africa, state name of country: ....
4		Male = 1 Female = 2	Head of Household = 1 Husband/wife/partner = 2 Son/daughter = 3 Brother/sister = 4 Father/mother = 5	Grandparent = 6 Grandchild = 7 Other relative = 8 Non-related person = 9	Name of suburb/village/settlement: .... Name of city/town/farm/tribal authority: .... Name of magisterial district: .... If not South Africa, state name of country: ....

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Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9

PLEASE ANSWER QUESTIONS RELATED TO THIS HOUSEHOLD

THIS DWELLING IS THE PLACE (HOUSE, FLAT ETC.) IN WHICH THIS HOUSEHOLD SPENT CENSUS NIGHT

1.4 Which type of dwelling does this household occupy? (If the household lives in MORE THAN ONE dwelling, circle the main type of dwelling.)

Dwelling (house or flat) with/as or a separate room or unit	1
Traditional dwelling/structure made of traditional materials	2
Flat in a block of flats	3
Townhouse/semi-detached house (simplex, duplex or triplex)	4
Unit in retirement village	5
Dwelling/house/flat/room in backyard	6
Informal dwelling/shack in backyard	7
Informal dwelling/shack NOT in backyard e.g. in an informal/squatter settlement	8
Room/flatlet	9
Caravan/tent	10
None/homeless	11
Other, specify	

1.5 How many rooms including kitchens are there for this household? (excluding toilet and bathroom) For homeless write "0"

1.6 Is this dwelling owned by a member of this household?   Yes 1   No 2

SERVICES USED BY THIS HOUSEHOLD

E. SERVICES

8.1 What type of energy/fuel does this household MAINLY use for cooking, heating and lighting?
(Circle only ONE code in each COLUMN)

Energy source used in this dwelling	Cooking	Heating	Lighting
Electricity from mains supply	1	1	1
Paraffin	2	2	2
Gas	3	3	3
Wood	4	4	4
Coal	5	5	
Candles			7
Animal dung	8	8	
Other, specify			

8.2 What is this household's main water supply?
(Circle only ONE code)

Piped water in dwelling	1
Piped water inside yard	2
Public tap	3
Water carrier/tanker	4
Borehole/rain-water tank/well	5
Dam/river/stream	6
Other	7

8.3 What type of toilet facility (if any) is available?
(Circle only ONE code)

Flush toilet in dwelling	1
Flush toilet	2
Bucket latrine	3
None of the above	4

8.4 How is the refuse or rubbish of this household disposed of?
(Circle only ONE code)

Removed by local authority at least once a week	1
Removed by local authority less often	2
Communal refuse dump	3
Own refuse dump	4
No rubbish disposal	5
Other, specify	6

8.5 Where do members of this household mainly use a telephone?
(Circle only ONE code)

In the dwelling and/or cellphone	1
At a neighbour nearby	2
At a public telephone nearby	3
At another location nearby, e.g. work	4
At another location, not nearby	5
No access to a telephone	6

THANK YOU FOR YOUR CO-OPERATION

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REPUBLICA ORIENTAL DEL URUGUAY
INSTITUTO NACIONAL DE ESTADISTICA

VII CENSO GENERAL de POBLACION, III de HOGARES y V de VIVIENDAS

CUESTIONARIO CENSAL

2686790

IDENTIFICACION GEOGRAFICA

Traspase a estos espacios los datos de Identificación Geográfica que figuran en la carpeta.

Departamento Segmento Empadronador
Sección Zona Borde

DIRECCION DE LA VIVIENDA

URBANA
Calle
Nº
Block Torre Apartamento

RURAL
Nombre

TIPO DE VIVIENDA Y OCUPACION

DATOS DE LA VIVIENDA PARTICULAR OCUPADA CON MORADORES PRESENTES

VIVIENDA PARTICULAR

VIVIENDA COLECTIVA

HOGARES EN LA VIVIENDA PARTICULAR OCUPADA CON MORADORES PRESENTES

2

E - DATOS DEL HOGAR PARTICULAR

SERVICIO HIGIÉNICO

CALEFACCIÓN

HABITACIONES PARA DORMIR

SERVICIO DE COCINA

CONFORT Y EQUIPAMIENTO DEL HOGAR

TENENCIA

F - PERSONAS QUE COMPONEN EL HOGAR

NO OLVIDE A LOS BEBES Y ANCIANOS

SI EL HOGAR TIENE MÁS DE 6 PERSONAS CONTINÚE ESTA LISTA EN CUESTIONARIOS ADICIONALES

Persona N°	Nombre y apellido	Relación de parentesco

TOTAL DE PERSONAS

HOMBRES

MUJERES

EMPADRONADOR:

0 - PERSONAS EN EL HOGAR

3 2686790

PARA TODAS LAS PERSONAS

PARA TODAS LAS PERSONAS DE 3 AÑOS O MÁS DE EDAD

PARA TODAS LAS PERSONAS DE 12 AÑOS O MÁS DE EDAD

PARA TODAS LAS MUJERES DE 15 O MÁS AÑOS DE EDAD

G - PERSONAS EN EL HOGAR

NOMBRE:

PARA TODAS LAS PERSONAS

PARA TODAS LAS PERSONAS DE 3 AÑOS O MÁS DE EDAD

PARA TODAS LAS PERSONAS DE 12 AÑOS O MÁS DE EDAD

PARA TODAS LAS MUJERES DE 12 O MÁS AÑOS DE EDAD

RELLENE COMPLETAMENTE EL CUADRO
DE LA OPCIÓN CORRECTA CON TRAZO FIRME Y OSCURO.

MARQUE ASÍ

NO MARQUE ASÍ

A B — ESCRIBA CON LETRA DE IMPRENTA MAYÚSCULA, SIN SALIRSE DE LOS CUADROS. NO PONGA TILDES.

G - PERSONAS EN EL HOGAR

PARA TODAS LAS PERSONAS

PARA TODAS LAS PERSONAS DE 3 AÑOS O MÁS DE EDAD

PARA TODAS LAS PERSONAS DE 12 AÑOS O MÁS DE EDAD

PARA TODAS LAS MUJERES DE 12 O MÁS AÑOS DE EDAD

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G : PERSONAS EN EL HOGAR

6 2686790

PARA TODAS LAS PERSONAS

PARA TODAS LAS PERSONAS DE 3 AÑOS O MÁS DE EDAD

PARA TODAS LAS PERSONAS DE 12 AÑOS O MAS DE EDAD

PARA TODAS LAS MUJERES DE 15 O MAS AÑOS DE EDAD

1 9

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A B C D E F G H I J K L M N Ñ O P Q R S T U V W X Y Z

G - PERSONAS EN EL HOGAR

PARA TODAS LAS PERSONAS

PARA TODAS LAS PERSONAS DE 5 AÑOS O MÁS DE EDAD

PARA TODAS LAS PERSONAS DE 12 AÑOS O MÁS DE EDAD

PARA TODAS LAS MUJERES DE 15 O MÁS AÑOS DE EDAD

G - PERSONAS EN EL HOGAR

NÚMERO:

2686790

PERSONA Nº

PARA TODAS LAS PERSONAS

PARA TODAS LAS PERSONAS DE 3 AÑOS O MÁS DE EDAD

PARA TODAS LAS PERSONAS DE 12 AÑOS O MÁS DE EDAD

PARA TODAS LAS MUJERES DE 15 O MÁS AÑOS DE EDAD

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