

Changes in Census Planning and Management

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This paper reports the results of research and analysis undertaken by U.S. Census Bureau staff. It has undergone a Census Bureau review more limited in scope than that given to official U.S. Census Bureau publications. This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress.

U S C E N S U S B U R E A U

Helping You Make Informed Decisions

Abstract

Statistical offices worldwide face a common problem: the need to produce more detailed, high-quality, and timely statistics with limited resources.

Population and housing censuses are the backbone of national statistical systems. They provide essential data for planning, allocating resources, and basic demographic information at subnational levels. Censuses are also essential for developing sampling frames for an integrated intercensal survey program.

Population and housing censuses are expensive and time-consuming operations for which financial support is becoming increasingly difficult to find. They are often the primary focus for a limited duration every 10 years. This periodic incorporation of such a massive operation into a national statistical system is a strain on resources and impacts other statistical programs.

There are an increasing number of methodological and technological options for censuses. Many statistical offices are exploring and adopting new ways to meet their users' demands. This environment of experimentation and rapidly changing technology calls for a shift to census management strategies that emphasize early planning, testing, and continuous evaluation of census operations to reduce the periodic census burden and improve quality.

TRADITIONAL CENSUS MANAGEMENT CYCLE

The goal of any census is to produce timely, accurate data to meet users' needs. Traditionally, censuses are labor-intensive operations with a large number of temporary field and data processing staff. Census data are primarily gathered through personal interviews, may be tallied manually, and then transformed into electronic records. Management of a traditional census means focusing on controlling the operations during different census phases to ensure consistency of operations and, ultimately, the quality of census results.

The International Programs Center has worked with many countries since 1947 and has observed that in a traditional census environment, census planning begins approximately 3-5 years before the census. Statistical office staff assigned to work on the census reviews the materials and plans from the previous census. User group and advisory board meetings are held to gather information on current data needs, which potentially lead to changes. This requires new staff to quickly glean information from previous census records and evaluate new methodological and technological options.

Often there is only time and resources for one main test, a pilot census, which is conducted about 1 year before the census. Any necessary changes that are made need to be incorporated quickly between the pilot census and the actual enumeration. This limited testing time makes it difficult to predict potential problems that may occur during the actual census.

After the census, an evaluation of the content and coverage is usually conducted and documented. Ideally, the census staff store the manuals, forms, and publications in a library before returning to other work. Available census documents are then retrieved and reviewed in detail when preparations begin for the next census cycle. Many times experienced census staff have left the statistical office or are not available to fully participate in the next census cycle. This means that there is a loss of valuable information that can only be gained from human experience.

Well-functioning cyclical census programs using this type of management model often incorporate Edward Deming's principles of Total Quality Management (TQM). The census operation is treated as a new production process, striving to incorporate new practices to increase the efficiency and quality of operations. When the major production is over, the process undergoes a quality evaluation of the products produced. During the next census round the entire process is repeated if there is no continuity between census cycles.

This type of discreet census management system may work fine if census methodologies and processes remain fairly constant. However, statistical offices are constantly under pressure to produce more data, faster, with currently available—usually limited—resources. In order to meet these needs, statistical offices are increasingly turning to technological advances to expedite data collection and data processing operations. They are also exploring methodological changes to produce more data in a timely manner.

INCREASED CENSUS OPTIONS

In today's environment there are many options available to statistical offices when planning a census. There are new methodologies such as self-administered questionnaires, the investigation of detailed topics on a sample basis during a census, a rolling census, or a census of administrative records. New technological advances in data collection include computer-assisted interviews with either a laptop or handheld computer or questionnaires delivered via phone or Internet. Advances in data processing include scanning and automated or computer-assisted coding. For a statistical agency under constant pressure to produce accurate data, faster, and with limited resources, these are attractive opportunities. However, along with the relative advantages of speed and accuracy, adoption of new methodologies and technologies exposes data collection and processing systems to new problems and different sources and types of error.

Adopting new technology for a census operation requires careful research and planning. A greater reliance on technology means that methodological changes must be made early in the process since thorough testing of all changes is required to assess the effect on data quality. During the 2000 round of censuses, many countries adopted scanning as a new data capture method. For many of these countries, the census is an infrequent operation with limited advanced resources for planning and testing. This limited testing in some contexts resulted in increased costs and time for data capture since many problems were not identified prior to the capture of census data. If problems are discovered relatively late in the planning stage, there is a danger that the necessary corrections may delay census activities, even census results.

In choosing to adopt new technology, census management staff must gain a basic understanding of the technology in order to make informed planning decisions. They should review past uses of specific technology; research the various options available; and investigate the availability of necessary materials, development, and technical support resources in country. After a tentative decision is made, a series of rigorous tests under real conditions should be conducted to identify the problems, advantages, and disadvantages. A cost-benefit analysis should be conducted to choose the most appropriate technology for the country at that time. The best advances are the ones that provide proven solutions to identified problems.

In terms of management, technology-dependent processes are fundamentally different from manual processes. Statistical agencies have a long history of using temporary staff for census processes and have established methods for training and controlling the work of census staff. Technological processes require an understanding of the technology, even if it will be outsourced. Companies that are familiar with specific technologies are not necessarily familiar with statistical applications. Detailed discussions must be held to ensure that census objectives and standards are met. Predetermined controls must be designed to provide adequate and timely information to allow intervention should a problem be discovered during the census process. This means that outsourcing does not alleviate the burden on statistical agencies, but rather creates different types of burdens in terms of communication, testing, coordination, monitoring, and evaluation.

If a statistical agency will implement new technology without outsourcing, it must have knowledgeable staff familiar with both the technology used and statistical operations. This may involve staff recruitment or hiring of contractors with an accompanying training period to become familiar with statistical operations and standards. Government agencies often have trouble luring information technology specialists from private industries. Adequate time should be available to recruit the necessary specialists, implement an introductory training program, and provide some hands-on work experience, prior to the census.

CHANGES IN CENSUS MANAGEMENT

With the adoption of new methods and technology, the management focus is no longer discreet *process control* of operations as they occur. There is now an increased emphasis on planning, modeling, testing, and refining new systems before data collection ever takes place. This need for more technical planning and evaluation can strain already stretched resources if it must be completed according to the traditional, periodic census management cycle.

Statistical offices adopting new methods should move toward *continuous census management*. This means that the testing, evaluation, and planning for a census are conducted continuously instead of completely shutting down and starting up every 10 years. This does not mean that a large staff would be required all the time but that a core of census specialists would be developed with experience in each phase of census operations. This core census staff would have more time to research options, conduct tests, modify procedures, and document operational reviews.

This type of continuous improvement management model is also based on Deming's principles of TQM. There are many names for this type of continuous management philosophy. It is called the Capability Maturity Model when used in managing software development. The U.S. Army uses Continuous Change Management to manage services and operations, and Continuous Risk Management is used in environmental monitoring systems. The basic idea is that management in a changing environment of new opportunities and risks must be a continual process of research, testing, monitoring, evaluation, and assessment. Otherwise, an organization will be unable to respond to new problems and risks introduced by change without endangering the objectives of the organization.

Potential census improvements include better-quality data, more efficient use of resources, and a reduction in data production time. This would be accomplished with better predictive models of potential problems, tested solutions, and less time and money spent responding to emergencies and correcting problems during the actual census. The ongoing census research and evaluation work will also benefit the intercensal survey program through the sharing of proven solutions to specific problems.

THE IMPORTANCE OF TESTING

All aspects of census operations should be tested prior to the event. The main goal of testing is to prevent problems during the actual census. Any investment made in prevention yields high returns in terms of improved quality and avoidance of costly corrections after a problem has already occurred. In preparation for a census, statistical offices should plan a series of specific tests in order to isolate and focus on different aspects of the census. This is especially true when adopting new methods. Focused pretests can be done on almost any part of the census. For example, tests dealing with things such as mapping, content, item non-response, and response categories should be handled very early in the census process to inform field operations, questionnaire design, and tabulation plans.

A complete test of the entire census process should be performed at least 1 year prior to the actual census. This complete census test is called a pilot census or a dress rehearsal. All decisions on content, field operations, and data processing should be finalized at the time of the pilot census. Ideally there should be only minor changes between the pilot census and the actual census. The only changes that should occur after the pilot census are corrections to problems noted during the pilot census. Any changes made should be tested on a small scale to ensure that they resolve the previously identified problem. If new decisions are made after the pilot census has been conducted, it will not be possible to assess the impact on all census operations, potentially jeopardizing the timely production of quality data to meet user's needs.

In a letter to the Secretary of Commerce on the operational plan for Census 2000, the U.S. Census Bureau Director referred to the "12-year process of designing and engineering the census." During the dress rehearsal that the U.S. Census Bureau conducts 2 years prior to the census, studies are included for the next census cycle. Since 1950, planning for the next census has started with research conducted during the current census. The census research is continued and refined through periodic tests conducted during the intercensal cycle, culminating in a dress rehearsal. This continuous census cycle has enabled the U.S. Census Bureau to investigate and evaluate new methods thoroughly prior to implementation, reducing the risk of change. The U.S. Census Bureau began developing and testing the American Community Survey (ACS), which will replace the 2010 long form, well before Census 2000 was conducted.

Another aspect of census pretesting is the development and use of control systems. Census plans are not set in stone. They are constantly changing in response to new information, while striving to stay within the predetermined limits of time and budget. A good census plan is detailed, efficient in resources, and continually forecasting expected conditions. Timely reports from control systems are critical to good planning. Testing allows statistical agencies to refine their control systems to ensure that they are not burdensome, provide needed information in a timely manner, and allow statistical agencies to properly manage census operations.

THE IMPORTANCE OF OPERATIONAL EVALUATIONS

Traditionally, when a census is completed the census staff return to their respective divisions and move on to other projects. Those staff that have worked on the census are wiser and the work in their respective divisions presumably benefits from their experience. However, this also means that there is little time for the census staff to conduct a thorough evaluation and provide detailed documentation of the census experience for the benefit of the entire statistical agency, in particular, to improve the next census.

The experience gained from conducting a census is extremely diverse and detailed. Only census staff directly involved in the different phases can accurately document the operations, problems encountered, and lessons learned. This includes not only information and feedback from managerial staff but also information from the staff directly involved in conducting the work during each phase of the census. Their detailed recommendations for the next census should be captured while the experience is still fresh in their mind. This information can be captured by a variety of methods but requires advanced planning and preparation so that it can be carried out during and immediately after an operation.

Census operations should be analyzed in relation to past census performance, cost-benefit analysis, ability to meet predetermined objectives, and ultimately the timeliness and quality of the data. This information can be used to draft plans, identify areas for further research, and develop procedures for the next census.

The importance of documentation and evaluation is widely recognized, though at times it is sacrificed for expediency and lack of funds. Once census staff have completed their respective evaluations and recommendations, it is time to begin planning the next census. If census operational evaluations are filed away, only to be acted upon by potentially different staff in preparation for the next census round, there is a likely loss of momentum and human experience that is critical to the development of robust census plans. Continuous census management makes optimal use of census operational evaluations by immediately acting upon operational evaluations and utilizing experienced census staff.

CONCLUSION

Continuous census management helps statistical offices adopt new methods to produce more detailed, high-quality, and timely statistics with limited resources. The creation of a permanent census core staff provides more time to explore various census options, make informed decisions on the best method to use, and improves the efficiency of census operations with thorough testing of new methods.

Permanent census staff have more time for staged testing of specific aspects prior to the pilot census, which is used to evaluate the impact of different aspects on the entire census process. Increased testing improves the statistical office's ability to predict and respond to changes in census processes prior to the actual census. This decreases the need to correct errors during the census, after they have already occurred, which can be costly in terms of time, money and quality.

Permanent census staff have more time to conduct and document operational evaluations. They can immediately act upon the census evaluations in the identification of areas for further investigation, revision of systems, and drafting of plans for the next census round. Continuous census management also improves statistical operations overall through the refinement of new systems that can be adapted to other censuses and surveys.

Population and housing censuses are necessary for the small area basic demographic data they produce that is used for the allocation of resources and planning. They ensure the continued accuracy of the intercensal survey program with an updated sampling frame. Censuses are large, complex, expensive operations that are only conducted periodically. Continuous census management ensures that the most efficient, appropriate methods are used during census processes to expedite data collection and processing without compromising data quality.