MITRE

Census: Planning Ahead for 2020

Written Testimony

Dr. Jason Providakes

July 18, 2012

Census: Planning Ahead for 2020

Dr. Jason Providakes
Senior Vice President, The MITRE Corporation and
General Manager, the Center for Connected Government

United States Senate Committee on Homeland Security and Governmental Affairs
Subcommittee on Federal Financial Management, Government Information, Federal Services
and International Security
July 18, 2012

Chairman Carper, Ranking Member Brown, and distinguished members of the Subcommittee, thank you for the invitation to discuss the effort to produce more complete and cost-effective enumeration by the Census Bureau in 2020.

MITRE is a long-standing partner for systems engineering and enterprise modernization with the Department of Defense and many civilian agencies and departments within the U.S. Government, including the Departments of Homeland Security and Veterans Affairs, the Centers for Medicare & Medicaid Services, the Internal Revenue Service, and the Federal Aviation Administration.

MITRE is a not-for-profit company and our sole activity is the operation of federally funded research and development centers, known as FFRDCs, which we operate for the benefit of federal government sponsors. Our expertise is scientific research and analysis, development and acquisition, and systems engineering and integration. The government establishes FFRDCs for the purpose of addressing long-term complex problems. Our operating model is unique and intentional, designed to preserve our ability to serve in the public interest with objectivity, independence, and freedom from commercial interests.

I'm sharing insights with you today from my perspective as a system engineer and technologist, derived from my experience in large and complex systems programs and as a contributor to several scientific advisory boards in the national interest. It is also our privilege at MITRE to serve with talented engineers and other professionals who supported the Census Bureau in its efforts to prepare and conduct the 2010 census, and we continue to work with Census today as they prepare for 2020. Our role in helping to mitigate large risks that developed during the 2010 program informs my comments today.

Because the decennial census is such an enormous undertaking in terms of both volume and complexity, the Census Bureau invests in technology in an effort to achieve efficiencies and increase accuracy. Today, the single most important management question for the Census Bureau —and indeed all government departments and agencies—is how to effectively and affordably capture value from technology innovation.

It is important to recognize that technology is never a complete solution. Technology "way points" are transient, fast-moving, and risky. Investments must be accompanied by changes in the roles of people and the work processes they implement. Operating models and governance structures must be designed to support flexibility in order to take advantage of emergent technologies.

So how can the Census Bureau navigate this rapidly changing ecosystem? By starting with a vision—a guidepost—for what is possible in 2020, in 2030, and beyond. This vision must anticipate change but be anchored on principles of affordability, continuous improvement for quality and on-going integration of thoroughly tested advances in technology.

A Future Census

In this vision, the Census Bureau avoids the need for a massive end-of-decade mobilization of people and fiscal resources by using technology effectively, eliminating paper, maintaining high-quality and current geographic resources, maximizing the use of administrative records and maintaining the trust of the people by ensuring security and privacy of the collected data. It includes:

- Paperless operation, enabled by technology, using devices and applications to streamline navigation, address operations, field-based enumeration, and administrative tasks. Without the physical storage space and logistics required for massive amounts of paper, the census infrastructure can be radically reduced and re-envisioned.
- Shared use of administrative data will enable routine, real time corrections of missing addresses and additions of new residential developments, which makes field operations deployment more efficient.
- Cloud computing, digital ubiquity and wireless communications which transmit and receive data from cloud systems will lower infrastructure costs and increase efficiency for all aspects of enumeration. U.S. residents will be able to use text, voice or mobile apps to securely and conveniently respond to the census questionnaire, and field operations may be liberated from the capacity limitations of person-to-person outreach.
- Security and privacy is assured at all levels within the system through the application of best security practices and protecting the data throughout its lifecycle.
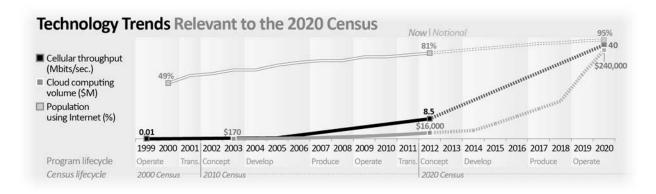
Drivers and Enablers

Technology Trends

The good news is that there is, today, no existing or predicted shortage of hardware, middleware and software to enable more efficient and accurate census-taking. We are in the midst of geometric growth of technologies and usage.

However, there are challenges. Technology selection and implementation are an order of magnitude more complex than they were in the previous planning and R&D cycle. The market cycle time for design to widespread adaption of emergent, transformational capabilities with technology has compressed, in our view, from five years to less than two.

A snapshot of today's capabilities would show a wide range of technologies that did not exist or were not mature in planning for the 2010 census, such as mobility platforms, wireless coverage, use and capacity, cloud computing, internet availability and use, biometrics, autonomous systems, global positioning and remote sensing. By 2020, we at MITRE join many others in predicting that these technologies will feel as antiquated as a rotary dial phone…replaced by commercial availability of quantum computing, advanced robotics, ubiquitous digital devices in clothing and automobiles, artificial intelligence and massive predictive analytics, among others.

Technology Trends Relevant to the 2020 Census

Technology trends that are relevant to the 2020 census include:

- Today, approximately 75 percent of US square miles are covered by one or more wireless services, and 98 percent of the population has access to wireless broadband services.[1]

- The percentage of U.S. population using the Internet has grown from 44 percent in 2000 to 77 percent in 2010 and will likely reach 95 percent by 2020.[2]

- The speed, capacity and coverage of digital networks increased by an order of magnitude in the past decade, to over 12 megabits per second.

- Forrester Research projects the global market for "cloud computing"—services delivered over the Internet—is going to increase from $41 billion in 2011 to $241 billion in 2020.[3]

- Today, citizens regularly use online services for banking, purchase transactions, bill paying, and other secure data exchanges. At the state level: 98 percent offer online tax filing; 92 percent offer online renewal of vehicle registration; 78 percent accept online requests for copies of birth, death, marriage, divorce, and adoption certificates; 58 percent accept payments for fines online; 58 percent offer online interactive customer service; and 48 percent offer a website designed for smartphone users.[4]

- GPS and other personal location tracking technologies were capable of locating a device as small as a mobile phone within a few dozen meters in 2010. The quality, accessibility, and volume of personal location data will improve and expand.

During the 2001-2004 planning cycle for the 2010 census, mobile computing technology was not mature. Separately, secure internet response channels were not a part of the census design solution. Today, however, the Census Bureau is well positioned to take advantage of these now mature and prevalent technologies.

---

[1] Federal Communications Commission Fifteenth Report (FCC 11-103) Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, including Commercial Mobile Services.

[2] Pew Internet and American Life Project. Adult Usage over Time Trend Data.

[3] Forrester Research. Sizing the Cloud – A BT Futures Report. Understanding and Quantifying the Future of Cloud Computing [for 2011].

[4] Center for Digital Government. Digital States Survey [for 2010].

Census Bureau Capabilities

The Census Bureau is strengthening its core capabilities by implementing recommendations resulting from the lessons of decennials past. These improvements will benefit not only the 2020 census, but all future surveys and censuses. A few examples include:

- An enterprise investment management process for prioritization of all Census Bureau investments in order to ensure alignment to strategic goals and objectives.
- Development of common standards and infrastructure, virtualization, privacy and security policies, and a mobile computing strategy that becomes the blueprint for advancing the use of information technology on future surveys and censuses.
- The use of project and system development lifecycles to define key decision points and phase gate reviews to ensure appropriate progress has been made before proceeding to the next phase of development.
- The development and utilization of a program work breakdown structure to form the framework for a fully integrated master schedule of all tasks to be performed to support more effective cost estimation, budget formulation and execution, and overall program performance.

In addition, the approach to risk management has been significantly strengthened, and the Census Bureau has begun analyzing alternative solutions to inform design and investment choices using modeling, operational scenario analysis and analysis of alternatives techniques.

Recommendations

The decennial census is characterized by a high degree of complexity and uncertainty. The complexity is based on the interactions and interdependencies among people, organizations, technologies, tools, techniques, procedures, and economics. The Census Bureau invests in technology as a means toward both achieving efficiencies and increasing accuracy, but given the technology growth curve any design that is currently feasible will almost certainly be surpassed by innovations occurring before 2020.

Engineering for a Data Rich Ecosystem

The internet has evolved over the past 10 years from a tool for data transport and unstructured data exchanges into today's rich semantic web. Now, structured data transactions exist that allow data sharing and reuse across applications and the entire enterprise. The result is the most uniquely data rich communication environment in history. The ubiquity of online access and experience within the American population creates an exciting, but infinitely complex, technology trade-space for the designers of future decennials.

The Census Bureau can use existing technology to move from exploration to aggregation, from discovery to synthesis. It can engineer itself to take maximum advantage of the data rich ecosystem—a web of interdependent data connections.

The technology exists today for a paperless census, and the technology will likely exist in 2020 for a fully automated census. This requires systems thinking, systems engineering expertise, and coordinated investment planning. The Census Bureau can continue to build on the successful foundation of traditional systems engineering methods and tools to complement its strong mission-oriented math and statistics skills.

However, government funding for technology investments is typically based on a return-on-investment (ROI) assessment of point solutions. MITRE believes the Census Bureau is well positioned to re-define itself and its approach to supporting technology. It can move away from point-solution perspective and toward a true business enterprise, modeled and planned as an integrated and continuously evolving system that incorporates people, interfaces and data.

Technology itself is not a panacea, nor can systems be implemented in isolation. As noted earlier, the most efficient solution will meet business needs through technology married to well-designed operations. This enabling technology spawns changes in personnel roles and business processes as well. In our experience at MITRE, planning, acquiring, and coordinating the changes to this combination of people, processes, and technology is the most significant predictor of implementation success and value realization for technology investment. This is the "system-of-systems" view.

MITRE's extensive experience with the Internal Revenue Service, Federal Aviation Administration and others leads us to observe that government is most effective in enterprise modernization when ownership and control of the technical baseline exists within the agency. The technical baseline provides the requirements framework and the reference design where adaptations and changes, and their consequences, are forecasted and controlled across the entire enterprise.

The technical baseline describes all essential aspects of a complex system. It includes requirements, components, interfaces, performance parameters, activity flows, and use cases. This technical baseline can be used to capture, maintain, and trace requirements; drive acquisitions; specify components; define system tradeoff analysis; drive system verification and testing; and coordinate system integration. Standardized methods for capturing and sharing these technical baselines have been developed by international system engineering bodies and have been adopted by numerous industry system developers. They are mature and ready for application to the census. The technical baseline permits continuous trade space analysis in order to optimize the total solution.

We observe that successful programs use enterprise engineering and the technical baseline as a compass for navigating the uncertainty and complexity of tomorrow's technological advances.

Based upon our observations of success, MITRE recommends that the Census Bureau take the following steps in the near term:

- Invest adequately early in the lifecycle to develop an overall design with iterative improvement throughout the planning decade. By defining the design space early in the research and testing phase, the Census Bureau can determine the key questions, risks, and issues that need to be addressed by the research projects to provide the evidence needed to support the design decisions. This will enable all of the stakeholders to reach a preliminary design that addresses the uncertainty and risks.
- When considering the initial design, set aggressive goals for self-response through automated channels. This approach, which drives investment, has been successfully applied at other agencies, such as the IRS.
- Leverage solutions that are available within other government agencies. Leveraged solutions begin with solution reuse, and go on to include shared solutions (e.g., government cloud, shared hosting, shared applications, etc.) and user-focused integrated services.

- Use industry, academia and federally funded research partners to perform environmental scans, red/blue teams for security and privacy, forecast technology trends and advise on successful engineering practices. Take advantage of the breadth of engineering expertise available externally.

Align the Budget Cycle to Realities of Technology Planning and Acquisition

As our MITRE CEO Al Grasso has noted previously to this Subcommittee, succeeding in a rapidly changing environment requires a balance between discipline and flexibility. The planning-centric investment and acquisition environment of today is based on process discipline, but management must have the tools and authorities to shift investments and resources as conditions change, opportunities arise, and risks present themselves and are identified. This balance is important in an effective technology governance model.

Aligning the budget process with the technology cycle offers the flexibility to shift resources to address changing needs and increase agility. Furthermore, streamlining governance and ensuring accountability strengthens the role and authorities of agency leadership and allows it to execute important responsibilities. However, these actions will fall short if the link and timing between the investment decision process and the budget formulation process is not addressed to afford increased flexibility.

MITRE continues to recommend that the government adopt a consolidated, portfolio-based IT budgeting model. This model will allow the flexibility for agency leaders to adapt funding to react to changes in technology requirements. This should include multi-year authority and the authority to fund the up-front systems engineering and alternatives analysis necessary to evaluate and estimate the scope, cost, and schedule for their proposed investments without prior approval. Overall program success is highly correlated to early investment in concept development and system engineering. This up-front investment requirement for effective planning and field testing is non-trivial, perhaps up to 20 percent of the total lifecycle costs of an acquisition. It is critical to successful execution, but not available to management with today's budget process.

Adoption of the technical baseline widens the aperture on the opportunities for IT investment and extends the "design-test-acquire" planning horizon. This longer-range perspective improves outcomes for the portfolio of technology investments because the planning and investment cadence permits spending on contemporary risk mitigation techniques (beta testing, agile [iterative] development, identification of trade-space and negotiation of open-source and non-proprietary solutions, etc.). With a more flexible budgeting model, capability development for the decennial census could be undertaken on a continual improvement basis rather than a point-in-time delivery basis.

Closing Remarks

In conclusion, MITRE is a committed partner to the Census Bureau for the successful completion of the 2020 census and other Census Bureau initiatives.

I thank the Subcommittee for this opportunity to discuss the 2020 census preparation and would be happy to answer questions.