Business Process Improvement in the Economic Programs Directorate at the U.S. Census Bureau

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Abstract

Formed in July of 2004 by senior managers in the Economic Directorate of the U.S. Census Bureau, the purpose of the Business Process Improvement Team (BPIT) was to review business processes associated with Economic Directorate programs to identify processes where improvements can be made that will reduce costs or improve efficiencies, while maintaining quality and timeliness. We began our work identifying potential areas for improvement then, based on these improvement ideas, we did the analysis of existing costs. The BPIT identified the top five major areas for improvement and made final recommendations to management in January of 2005. This paper covers the process to identify areas for improvement, recommendations for next steps after areas were identified and an update on the changes that have been implemented.

Key words: Business Process, Costs, Establishment Programs, and Standardization of Processes

1. Introduction

In July 2004, the Economic Programs Directorate at the U.S. Census Bureau formed a team to identify business process improvement opportunities for its organization. The team addressed one of the directorate’s key strategic goals: find ways to operate more efficiently. The Business Process Improvement Team (BPIT) identified processes where improvements could be made in reducing costs or improving efficiencies, while maintaining quality and timeliness. This paper discusses their key process improvement opportunities and progress to date.

2. Background

The Economic Programs Directorate is responsible for statistical programs that measure and profile the United States economy. To achieve this, the directorate conducts an Economic Census and Census of Governments every five years; more than 100 current economic and government surveys; a foreign trade program producing import and export statistics on a monthly basis; and extensive compilations of administrative records.

In 1994, the Economic Programs Directorate underwent a major reorganization to focus more on corporate planning and implementation of key processes associated with the economic census and surveys. The Economic Planning and Coordination Division (EPCD) was formed to perform these functions. Prior to this time, key process areas were managed uniquely by each subject area, which resulted in duplication of effort for similar functions. Under the new organization, the directorate had a mission to standardize and generalize operations.

In the next ten years, significant strides were made. Several key initiatives came out of this work including the development and implementation of the Standard Economic Processing System (StEPS), used for 90 economic surveys. The business register, the statistical frame for economic censuses and surveys, was modernized on new Oracle technology, which allowed us to house new content/organizational information, and to provide new, more intuitive functionality through web-based applications. The Economic Censuses introduced a metadata-driven instrument design system for paper and electronic collections; expanded use of electronic reporting to respondents; and standardized and generalized post-collection processes comprising edits, interactive review systems, macro-analytic review systems and data dissemination processes.

When the BPIT formed in July 2004, it sought to plan the next generation of key process improvement areas. In pinpointing high payoff areas, the BPIT reviewed the costs of processes across the directorate. Cost data, however, did not exist uniformly by activity. To collect cost data by activity was resource-intensive for the team and a burden to managers. As discussed in the next section, the BPIT adopted a different approach.

3. Team’s Approach

To identify areas for improvement, the BPIT solicited all staff in the Economic Programs Directorate, and other support areas across the Census Bureau for process improvement ideas — including the National Processing Center where most economic programs are collected and processed. They sent out a wide-scale email request for cost-saving ideas. The email request asked for ideas from the following broad process areas identified by the team:
• Program management
• Content planning and approval
• Sample design, selection, and maintenance
• Data collection, follow-up, and data capture
• Respondent assistance
• Editing and tabulation
• Data review and correction
• Data dissemination and outreach

The team received more than 240 ideas for process improvement. We set up a system to review and pare down the list, categorizing and scoring ideas as follows:

1 - Ideas to consider
2 - Off the table (outside the team’s scope)
3 - Relatively easy to implement
4 - Things already in progress
5 - Nice goals but not a process improvement

Table 1 shows the results by category.

Table 1: Categories and Associated Scores

<table>
<thead>
<tr>
<th>Category</th>
<th>Scores</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Program Management</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Content Planning and Approval</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Sample Design, Selection and Maintenance</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Data Collection, Follow-up, and Data Capture</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Respondent Assistance</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Editing and Tabulation</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Data Review and Correction</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>Data Dissemination and Outreach</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Total by Ranking</td>
<td>59</td>
<td>17</td>
</tr>
</tbody>
</table>

Note that, in the process, the team consolidated similar ideas, which reduced the total from 240 to 216. To read the table, as an example under program management there were three ideas given a 1 (ideas to consider); three ideas given a 2 (off the table); 30 ideas given a 3 (easy to implement); 15 given a 4 (already in progress) and 8 given a 5 (nice goals but not a process improvement). The team considered further those ideas scored a “1.”

At the next stage, the team reviewed the 59 ideas in category 1. Through discussion they whittled the list down to 25 ideas through further consolidation, refinement and elimination. The team then reviewed these 25 ideas through facilitated discussions and ranked them according to these criteria:

Benefits other than cost:
- **High Benefit** - The benefit directly / mainly accrues to a customer or product.
- **Medium Benefit** - The benefit directly / mainly accrues to the Economic Directorate or other Bureau Organization.
- **Low Benefit** - The benefit directly / mainly accrues to only one or two Economic Directorate divisions.

Cost Savings:
- **High Cost Savings** - More than $1,000,000 per year.
- **Medium Cost Savings** - $500,000 to $1,000,000.
- **Low Cost Savings** - Less than $500,000 per year.

Implementation Effort / Cost:
- **Low Effort / Cost** - Can be absorbed within current schedules and resources.
- **Medium Effort / Cost** - Will require reallocation or resources within the directorate.
- **High Effort / Cost** - Will require a congressional budget initiative.

Impact on Quality and Customer Satisfaction
- **High Impact** - Improvement has a significant positive impact on quality and customer satisfaction.
- **Medium Impact** - Improvement has a moderate impact on quality and customer satisfaction.
- **Low Impact** - Improvement has a low impact on quality and customer satisfaction.

The final outcome produced the following ideas, which senior executives approved for further business case development:
- Automated workflow / electronic tracking system
- Standardization and generalization of current survey data collections
- Economic Directorate analytical toolkit
- Improvement in data editing procedures
- Improvement in register maintenance procedures

**4. Business Case and Status of Top Ideas**

For ideas given the “go ahead,” the BPIT formed new
subgroups with the appropriate expertise to develop the business cases. Their results are discussed below.

4.1 Automated Workflow / Electronic Tracking

**Benefits**

The objective of this effort was to design and implement a combined workflow application and electronic tracking system to support processing steps associated with the 2007 Economic Census at headquarters and at the National Processing Center. An economic census cycle processes more than seven million paper, electronic and administrative records. It is estimated that one million records are referred during an economic census cycle at different points in the processing pipeline.

Automated workflow processes link respondent data with images of appropriate questionnaires and other documents, and electronically route this information through various processing steps and activities. It eliminates paper such as questionnaires, reject listings, and reference material from the processing stages. Additionally, for respondents reporting electronically, mechanisms are in place to track cases through stages. Paper and electronic workflow applications are based on business rules and logic that are built into the system and applied automatically.

The benefits of workflow and electronic tracking are many. It gives managers access to real-time information about processing operations, current status and problem areas. It eliminates manual paper sorting, counting and report writing operations especially at the National Processing Center. It identifies more quickly processing bottlenecks by prioritizing / rerouting work as necessary. Finally, it allows assignment and resolution of edit referrals by company or specific edit failure type. For example, in the economic census, there can be 2000 establishments of the same company with the same edit referrals assigned to 20 different clerks.

**Results**

The BPIT subgroup evaluated costs, benefits and risks of the existing paper-based system for edit referrals versus an automated solution. Additionally, they evaluated two software packages to enable this functionality: Feith and Oracle tools. Feith software is currently used in the existing environment to house and retrieve images of forms. The forms are imaged as they are received at the National Processing Center. The Feith software had a steep per license user fee for its workflow product. Oracle’s workflow product was covered by the existing site license at the Census Bureau and represented no additional cost. The Oracle software, however, required external expertise at a significant cost to the organization. In the end the subgroup recommended not implementing this initiative for the 2007 Economic Census.

The subgroup’s rationale was that the cost of the software solutions exceeded the manual cost of printing, shuffling and organizing paper. That manual cost was estimated to be less than $200,000 for the 2002 Economic Census, in part because form imaging was available. To see the cost savings, automated workflow promised two things would have to happen. First, implementing the software within the current framework would have automated only the delivery of the referral. The real savings would come from changing the way referrals are identified and organized. This change could happen by rethinking the editing approach and process flow for the 2007 Economic Census. This was not feasible for the 2007 Economic Census. Second, the subgroup would have to take a long-term point of view on a project plan that realized these benefits in 2012, and senior executives and managers would have had to invest in something that would take ten years to realize cost savings.

4.2 Standardization and Generalization of Current Survey Data Collections

**Benefits**

The purpose of this initiative is to develop a generalized data collection system for processing current economic surveys. As they exist now, these surveys determine individually how best to conduct collection activities. As a result, data collection practices are often fragmented, with areas not taking advantage of best practices across the organization. This initiative looks at standardizing data collection materials such as letters, mailings and follow-ups to eliminate duplication of effort; using newer technologies for more efficiency and for reducing maintenance costs; using more electronic reporting; and adopting more of a company-centric approach with data providers. A company-centric approach means that the Census Bureau works as one organization with the company, striving to harmonize the company’s needs with our program requirements.

The initiative involves evaluating current data collection systems and practices, determining required features and identifying activities no longer adding value. An outcome would be requirements for standard collection practices and processes, for developing a library of materials using
accepted styles and languages and a technology plan for using existing systems with long-range objectives for Internet data collection.

Following through on this initiative would increase the value to data providers by using consistent terminology, by promoting a common look-and-feel among collection instruments and by streamlining information requests. Analysts benefit by having standard approaches and best practices to implement for their programs. Lastly, managers would reduce costs by eliminating duplicate processes across programs.

Results

The directorate spent more than $9 million in fiscal year 2004 for the data collection activities at the National Processing Center for 18 key programs. The BPIT subgroup determined that for these surveys $1.6 million could be saved annually by migrating activities from a paper-based mailout and data capture environment to an electronic notification and collection environment. The team laid out several recommendations to meet this savings target, assuming no deterioration in response rates or other aspects of survey quality.

First, the team recommended the development of a business portal. The business portal would facilitate the electronic notification and data collection with a one-stop service center for companies. It adds value to the data providers by providing an electronic means for them to manage their reporting requirement for the Census Bureau. At the site, companies could review their reporting calendar and see the surveys they are expected to respond to in the upcoming year and when their data are due; manage and update their company contact information; request extensions; and review survey questionnaires and instructions. Additionally, the site would provide a secure place that would ensure confidentiality for automated or individual email exchanged between staff and company contacts. Finally, through the business portal, respondents could report electronically.

The team recommended that the portal be built as an extension of the Business Help Site. Launched for the 2002 Economic Census, the Business Help Site provided respondents a place to get information about the census, view questionnaires, report electronically and process service requests - for example, time extensions, reprints of questionnaires and so on. As current surveys moved to the web-based Census Taker (an on-line electronic means of reporting), their respondents currently use the help site as a pass-through (for security) to Census Taker and for general information about the survey. A current limitation is that the Business Help Site is designed on a program-specific basis and not a company-centric basis.

Second, the subgroup endorsed the standardization and generalization of mailouts so that information and the look-and-feel in packages would be consistent with the portal, making it easier for data providers. The team estimated a price tag of $1 million to move to the company portal. Senior executives approved the business case. Implementation would be phased-in due to resource constraints.

The first phase of this initiative was the development of a “read-only” reporting calendar, which took one year to automate. Available September 2006 as an interactive routine to the business register, analysts are now able to generate the calendar on an as-needed basis to assist them in working with companies. The second phase of this initiative is secure messaging. In March 2007, the Business Help Site was expanded to allow secure messaging for the Report of Organization Survey, allowing respondents to get their calendars electronically and use e-mail via secured access. Plans are being developed to roll out secure messaging to the remainder of the current surveys.

4.3 Economic Directorate Analytical Toolkit

Benefits

The purpose of this initiative is to design and develop an analytical toolkit for analysts in the directorate. The tools in the toolkit would follow a similar conceptual design. That is, they would have a common look-and-feel and use the same process to accomplish similar tasks. A more intuitive design would mean that knowing how one tool worked would make it easier to learn additional tools.

New tools would be developed to fit well with other tools. Ideally, there would be one tool per function. For example, there would be one search tool. Further, the tools would be highly integrated so that an analyst could move from reviewing a micro-record in a survey database to reviewing a host of related tools, such as the forms image, the business register data, and data from other related surveys without reentering the case identification. Further, corrections to micro records would be reflected in related macro estimate files. The tools would not be dependent on any specific program but would work from a network of data sets at both the micro and macro levels. Finally, there would be a single sign on to enter the toolkit. As it is now, a user must currently log onto each
of these separate applications, which have their own unique password structures. Table 2 shows the tools covered by this initiative.

Table 2: Tools

<table>
<thead>
<tr>
<th>Tools</th>
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<tbody>
<tr>
<td>Searching</td>
</tr>
<tr>
<td>Review /correction tool</td>
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<tr>
<td>Macro review tool</td>
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<tr>
<td>Graphical data analysis tool</td>
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<tr>
<td>Image review tool</td>
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<tr>
<td>Internet access and search</td>
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<tr>
<td>Management reports</td>
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<tr>
<td>Customer Relationship Management (CRM) view</td>
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<tr>
<td>Data comparison/reconciliation tool</td>
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<tr>
<td>Company summary view</td>
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<tr>
<td>File format exporting functionality</td>
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Corresponding to the tools, data would logically reside in one place with access from many places. The available data would cover all micro-data and macro-estimate files, including survey and census data; the business register information; customer relationship data; other agency and outside sources.

The value-added from this idea is developing a system of tools that fit together in a logical fashion that makes data review and correction and interaction with companies the most efficient process for the analysts in a secured environment that safeguards the data. This system interacts with the business register, survey databases, census databases, and outside sources. Thus, it reduces barriers to reviewing other data points for reference. Analysts will have more powerful tools that allow them to spend more time on high value tasks and less time on low value tasks. Intuitive tools will mean less training of analysts and improve their mobility across programs.

Additional benefits of this initiative are that each tool is developed once, thus duplication of effort is eliminated. For example, instead of having numerous developers designing search technology, one group would gain a high-level of expertise. Finally, it provides more corporate organizational structure by specializing development by function rather than by program.

Collection of Cost Data

The BPIT team reviewed how analysts across the directorate were spending their time. They established a number of focus sessions with analysts to identify the inventory of items that they currently did within their processing cycles. A budget specialist on the BPIT converted the inventory list into a survey instrument. The instrument was then administered to all areas within the directorate that conducted surveys or worked on the censuses. From the time spent on activities, a cost algorithm based on average salaries was applied to obtain relevant cost information for this initiative.

Results

The toolkit team evaluated the cost data. They found that the directorate spends more than $30 million a year on editing, data review, and analysis based on 350 analysts spending 60 percent of their time on these activities. In addition, approximately 90 first-line supervisors that are analysts spend 50% of their time on these tasks. Factoring in the development of analytical systems, the resources were even higher. Given the enormous amount of effort spent on data review, even a small improvement in efficiency would yield a substantial resource savings that could be applied to numerous unmet needs.

The toolkit team then analyzed the current environment, which requires analysts to access more than 20 different systems to do their work. Each system was developed to meet specific needs, with duplicate functionality among StEPS, the census systems and other systems to support the total work. While generalization and standardization had made significant strides, in further focus sessions, analysts complained about all the systems they needed to know to accomplish their work, all the passwords and all the different ways they had to learn to perform similar functions. Other issues they raised were the following: corrections in one system didn’t carry to other systems; systems for reconciliation were nonexistent; data was fragmented across programs and companies.

After presenting this information to senior executives, the toolkit team received approval to conduct a technical evaluation. A strategic objective was to build on the existing investment in the generalized systems for the census and StEPS. The toolkit team’s task was determining what technology existed to enable the toolkit, yet build on these existing generalized systems.

The toolkit team focused their review on these four key areas to judge new technology: single sign-on, displaying data from multiple source files and passing identification and text between applications. The latter meant the seamless linking of two applications without entering strings or text. For example, a user in one system viewing a “write-in” for an industry classification could simply pass that write-in description automatically to the classification coding system without having to log into that separate system.
The toolkit team spent six months of intensive research evaluating major technology solutions. They recommended that the organization move to an object-oriented / service-oriented architecture. Their recommendation covered a short-term frame - through the 2007 Economic Census - and a longer term. In the short run, the team proposed bridging existing applications, and developing three new applications under this new architecture. The new applications comprised reconciliation, searching and macro analysis. In the short run, developers and processors would learn about the technology, then slowly redo underlying applications in the new framework as a long-term solution.

When the research was presented to senior executives, they made the “no go” decision for further work on this initiative. The reasons varied, but the primary reason was the current budget situation, in which we could not afford the estimated $1.7 million investment per year in software, training and dedicated staff to implement this initiative. There were other reasons. Executives perceived a steep learning curve with the new technology. There was some skepticism about the need for meeting such requirements. Finally, what was lacking was a good analysis of our current systems - what was working and not working. A commitment in generalizing more systems at the next level would mean making sure we were improving on what we had now in terms of costs and value for the analysts. These comments led to conducting a formal evaluation of StEPS.

As such, senior management chartered an effort to do a formal evaluation of StEPS. The evaluation team, which started Spring 2006, has identified the key issues and lessons learned from our StEPS experience based on the feedback from all the user groups and stakeholders. The evaluation team is in the process of recommending both short and long term action items, which will be presented for approval to senior managers in April 2007.

4.4 Improvement in Data Editing Procedures

Benefits

From the viewpoint of touching the data, editing starts with the automated testing of data using predefined edit tests and ends with the creation of a “clean” data set based on the edit results. In particular, each edit test accepts or rejects one or more data items, after which rejected data items are examined, either by a computer program or manually by a survey analyst, and then identified unacceptable data are replaced with acceptable data. Additionally, editing involves a number of pre-production tasks, including the development of edit tests and parameters and testing the edits using test decks.

This initiative improves processing efficiency by defining process measures for editing, investigating alternative editing methods, reducing excessive amounts of “low-value” edit failures and reducing manual review of edit failures. This initiative involves assessing current practices in the directorate and other statistical organizations, developing recommendations and conducting one or more pilot studies.

Improved editing will reduce the analysts’ workload by cutting the time spent working on low-value edit failures, and improving data quality by focusing on the “right” cases, that is by focusing on cases that will impact the published data. Managers gain by having better process information about data editing for use in allocating resources and improving overall processing. Others who benefit are questionnaire designers and testers, who will have increased information about questionnaire items respondents have difficulty answering correctly, and respondents, who will find it easier to provide data if editing results are used to improve questionnaires.

Results

The editing subgroup evaluated the initiative, by soliciting information about editing from 50 programs in the directorate. From their analysis and discussions, the team made these seven recommendations:

- Subject areas should evaluate selective editing and, where feasible, implement the Hidiroglou-Berthelot (HB) edit.
- Subject areas need to calculate edit failure rates (62 percent surveyed did not do this).
- Metrics about the impact of editing and imputation on estimates need to be developed.
- Subject areas should evaluate the need to review automatically corrected data that fail edit.
- Areas should implement audit trails.
- Management should improve support for the economic census edits, known as “plain vanilla.” Plain vanilla is a generalized approach for editing and imputing non-response items at an establishment level (see Wagner, 2000).
- Subject areas need to share information about editing.

Senior executives agreed to implement the last recommendation to broadly share information about editing. They also agreed to look into improving editing
support for the economic census. Before committing to the remaining recommendations, however, they asked that the edit subgroup specify studies to determine editing efficiency. Executives defined efficiency as the value added from (1) subjecting the same record to multiple editing phases during the processing cycle, (2) the impact of editing and corrections on final data and / or (3) defining where in the processing cycle the quality of the micro data reached an acceptable level.

In response to this request, the team prepared procedures for evaluating editing efficiency for these five programs: the 2002 Census of Wholesale Trade (part of the economic census), the 2005 Annual Survey of Manufactures, the 2003 Annual Trade Survey, Foreign Trade - Evaluation of Shipping Data and the 2005 through 2007 Annual Finance Surveys of Governments.

Currently, the editing subgroup is wrapping up these studies. When the studies are completed, the editing subgroup will revisit their original recommendations, and make specific recommendations. Lastly, based on an additional request from executives, the team issued guidelines for correcting data.

### 4.5 Improvement in Register Maintenance Procedures

#### Benefits

The purpose of this initiative is to provide a process for keeping the business register up-to-date with information available from current survey programs and new administrative sources, such as the Bureau of Labor Statistics (BLS) Business Establishment List (BEL) as well as to institute processing improvements to improve ongoing programs that directly use the business register.

The first part of this initiative involves setting up a continuous flow of current survey company updates to the business register based on organizational changes (mergers, acquisitions, births/deletes, etc.) identified through ongoing operations. The initiative involves:

- Establishing an electronic means for identifying and updating both the business register and current survey data bases with new company information (especially for large companies) from internal users and from external data providers, utilizing on-line access to their establishment lists.
- Reconciling mismatched information between current programs and the register about companies.
- Identifying “future actions” about companies.

The second part of this initiative is identifying additional administrative data from the BLS BEL to improve the coverage and relevancy of the register. Lastly, this initiative will identify bottlenecks with existing processes and outline improvements to speed the release of data products produced from the register. The benefit of this initiative is that it smooths out updates to the register by creating an ongoing flow of information. This should reduce costs and improve the quality of the business register because the information will be timelier. Having accurate data on the business register is important for frame development. Analysts also use these data to obtain the latest information about companies.

#### Results

The first part of this effort – establishing an electronic means to get more frequent updates from companies – has started as part of the automation of the reporting calendar. We await results from the BLS BEL and Census Bureau business register comparison project to expand work on this initiative (see Elvery, Foster, et al, 2006).

### 5. BPIT Easy-to-Implement Ideas

As part of the BPIT’s initial assessment of ideas, there were ideas initially categorized as “Easy-to-Implement.” The team went back and reviewed these, and concluded many were more complex than initially thought. One idea, however, proved worthwhile. That idea was requiring all managers to use Lotus Notes calendaring for setting up and scheduling meetings on-line. (Note, Lotus Notes is the standard email package used internally at the U.S. Census Bureau.) In March 2006, the BPIT team organized and conducted training of more than 350 managers, and the Assistant Director signed a policy requiring its use – the implementation of which has been effective for the organization.

### 6. Reforming the BPIT Team

In Fall 2006, the BPIT team reformed with new membership and a new charter, and conducted a lessons learned on worked well / what needed to be improved from the earlier BPIT team (now known as Phase One). Our key lesson was that future improvements needed to be “doable within existing resources and feed into the longer term vision of ideas identified from the earlier BPIT team.” The team decided to revisit the original 240 ideas to determine if any qualified under the new criteria. Again, the team canvassed the directorate for
additional ideas. Following a similar review of ideas as before, the team then identified these new process improvement ideas:

- Provide an effective document management system to foster knowledge management, reduce the need for paper and redundant disk space, and automate the approval process for critical sign-offs.
- Improve web-based reporting for current economic surveys by evaluating Census Taker, refining it, and actively promoting its use as a means of maintaining response.
- Publicize and increase awareness of the business help site to help data providers with answers to their questions and information to assist in filing.
- Inventory analysts’ review practices, develop checklists and ensure review procedures and comprehensive MIS are in place as a means of better understanding the work of the analysts, ensuring standards and good practices are in place for producing quality data, and identifying tools that make this process more efficient.
- Establish a document series to reflect key policy and strategic decisions to promote common understanding and communication among staff.

Senior management approved these ideas, with subgroups launched for each of these initiatives.

7. Conclusions and Next Steps

It is a benefit to organizations to conduct a full review of business processes. Through both BPIT phases we have identified improvement areas that affect multiple areas within the organization – thus, work on these areas has greater impact than our traditional process improvement within program areas. The BPIT team will continue to monitor implementation of improvements from both phases, and re-evaluate key technology improvements as part of planning for the 2012 Economic Census.

References


