Determinants Of Web Reporting: A Qualitative Study Of Mode Selection

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Introduction

Respondents are offered electronic reporting in an effort to increase the quality and timeliness of reporting. The cost of administering a survey electronically is substantially lower for the Census Bureau. Moving from paper-based to electronic data collection is a priority for the Census Bureau. We have been introducing electronic survey options into several existing data collection programs over the past decade. The goal of the research described in this paper was to identify factors that influence electronic reporting uptake rates in an effort to assess and improve current electronic reporting practices. The current electronic forms at the Census Bureau for establishments cover a variety of surveys. These surveys vary in frequency and complexity ranging from monthly indicator surveys to the detailed economic census, which is administered every five years. In an effort to help capture a range of the different electronic reporting experiences, we conducted our research with two widely different survey programs: the monthly Manufacturers' Shipments, Inventories, and Orders Survey and the 2002 Economic Census.

Manufacturers' Shipments, Inventories, and Orders (M3) Survey

The program. The Manufacturers' Shipments, Inventories, and Orders (M3) Survey is a voluntary monthly survey administered to approximately 3,500 manufacturing companies in the U.S. The M3 survey collects at most seven data items about manufacturers' shipments, inventories, and orders. The Web reporting option for the M3 was offered to a subset of the M3 sample in 2000. In 2002, the Web survey was completely redesigned with a new layout. The main reporting modes for the M3 have historically been fax and Touch Tone Data Entry (TDE).

Companies can either be considered single form or multiple form companies. Single form companies are those who primarily manufacture one type of good or goods that are very similar. These companies receive only one form per month. Multiple form companies are those that manufacture several different types of goods, and they receive more than one form per month. Because Web reporting was not available for multiple form companies at the time of our research, we will report here only about single form companies.

The electronic form. The M3 electronic form was designed to be simple and to not add respondent burden. Respondents are taken to a main menu screen after entering their username and password using a login screen. The main menu screen allows users to go right to filling out their form, to review the form, print it, and view its status (complete vs. not complete).

Aim of our research. The Census Bureau wanted M3 respondents who were reporting in non-electronic modes (fax and mail-out/mail-back) to switch to Web reporting. The aim of this research was to look at respondents' reasons for choosing or not choosing to switch reporting modes.

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[1] This research was conducted while Tony Hak was an American Statistical Association / National Science Foundation Research Fellow at the U.S. Census Bureau (2002-2003).

[2] This paper reports the results of research and analysis undertaken by Census Bureau staff and their collaborators. It has undergone a Census Bureau review more limited in scope than that given to official Census Bureau publications. This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress. The authors thank their reviewers for their helpful review comments.

Methodology. In December 2002, M3 staff approached mail/fax reporters by telephone with a request to switch to Web reporting. Callers were instructed to probe respondents who refused the electronic option. Ten on-site visits were conducted to observe how respondents handled reporting through the Web for the first time. For respondents, these visits were aimed at helping them adapt to this new method of reporting and to solve any problems that might occur. For the researcher, it was an opportunity to watch real-time reporting of data using a Web mode. Arrangements were made for follow-up telephone calls with the companies that agreed to switch to an electronic mode but were not visited in-person. The purpose of the follow-up telephone call was to get additional feedback about the electronic survey and any issues with converting to a new mode. These respondents were contacted as soon as possible after their data was submitted to the Census Bureau.

Findings. Of the 77 mail/fax reporters that were approached by telephone, eleven respondents refused outright to convert to Web reporting. A considerable number (22) of the 66 respondents that expressed their willingness to give Web reporting a try never did so. Respondents told us repeatedly that they had not tried electronic reporting for practical reasons, and promised us to attempt it next time. They never did, therefore we conclude that these were 'soft refusals'.

Refusal was mainly based on the assumption that fax reporting cannot be beaten in terms of objective response burden. These respondents saw no good reason for changing a routine that was convenient to them and for substituting another system that takes more of their time, not accounting for the additional burden of the effort of switching modes itself. In contrast, some converters assumed that Web reporting would reduce their burden. Other converters did not find burden an issue and did not mind that Web reporting adds to burden. In other words, refusers and converters differed mainly in terms of their *expectations* regarding the burden of Web reporting.

Eventually 37 companies (48%) were converted to Web reporting, with those respondents having received an offer of an onsite company visit netting 50% more adopters than those offered only a telephone debriefing call. Among converters, no difference was found between respondents who expected Web reporting to take less time than fax and/or mail and those who had no such expectations. All agreed that Web reporting is preferred, even though it took more time. The main reasons respondents gave us for these preferences were:

- Respondents do not need to move from their desk to file the report.
- Web reporting fits with how they see their work developing in the future from paper-based to paper-less.
- Some feel more confident that data have actually and safely been submitted.

Our main finding, thus, was that fax reporting continues to be the most attractive and easiest method of reporting for at least half of the reporters, but that for converters the perceived advantages of Web reporting seem to outweigh its perceived disadvantages.

The conversion process. Our findings revealed four steps to the conversion process, and we draw the following conclusions.

The decision to try electronic reporting: The initial decision to convert to Web reporting was not dependent on established company policies or technical restrictions. Respondents' initial decisions were based on a comparison of the level of burden associated with the current method of reporting to the level of perceived burden associated with the new method of reporting. For the M3, respondents already believed that reporting through fax could not be improved upon. There will be respondents who will assume that reporting through the Web reduces burden and others who will not find issue with the added burden and will choose Web reporting for other reasons.

A first attempt at reporting electronically: M3 Web reporting is a fairly straightforward task for most respondents. Some usability problems were uncovered during company visits, but none that affected adoption of Web reporting.

A decision to adopt this new mode of reporting: We found no difference between respondents who expected fax reporting to take less time and those who did not. All reporters that made the first attempt at Web reporting liked it, and told us that they preferred Web reporting, although it took more time. This decision was based on reasons mentioned previously, as well as respondents' confidence that their data had safely been submitted. If respondents can be convinced to try Web reporting, it seems very likely that they will adopt this method long-term with satisfaction.

Future use of this new mode: All of the respondents who tried Web reporting once stated that they would continue

using this mode in the future. Follow up research has found that the majority of these respondents did in fact remain with the Web reporting. Very few respondents switched back to fax reporting in subsequent months.

Conversion methods. The conversion rate in this study was 48%. In January 2003, a letter was sent to all 3500 companies in the entire M3 sample to inform them that mail reporting would be phased out. Additionally three remaining other modes (Web, TDE, and fax) were presented in the letter, of which Web reporting was the first in the list. After this mailing there were a number of 'spontaneous' Web reporters. We collected data on the reporting mode for all M3 sample companies for six consecutive monthly reports (December 2002 thru May 2003) after this letter was sent. This allowed us to compare the eventual success of the personal conversion calls with that of 'spontaneous conversion' invoked by the January letter. After six months there were 96 stable 'spontaneous' Web reporters (approximately 3%). It was concluded that an intensive approach (in this case a conversion request through telephone accompanied with an offer of a company visit or a telephone debriefing) is a much more effective, though more costly, conversion strategy than merely sending a letter.

Recommendations. This study showed that an active conversion strategy helped in moving respondents from a nonelectronic mode (fax/mail) to an electronic mode. Completely phasing out fax reporting and converting to Web reporting is not recommended at this time because likely resistance will occur with respondents who are content with fax reporting. To convert such resistant respondents, the Census Bureau may need to adopt an approach offering continual support until the respondents demonstrate sufficient confidence in reporting via the Web. Such a supportive approach would demonstrate to respondents how important Web reporting is for the Census Bureau, as well as how much these respondents' contribution is appreciated.

Knowledge of other non-electronic reporting modes (mail/fax) was an obstacle for converting respondents to the Web. With this in mind, we speculate that uptake of Web reporting might be more successful among respondents who are not accustomed to another mode – e.g., new sample cases. New respondents could be given the Web version as the only reporting option. Other options could be offered to respondents that had technical issues or were seriously resistant to Web reporting.

The 2002 Economic Census

The program. Our second study was of the economic census, which provides a comprehensive look at most of the industries in the U.S. economy from all geographic levels. The economic census is an establishment-based survey conducted every five years, for years ending in "2" and "7". It is a major component for many economic measures including U.S. Gross Domestic Product. In the past, the economic census was collected mainly by self-administered paper forms. Economic census questionnaires are tailored by industry, resulting in more than 550 different versions. For 2002, all respondents were offered the option of electronic reporting. The Census Bureau sees electronic reporting as a means of reducing survey costs while increasing survey data quality (using imbedded edits) and response timeliness (by allowing submission of responses using the Internet).

The electronic reporting system. The electronic form for the 2002 Economic Census is a Windows based application that must be downloaded to a respondent's personal computer (PC) from a diskette, CD, or through the Internet. Promotion of electronic reporting was done in two different ways. For very large companies in all industries, Census Bureau analysts made telephone, mail, or personal contact in an effort to recruit the company into electronic reporting. The remaining companies were told about the electronic reporting option in the cover letter that accompanied the form. The cover letter listed the Internet address needed for downloading the application as well as instructions for finding respondents' usernames and passwords, which had been pre-printed in the mailing label.

When respondents first open the application, they see a window containing general information for using the electronic form. Respondents then move on to a "survey in-box," where they receive a list of all the forms they are required to complete, one for each establishment. Respondents use the in-box to toggle between forms, print forms, and to submit forms. The in-box displays information about each form, including the form number, the establishment's address, and whether or not the form contains errors or warnings.

The most common way for companies to complete their forms using the software application is to navigate through the form keying in data where necessary. Companies also have the option of importing data into the electronic form from a preformatted spreadsheet. In order to use this option, companies had to map questionnaire items to

spreadsheet columns, selecting items relevant to their business. Such "import maps" had to be created by respondents for each form type assigned to their company.

Aim of our research. The aim of this qualitative research was to understand user problems with the electronic instrument in the context of the response process in order to evaluate the software from the users' perspective. We wanted to develop specific recommendations for electronic reporting in the 2007 Economic Census, along with general recommendations for other electronic establishment surveys at the Census Bureau.

There was interest in a variety of topics related to the 2002 Economic Census electronic form:
- How long did it take to download the software and prepare the software for reporting? Do respondents consider these times reasonable?
- What are the major problems encountered when reporting electronically?
- If respondents chose to import their data, did they find the procedure user friendly?
- What were the most significant benefits (if any) of choosing the electronic reporting options?
- What were the least significant aspects of the electronic reporting option?
- What improvements or recommendations can respondents offer to enhance the software?
- Are respondents likely to use the software again to report for other economic programs?

Methodology. To answer the many questions posed about this electronic software, we aimed at collecting as much detailed data as possible about the actual disparate but interconnected steps involved in responding electronically to the 2002 Economic Census. We developed two approaches to data collection:

On-site real-time visits. Visits were arranged with nine very large companies to observe their complex response processes. In order to get this firsthand experience with tasks necessary for companies to complete the electronic census form, we identified respondents who were willing to give us direct access to the work they were doing. This access was facilitated by economic census analysts who were working one-on-one with companies. These analysts identified companies that would welcome on-site visits to discuss issues. These companies were offered support in dealing with the electronic reporting system. Our visits were seen as an instrument for customer relations to help companies report timely quality data.

A researcher who was accompanied by either an analyst or a member of the Electronic Reporting Branch (ERB) made all company visits. Analysts were helpful in answering questions about the form content, while ERB staff were the "experts" on the electronic reporting system. Meetings with companies were audio-recorded with the respondent's permission, and some companies were visited more than once. Respondents were told during initial contact that researchers would be interested in discussing their response process and (hopefully) observing parts of it.

Retrospective on-site debriefing visits. Experiences of electronic reporters in smaller companies are typically different than those in large companies. Since it would have been very difficult to make similar real-time arrangements with small companies, we recruited businesses that submitted their 2002 Economic Census form electronically. Companies were typically visited within a few weeks of completing the electronic form. These companies were debriefed about all of the different tasks that were necessary for them to complete the survey electronically. They were also asked for feedback. Fifteen companies were debriefed. These companies ranged in size from companies having one location to companies with 30 locations. Meetings were audio-recorded with the respondent's permission.

Findings: large companies. Large companies took the 2002 Economic Census very seriously. Companies spent significant amounts of time preparing for this survey. They printed advance copies of the survey to identify data they would need to gather. They spent a significant amount of time matching their lists of locations to the lists provided by the Census Bureau.

Most of the companies we visited chose to import their data into the electronic form from spreadsheets. They felt that although importing required a considerable amount of time up-front, it would save them a significant amount in the end. Company respondents were very adept at working with spreadsheets. Many respondents were able to create programs or macros that automatically pulled data from their financial systems into the spreadsheet. However,

companies needed to spend additional time “cleaning-up” their spreadsheets to match the formatting required for importing.

Many companies struggled with the importing feature initially. For some it was the case of unclear instructions that necessitated frequent calls to the Census Bureau for assistance. For others it was the tediousness of getting their spreadsheets ready for importing. The amount of time it took to create import maps and to actually import the data into the electronic instrument was close to the amount of time required to actually gather the data.

Early versions of the software did not function well for many of the companies visited. They experienced long wait times for downloading forms from the Internet or importing a handful of data cells. Later versions of the software were more efficient.

The system was not built to be shared by multiple reporters within the company. There was neither ‘spawning’ functionality (i.e. a way of distributing forms to different persons in the company) nor consolidation functionality (i.e., a way of bringing different completed forms together). Large companies typically have more than one person completing and gathering data for the economic census. The system was built to be the most beneficial for companies that had a centralized reporting process. If decentralized companies were interested in reporting electronically, they had to spend time either coordinating their efforts through one central contact person or come up with other creative solutions for distributing the software. The decentralized companies included in our research spent many more hours than other types of companies in order to report electronically. One company we visited abandoned reporting electronically because of this and reverted back to completing paper forms. This was a tedious alternative they had been trying to avoid.

The software’s review (editing) function was less than ideal for very large companies, because editing was done on a form-by-form basis. Very large companies can have thousands of forms, and it is not feasible for them to perform this review by individual location. Since companies were very interested in performing a review of their data, they would return to their spreadsheets to look for problems.

Findings: small and medium-size companies. The smaller companies that chose to report electronically had a much different reporting experience than larger companies. The reporting responsibility was typically given to one person instead of several. It was not necessary for smaller companies to invest their time in the importing function of the software. To complete their surveys, these smaller companies typically key entered their data location-by-location. They tended to use paper forms as a reference during data retrieval, completing the paper forms first, and then using the electronic software as a data entry and submission device.

These respondents ran into very few problems with the system itself and they were pleased with the performance and appearance of the 2002 Economic Census electronic form. However, it must be remembered that these respondents were self-selected, choosing to report electronically. It was not possible for us to interview companies that had downloaded the electronic form, but abandoned it, submitting a paper forms instead.

Since smaller companies have fewer forms to handle, they were happier with the review functionality built into the software and felt this was a major asset to the electronic form. Regardless of their size, companies did not seem to have any problems with the submission process. The confirmation message, however, was unclear and many respondents reported being unsure whether their submission had been successful.

Some of the reasons respondents gave for choosing to report electronically included:
- Neatness and readability of report forms: Many respondents noted that, in the past, they had used mechanical typewriters to complete the forms. Although it was not mandatory for answers to be typed, many respondents felt it necessary.
- Ease of a dding new locations was easy.
- No need to send the forms through registered mail, which saved time and money.
- Fits with the priority of companies to go paper-less.
- No fear of responses getting lost in the mail.
- Sending in data that is higher in quality.

Some of the recommendations that respondents gave for improving the system included:
- Giving a clear confirmation that submission had been successful. Some respondents suggested that an e-mail confirmation would be ideal. Confirmations should be printable for respondents' records.
- Making the electronic form more like the paper form. (We assume this recommendation is related to our observation that respondents repeatedly used the paper form as a reference throughout the reporting process.)
- Assigning a status to forms. Companies managing large numbers of forms needed some additional help in figuring out which of their forms were blank, in progress, contained errors, or complete.
- Integrating the Census Bureau software with common payroll, financial, or spreadsheet software.

Conclusions. The response process involved with reporting for the economic census varied widely across all companies and posed several different challenges to the electronic reporting system. The system was able to meet several of these challenges, but could not adequately deal with others. Our main conclusions are:
- The current system is adequate for self-selected electronic reporters in small companies. These companies perceived the rewards of electronic reporting outweighed the minimal added burden. The current software met respondents' expectations.
- The importing functionality of the system is too burdensome. The amount of effort and time needed for importing was something that respondents in large companies did not anticipate. Added to this time was the long time that it took to actually import the data into the system. Although respondents did state that overall they probably did save time by importing, they still felt strongly that the current importing process could be greatly improved.
- The current system is not useful for companies with a decentralized response process. Decentralized companies that chose to work with the system needed to make special arrangements. The system could not be distributed to more than one PC to accommodate companies with multiple internal respondents.

Our findings regarding large companies indicate that some assumptions of the software developers regarding respondents' work practices and preferences were incorrect. Developers had assumed that respondents would prefer the opportunity to create their own custom import maps rather than use generic import maps. Respondents, however, considered the need to create these maps as an unwarranted additional burden to their core response work (perceived by them as the work of retrieving the requested information and making it available to the Census Bureau in some form). Another incorrect assumption was that all large companies would want to make a clear distinction between information providers in establishments on the one hand, and central reporters for the economic census on the other hand, and that central reporters would want to consolidate information received from their various establishments in spreadsheets before preparing this consolidated information for communication to the Census Bureau. In actual practice, some central respondents only wanted to have a monitoring role and, therefore, preferred that informants from their various establishments be able to load their data directly onto the electronic forms. The latter was not possible because the software had no spawning or consolidation functionality.

Recommendations. Although research into business respondents' preferences and response processes could lead to more realistic assumptions to guide software development, we assume there will remain unknown situations in companies that will differ in significant ways. That is, we doubt it is possible to develop assumptions that cover all relevant response situations. Therefore, we recommend that further software development not be aimed at developing an electronic reporting system that meets requirements connected to a limited number of known or assumed circumstances and preferences, but at developing a system that is less dependent on such assumptions and is, instead, flexible enough to be adequate in circumstances not known beforehand. In our view, this would be a respondent-centered approach.

Overall conclusions and recommendations

Large companies in the economic census. Most respondents in most economic programs of the Census Bureau in which an electronic reporting option is (or will be) available will have a choice regarding the reporting mode they want to use, either electronic or another mode (fax, mail, or TDE). The one exception is the group of very large companies for which completing the economic census using a non-electronic reporting option is not viable. For the latter companies, it is of paramount importance that electronic reporting software for the 2007 Economic Census be improved significantly, particularly in terms of the importing, spawning and consolidation functions. The system should be respondent-centered in the sense that it is flexible enough to adapt to many different circumstances that may not be known beforehand.

Mode selection. Our main conclusion about mode selection is that respondents have subjective reasons for adopting or not adopting the electronic reporting option. Respondents' attitudes can be influenced by means of an intensive approach in which support is offered to respondents (either through telephone or by on-site visits), or by promoting subjective reasons for adoption rather than objective (burden) reasons. Nevertheless, in the near term at least, we suspect that substantial numbers of respondents in multi-mode surveys will likely exercise their right to opt for a non-electronic mode.

Thinking outside the box. We observed that respondents repeatedly used the paper form as a reference throughout the reporting process and we assume this is the reason why many respondents want the paper and electronic instruments to look alike. However, this does not mean that electronic reporting instruments must be based on current paper forms. Designing electronic instruments first will take advantage of the flexibility and capabilities of the electronic medium, and the paper forms can subsequently be designed to resemble the electronic instrument. In particular, we suggest enabling respondents to 'build' their own customized forms (in the manner by which routing is managed in CAPI and CATI instruments) and to print the resulting form. Such a form-building functionality – as well as the spawning functionality recommended above – may be more easily supported in a Web-based environment than in a downloadable system.