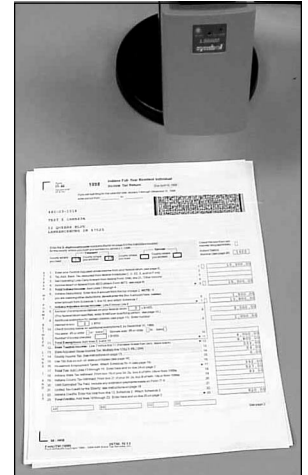


2000 Better Government Competition HONORABLE MENTION

Application of Two-Dimensional (2-D) Barcodes to Tax Returns

Kenneth L. Miller, Indiana Department of Revenue



A 2-D barcoded return being scanned with a barcode scanner.

THE PROBLEM

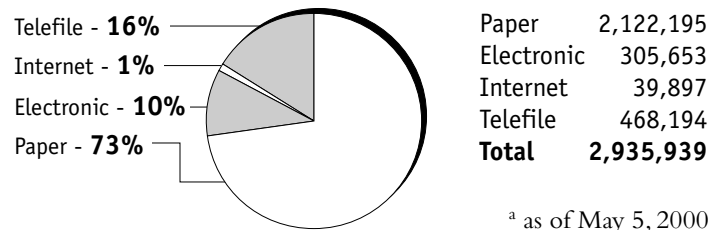
Each year, state taxing agencies that collect an individual income tax, like the Massachusetts Department of Revenue, find themselves with millions of tax returns to be processed as quickly and efficiently as possible upon receipt. As figure 1 shows, even with initiatives like Internet filing, Telefile, and Electronic Filing, the majority of taxpayers are still using paper.

Many taxpayers are simply more comfortable filing a paper document through the mail than using the Internet or telephone. Yet it is estimated that more than half the paper forms received by most state revenue agencies are computer-generated (e.g., paid preparer, Turbo Tax, etc.). This means that although the information was available in electronic form at one point, the taxpayer submits the information on paper, requiring the Department of Revenue to re-key the form upon receipt, delaying the processing, and consuming data entry time and money. With so many returns arriving within a few days, hiring sufficient employees to perform these tasks is also an issue. In a market of low unemployment, it can be extremely difficult to attract sufficient short-term employees to open mail and key tax returns.

The high proportion of paper returns also adversely affects the taxpayer. Electronic returns in Massachusetts are typically processed in 4 days, while paper returns take much longer. As is the case in any state, department staff who re-key data may introduce errors, inconveniencing taxpayers and delaying the processing of their returns.

Legal requirements must also be taken into consideration. Many states have laws that require the Department of Revenue to work returns within a particular time frame (e.g., issue any refund within 90 days of the due date). This requires staff to place a strong emphasis on working the refund returns quickly, while still meeting the requirement of getting the money in the bank as soon as possible. Working within all of these parameters requires the department to look at each step to determine what, if anything, can be done to expedite the process.

Figure 1. Massachusetts Individual Income Tax Filing^a



The Massachusetts Department of Revenue's website can be accessed at www.state.ma.us/dor.

THE SOLUTION

In June 1998, the Commissioner of the Indiana Department of Revenue attended a meeting in New Orleans where he met a representative from Symbol Technology and had a discussion about the use of two-dimensional (2-D) barcode technology in the business world. After the Commissioner returned to Indiana, he requested an internal meeting to discuss the possibility of using 2-D barcodes in processing tax returns. It quickly became apparent to members of the administrative staff that this process could be developed into a viable way of processing tax returns.

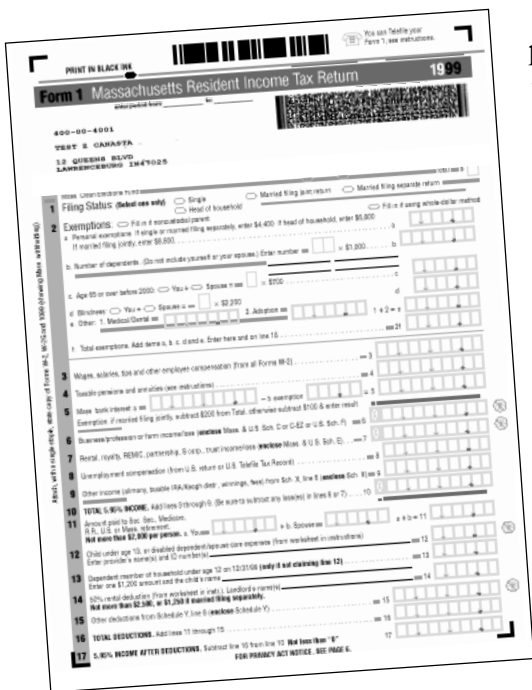
During the period from June to August of 1998, Andersen Consulting assisted the department in developing a prototype system that included the creation of a 2-D barcode on a tax return, and the capacity to read the 2-D barcode once it was received by the department. After a demonstration was previewed at the Federation of Tax Administrators (FTA) Technology Conference, the department was able to partner with H & R Block, Creative Solutions, and Access Indiana to implement 2-D barcode technology for tax year 1998. H & R Block and Creative Solutions agreed to utilize the 2-D barcode on all IT-40 Individual Income Tax Returns created by their software for tax year 1998, provided that the taxpayer chose not to file the tax return electronically. Access Indiana, the Internet service provider for the State of Indiana, developed the site for Internet filing, with the caveat that if the taxpayer chose to file the prepared return by mail, then a 2-D barcode would be created on the return prior to printing.

While these companies were developing the software to create the 2-D barcode on the tax returns, Andersen Consulting was developing the back-end system to allow the department to read the barcode once the return was received. By January 1999, the department was ready to receive its first 2-D barcoded tax returns.

PROGRAM OVERVIEW

Two-dimensional barcoding bridges the gap between electronic and paper filing by providing the speed and accuracy of electronic filing with the peace of mind associated with sending a traditional paper return. Tax preparation software with the 2-D barcoding feature can be used by both individuals and paid preparers to complete tax forms. When the user prints the return, a 2-D barcode appears on the completed tax form, as shown at left. This 2-D barcode contains all the information from the tax form, attached schedules, and from a maximum of ten W-2 forms. The completed tax forms and schedules are then signed and mailed with the W-2s, as usual, by the taxpayer.

When tax returns are submitted with the 2-D barcode, the information can be captured by the department significantly faster and more accurately. When received, the 2-D barcoded returns can be scanned with a barcode scanner. This one scanning action captures more information (up to 2,000 characters) than is typically keyed, and the process is highly accurate. Scanning retrieves the exact data contained on the form without the need for data entry. Unlike Optical Character Recognition, when a 2-D barcode is scanned there is no margin for interpretation.



Once scanned, the data can be passed to the existing tax system to be validated and processed as usual. Turn-around times and error rates are similar to electronically filed returns (approximately 4 days and 2 percent respectively), and data will be captured in 95 percent less time than with traditional keying. This relatively simple solution is inexpensive, quick to implement, and resolves many of the problems associated with paper returns.

COSTS AND BENEFITS

The department purchased what it considered to be an adequate supply of scanners for both the Returns Processing Center and for its district office locations. These products and a minimal amount of technical support cost approximately \$55,000. In addition, the state partnered with Andersen Consulting, who provided two contracting resources for six months to develop the scanning application.

The traditional processing of a standard batch of 90 paper tax returns takes approximately 4½ hours from the time the returns are received, until the money is deposited in the bank, and the tax return is data-entered. Utilizing the 2-D barcode, it takes approximately 10 to 15 minutes to process 90 returns, which is about 95 percent less time than it takes for the standard paper returns. Returns received each day are scanned and processed by the department's integrated tax system that same night.

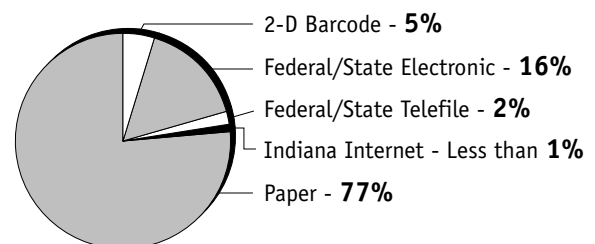
The taxpayer also receives numerous benefits. Because the department can process the return faster, it will generate a refund to the taxpayer more quickly than a traditional paper tax return. The Indiana Department of Revenue feels that, for the most part, it can work the 2-D barcoded returns almost as quickly as electronically filed returns. Therefore, taxpayers can expect refunds as quickly as if they had electronically filed their returns. Also, the number of returns that "suspend" due to errors and require employee review are fewer than for traditional paper returns due to the elimination of the manual data entry process, thus allowing the returns to post to the returns processing system more quickly. If a 2-D barcoded return does in fact suspend, the department is able to correct it faster since the return is still on site and not yet sent to the warehouse for storage.

During the first year of implementation, the 1999 processing season of the 1998 tax returns, the department processed more than 131,000 IT-40 tax returns with 2-D barcodes, saving an average of \$.75 per return. These tax returns made up 5 percent of all IT-40 returns filed for tax year 1998. These savings allowed the department to pay the cost of the equipment in the first year, while obtaining many intangible benefits as well.

Because the first year was so successful, the department decided to include additional individual income tax forms in the project for the second year. For the 2000 processing season of the 1999 tax returns, the forms IT-40, IT-40PNR, and IT-40EZ were included. The same companies continued to partner with the Indiana Department of Revenue, and by August 2000, the department had received more than 192,000 of these tax returns. This figure is an increase of 47 percent from the 1999 processing season of the 1998

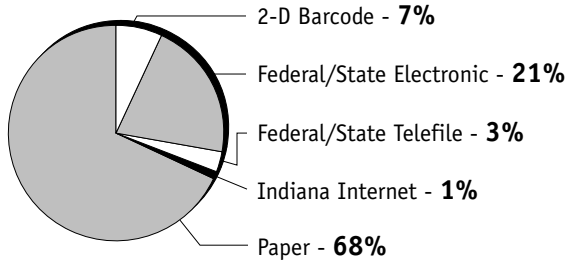
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Figure 2: 1998 Indiana IT-40 Income Tax Returns Filed in 1999



tax returns and constitutes 7 percent of the total individual income tax returns filed for tax year 1999 thus far. The savings per return this year are expected to be even greater due to the addition of the IT-40PNR, which is a more complicated return than the others. The department estimates the savings for the 1999 returns to be between \$.70 and \$1.50 per return, based on the amount of data to be keyed on each form.

Figure 3: 1999 Indiana Income Tax Returns Filed through August 28, 2000



During this second year of implementation, Indiana was joined by several other states initiating the use of 2-D barcodes on their individual income tax returns for the 1999 tax year. These states and the respective number of 2-D barcode returns processed are as follows: Rhode Island, 44,000 returns; Delaware, 30,000; Illinois, 194,000; and Missouri 75,000. All of these states have found the project to be a benefit to their processing programs as well.

It is anticipated that approximately 13 states will implement 2-D barcoded tax returns for tax year 2000, and a number of additional software vendors have agreed to support these initiatives, including Intuit, whose TurboTax product has a large share of the individual tax market. In addition, the Federation of Tax Administrators (FTA) and the National Association of Computerized Tax Processors (NACTP) have also joined forces with the states to develop standards for use by all states that intend to move toward a 2-D barcode initiative.

OBSTACLES

Now that software specifications have been given to the tax software vendors, and vendors are aware of the project, many of the hurdles to creating a 2-D barcode system have been cleared. For a new state to begin receiving tax forms with 2-D barcodes on them, they must simply take a copy of the Indiana 2-D barcode specifications, and modify them with the specific fields from their tax forms that they would like to have included. Then, they will need to send their specifications to the software vendors that reproduce their forms. Technical support for all of the vendors can be obtained by purchasing a \$3,500 license from Symbol Technologies. Once this is complete, tax forms will begin arriving with a 2-D barcode on them.

REPLICATION

This concept could be implemented in Massachusetts for the 2000 tax year. The Indiana approach has the potential to reduce the number of paper returns that need to be keyed by 50 percent (1 million returns) as additional software vendors comply with the program. Even if it is conservatively estimated that of the 2.1 million paper returns Massachusetts will receive only 10 percent will have barcodes in the first year, this would represent savings of \$200,000 in labor costs alone. Depending on implementation requirements, this program will pay for itself within the first year or two, while providing the intangible benefits discussed above.

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In order to begin processing the returns, the state must develop a system (probably Windows-based) that will allow them to read the 2-D barcoded forms. This system is not that different from those developed for other data capture methods, and it likely will need to include the following elements:

- security (sign-on, passwords, security levels, etc.)
- sorting returns, separate PO box?
- batching – assigning batches, reassigning batches, closing batches
- capturing document locator numbers and post mark dates
- simple validation rules
- storing the data locally or centrally
- gathering up all data captured and formatting a file for the existing tax system
- summary reports.

States will need to consider a number of additional issues:

- purchasing equipment like scanners, PCs, Server, etc.
- triggering the data-capture from the barcode scanner and port, rather than the keyboard
- providing the ability to view the entire form after it has been scanned
- providing the ability to maintain address information that has been manually corrected by the taxpayer
- processing the associated payments as the return is scanned, or tying the return and the payment together
- endorsing checks that are associated with the return
- allowing Department employees that assist taxpayers in filling out returns to at least produce a 2-D barcoded return rather than standard paper returns
- providing an option for Internet filers to print a 2-D barcoded return and mail in, rather than submit electronically.

CONCLUSION

Applying 2-D barcode technology to individual income tax returns provides substantial benefits to taxpayers. Errors will be reduced for taxpayers who choose to file a paper tax return with a 2-D barcode. The turnaround time, from the mail being opened until the tax return is available to be processed, is one day, and processors should be able to scan returns as they are received. Excluding the time it takes the return to arrive in the mail, taxpayers typically receive their refunds as quickly as with electronically filed returns. The technology enables state revenue agencies to process paper tax returns in less time, with lower staffing levels and greater accuracy, than with conventional processing methods. The Massachusetts Department of Revenue should consider utilizing 2-D barcode technology to process its paper tax returns more efficiently.

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APPENDIX¹

Indiana's application was developed by Andersen Consulting specifically to capture the data from individual state tax returns. The functional features of the application are as follows:

- tracking batching of returns
- assigning batches to individuals
- tracking batch status
- inquiring on open batches
- verifying batch control totals
- scanning different form types in the same batch
- verifying that the return scanned in is valid, and is not already included in the batch
- immediate visual confirmation of return being scanned
- printing of batch header sheet
- prompting for remit amount on remit due returns
- endorsing of checks
- ability to change demographic information if noted on return
- formatting a daily return and payment file
- statistical reporting
- user sign-on
- access to some functions controlled by security
- deposit date reporting.

The application runs in a Windows environment on the user's PC. The application was built utilizing PowerBuilder 6.5 and can work with a variety of RDBMS on a number of platforms. Indiana has installed it with an Oracle database running under UNIX, a Microsoft Access database on a Novell file server, and a Sybase SQL Anywhere database running under Windows95. The application interfaces with a barcode scanner from Symbol Technologies and utilizes Symbol Technologies' PDF 417 Development library.

¹This section is based on a presentation given by Nathan E. Beadle, Partner, Andersen Consulting, to the Federation of Tax Administrators Annual Conference, July 15, 1999.

The Implementation Process

A typical implementation of 2-D barcodes is completed in 3 to 5 months and requires the following steps:

Figure A-1: Implementation Timeline

Task	Month				
	1	2	3	4	5
Produce barcode form specifications for software vendors	■				
Implementation of a barcode reading application		■	■	■	
Interface the reading application with existing tax processing system		■	■	■	
Testing with vendors and existing tax processing system application				■	■
Deployment of associated hardware and training					■

1. Produce barcode form specifications for software vendors. Identify forms and associated schedules that you would like to have captured in the barcode, and then produce the specifications that meet the FTA standards. These specifications can be sent out with regular form revisions to the software vendors certified to reproduce the forms. Production should take one to two weeks.

2. Implementation of a barcode reading application. Define processing steps (sorting, batching, assigning, etc.) required for barcode forms. Based on this, the application may need to be changed where the user procedures cannot conform to the application. The application must also be configured to incorporate the specific forms to be scanned and the associated validation rules. Depending on the number of forms and the procedural changes required, this process will take from one to three months.

3. Interface the reading application with existing tax processing system. The barcode reading application will need to produce an output file of all batches that have been closed since the last time a file was produced (typically 1 to 3 times a day). Depending on the type of input file processing done by the current application, changes may be required in the current system to enable it to accept this file. This task can run concurrently with the implementation of a barcode reading application.

4. Testing with vendors and existing tax processing system application. Work with the tax preparation software vendors to test the application from the time a return is entered in the vendor's software until it is posted in the tax processing system. This should take approximately one month.

5. Deployment of associated hardware and training. At a minimum, two barcode scanners will need to be purchased. In addition, depending on the current environment, PCs, database, database server, and printers may also need to be purchased. User and technical training materials will need to be adapted for the application.

ABOUT THE AUTHOR

Kenneth L. Miller was first named Commissioner of the Indiana Department of Revenue in January 1992 by Governor Evan Bayh and was reappointed in 1997 by Governor Frank O'Bannon. Prior to his appointment, he served as Acting Commissioner following the resignation of John Gildea in September 1991, and also served as Deputy Commissioner from 1989 to 1992. He began his state government career as a field auditor in the Department of Revenue in 1971 and has been a technical tax advisor, training director, field operations director, regional administrator, deputy auditor, administrator, and head of the Research and Analysis Division. He served a one-year term as a member of the Internal Revenue Services, Commissioner's Advisory Group and is presently serving on the Executive Board of the Federation of Tax Administrators (FTA), serving as its president in 1997. In 2000, FTA recognized him for his innovative use of barcodes in tax processing.