

Computerised Legislation: A Case Study in Bermuda

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Summary

This case study describes the experiences of the Bermuda Government with the computerisation of the Revised Laws of Bermuda, and the legislative drafting process. Two papers have been written about this project previously, one at the conception of the project¹, and the other during its implementation.²

This five year project involved converting about 12,000 pages of printed law, and creating a computerised system that would store, update, and publish future revisions. As a result, the 1989 Revision was edited entirely on computer, and was published without any typesetting cost. Updates since 1989 have also been done entirely on computer, and only the updated loose-leaf pages have been printed. By eliminating typesetting costs and printing fewer pages, publication costs have been cut dramatically.

Now that all of the laws are on computer, such tasks as drafting and research are also greatly improved. Research projects that could have taken days, or weeks, manually are now being done in a matter of hours. We plan to expand electronic access to the law in the future so that even the general public can begin taking advantage of this great resource.

The First Analysis

The Bermuda Government first considered computerising the Revised Laws in 1985. The reasons for doing so were clearly seen at the time. No complete revised edition had been produced since 1971. Bound volumes of laws passed each year since 1971 were becoming too cumbersome to work with. There were not enough printed sets of the Revised Laws to serve the government and legal profession. The cost of preparing, typesetting, and printing another paper edition was going to be enormous.³

The computerisation of the Revised Laws would result in lower printing costs, and wider distribution. It would also deliver the ability to search and retrieve laws from a database, making legal research faster and more efficient. It would make the on-going updating process easier, faster, and less costly. In addition, the end product would be more useful to the legal community.

It was estimated that some 12,000 pages of law, or about 20 million characters, existed in the Revised Laws in

1985. The cost of manually entering all the text into a computer was estimated as well over \$100,000. The emerging computer technology capable of automatic character recognition was at least two years away.

The decision was made to wait until the technology evolved to the point that the conversion from paper to computer disk could be automated.

Phase One, Document Conversion

Technology evolved over the next three years, and finally reached a workable level in early 1988. The Cabinet approved the project in May, 1988, and two consultants were brought in to work on the project.⁴

The primary objective of the first phase of the project was to convert the laws from paper to computer disk. We obtained estimates from several data conversion firms, but the cost remained well over \$100,000. We made the decision to purchase the required equipment and do the data conversion in-house, to be completed by July, 1989⁵. Our reasons for this decision included the lack of assurances from potential vendors that they understood public law, the difficulty of monitoring quality control of work done overseas, and the potential spiralling costs if problems were encountered.

The equipment was installed, and the conversion process started in December, 1988. We completed the data conversion process two years later, in December, 1990. This was 17 months behind schedule, for two primary reasons. First, a lack of skilled labour available to do the conversion process limited our ability to progress quickly⁶. Second, we encountered a large number of pages that were typeset in Bermuda between 1971 and 1976 that contained sloping lines of text, and crooked type. We learned quickly that the recognition technology required neatly produced typesetting, and in straight lines. Much of this text had to be manually typed into the computer.

Phase Two, Desktop Publishing

Once we completed the document conversion, the next step was to format the text properly within a word processor. We had selected the Ventura Publisher software as the final platform for desktop publishing. We used Microsoft Word as the initial platform since Ventura stored its files in Word format. We considered this initial platform to consist of the basic formatting only, without graphics. We created a standard style for the Revised Laws, including new headers and footers.⁷

This portion of the project ended up consuming more time than the actual conversion from paper to disk. We did not anticipate beforehand that the automatic recognition technology only produced an unformatted text file in a standard typewriter font. Every document had to be manually formatted to appear in our new style.

During the time that it took to complete the formatting process, the Word software evolved to the point that it could handle graphic images, left- and right-hand pages, and other features that only Ventura provided in 1988. For this reason, we established Word 5.0 as our desktop publishing platform and removed Ventura from the planning.

By 1991, Word evolved once again, this time into the Windows environment. The advantages of a graphical user interface⁸ for editing, and a built-in programming language were so compelling that we moved our platform ahead one more time. We were able to do so because we still had a small amount of documents to finish in Word 5.0 and had not yet gone to press.

We ended up with nearly 1,000 document files containing over 10,000 pages of law. All the files were converted into the Windows environment by July, 1991. This new platform also provided us with a direct interface to the Linotronic typesetting system, thus eliminating the step of printing to a disk and then reading it into the typesetting machine. We created a program to allow the government printers to call up each document file,⁹ add crop marks¹⁰ to it, and then send it to the typesetting system.

We completed the formatting process and began typesetting the laws by late-1991. The complete printed sets of the 1989 Revision¹¹ were delivered by mid-1992.

Phase Three, Loose-Leaf Updates

The Revised Laws are being published in a loose-leaf format. As laws are added or amended, only those pages that have changed need to be printed. Loose-leaf publishing software was typically selling for \$100,000 or more,¹² plus the cost of another document conversion from our Windows platform. Another solution had to be found that fit within Bermuda's budget constraints. We found the solution within Microsoft Word for Windows and its inherent programming language.

In mid-1991, the Bermuda Government contracted Implex Corporation to design, build, and implement a legislative processing system within Word for Windows. Using the tools within this off-the-shelf software product, we created a series of programs to control the publishing of the loose-leaf updates, and automate the legislative drafting process.

To achieve maximum results, a local area network was installed in the Attorney-General's Chambers¹³ so that the Revised Laws can be accessed by all who will need to use them. Security procedures are in place to prevent unauthorised access. For instance, Crown Counsel may

only search and read the laws, not update them.

The system developed for Bermuda is divided into five major areas:

Drafting. Automates the legislative drafting process. Standard boilerplates were created for each major type of legislation. When a new instrument needs to be created, the system provides some of the standard text automatically. Since all legislation is on computer, the Parliamentary Counsel can easily search and retrieve relevant laws, and even cut and paste sections of text.

Editing. Used for editorialising legislation, and consolidating amendments for publication. The Editor tracks the progress of all legislation, and when new provisions take effect, prepares the legislation for publication. At this stage, instructions are created for the word processing staff so that they can make the changes through the updating system. This ensures that updated pages are processed and published correctly, and frees the Editor to concentrate on content rather than form. The Editor retains final control over changes that are made to the active database of laws.

Updating. The word processing staff use this part of the system to make changes to existing documents and prepare new legislation for publication. Work is sent back to the Editor for review. The key element of the updating system is its ability to modify, track, and print only those loose-leaf pages that are changed from the last printing.

Publishing. Manages and prepares updated loose-leaf pages for typesetting. A master table of contents that is kept up to date by the updating system allows for automatic generation of the table of contents and alphabetical listing of instruments for the Foreword. Replacement page instructions can also be generated for publication.

Annual. Manages the Annual Volume of Acts, and the Annual Volume of Subsidiary Legislation. Copies of legislation, as they were approved, are included in the annual volumes. Small cosmetic changes are made before publication, including placement of the Bermuda Coat of Arms on new acts, and creating headers, footers, and page numbers. Much of this work is done automatically by the system.

By combining all of these elements, we have created a complete system that follows legislation all the way from drafting to publication.

Electronic Access to the Law

The Attorney-General's Chambers has been able to search and retrieve the law by computer since early 1992.¹⁴ It is possible to search for all occurrences of a word or phrase, with a full set of logical and proximity search methods. This has greatly enhanced the research process and has already saved many hours of work.

It has always been our intention to expand this kind of electronic access so that anybody within government, or the private sector, can take advantage of this resource. The means by which we achieve this has yet to be determined. Several options are still under consideration.

CD-ROM.¹⁵ One disk can store over 600 million characters of data. That is enough room to have the complete set of laws for the current year, and up to 20 years for historical reference. For this reason, this would be an ideal format to produce as the disks are relatively inexpensive to produce. However, the low number of users may make the initial production and mastering costs prohibitive.

Floppy Disk. The entire database of laws could fit in a box of ten floppy disks. However, it would require at least 30Mb of disk space to unpack and use them. In addition, the same kind of production as CD-ROM would have to take place in order to build the search and retrieval methods.

Modem. An electronic bulletin board system could be established where those interested could dial in to search and browse the laws over a standard phone line. In addition, individual items could be transferred across the phone line by request. The technology to set up this type of system is only now becoming affordable and easy to maintain. This system would not be connected to the Attorney-General's network in order to provide maximum security.

Lessons Learned

Of all the major pieces of work that we accomplished over the past 5 years, only the document conversion process would be done differently today. We expended a considerable amount of time, and money, to complete the conversion.¹⁶ Even so, we probably spent less than if it had been contracted out to a vendor in 1988. And, by doing so we ended up owning a sophisticated optical scanner and computer, and the knowledge required to operate them.

Since 1988, optical recognition technology has come a long way. Today, the conversion process would be much easier, and cheaper, to perform. Part of the improvement comes from the ability to recognise not just text, but formatting as well. With a little bit of planning, the laws could be scanned in from paper and look very close to the original.

We could have significantly shortened the amount of time it took for the conversion process simply by having more people working on it at the same time. Because it took so long to do this portion, we were not able to have the 1989 Revision printed until 1991. If the decision had to be made again today, we would probably contract out the work to a firm specialising in document conversion. The main reason is because a specialist firm could have many more people on the job, and would be able to

complete it in a matter of a few weeks. We discovered that the timeliness of the publication was just as important as the accuracy.

The main reason we feel that we have been successful is that we had a vision from the very beginning, and held to it throughout the project. When technology evolved to a new level, we embraced it openly. We continually changed and adapted our methods of achieving the vision. Today, the system we have in place does not look anything like our original concept in 1988, but it is true to our original vision.

What the Future Holds

As we gain experience in Bermuda, further improvements and upgrades will be made to the system. Electronic search and retrieval will be expanded and made available to more people. If other jurisdictions get involved, the possibility of publishing multiple sets of laws in a single medium begins to make sense. It is even possible to end up with the law of all Dependent Territories on a single CD-ROM, and available by computer modem from a single source. Sharing the production cost over multiple jurisdictions would greatly increase the feasibility of this kind of project.

Any small Commonwealth jurisdiction that wants to computerise their legislation today will have a much easier time of it than we did in Bermuda. The time consuming, evolutionary process that we followed was the result of constantly being on the leading edge of technology. Today, the technology is a reality, and others can now benefit from the development efforts of the Bermuda Government.

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Legislative Processing System

The Legislative Processing System was developed for the Bermuda Government's Attorney-General's Chambers. Key features of the system include:

- Custom boilerplates to simplify creation of new pieces of legislation
- In-house laser-printing of pending legislation
- Production of replacement loose-leaf pages for printed volumes
- Direct interface to electronic typesetting systems for final output
- On-line searching of laws for easy cross-referencing

- Designed to run on industry-standard personal computers

Some of the benefits that can be achieved include:

- More efficient drafting process due to electronic retrieval of source materials, and ease of revision
- Amending provisions can be incorporated into existing legislation without requiring a complete re-print
- Typesetting errors are greatly reduced due to electronic interface
- Lower printing costs before and after legislation is passed
- Legislation can be printed in-house at any time for any purpose
- Laws can be distributed by electronic means, reducing paper

In order to achieve the desired results, a computerisation of laws project must be properly managed from beginning to end. Every jurisdiction will have situations unique to it that require different automation solutions than others. The core software, however, remains unchanged. A complete project might include the following steps:

- Create legal authority within jurisdiction to create and maintain laws in electronic form
- Convert existing (paper) laws to electronic files by optical recognition
- Procurement of necessary hardware and software
- On-site procedural analysis to finalise specific requirements for software customisation if needed
- Identify print shops that can accept electronic typesetting interface
- Mass editorial work can be applied to laws before publication to create overall consistency (if authority to do so exists)
- Initial publication of loose-leaf volume
- Installation and training of software
- Processing of all updates and publication of new loose-leaf pages

Project duration and costs will vary depending on the specifics of a jurisdiction, such as:

- Quantity of existing law
- Quality of existing printed law
- Amount of editing/modification of existing law
- Frequency of updates
- Amount of customisation required
- Other factors

REFERENCES

1. "Computer Technology in Law Drafting" by Ronald A L Coward. Presented to the Meeting of Attorneys-General of Small Commonwealth Jurisdictions in December, 1988.
2. "Computerization of the Revised Laws of Bermuda" by Bryan J Nylin. Presented to the Second Annual Meeting of Attorneys-General of Dependent Territories in the Caribbean and Bermuda in March, 1992.
3. A printing of 100 sets was done in 1978 at the cost of \$87,625, and they sold for \$1,500 including binders. An estimate in 1987 projected the cost of typesetting and printing 700 sets at over \$1 million. The total printing cost of the computerized laws cost about \$550,000 including binders.
4. The legal consultant to the Attorney-General's Chambers was Ronald A L Coward, former Solicitor General of Bermuda. The technical consultant to the Computer Systems and Services Department was Bryan J Nylin, the author of this paper.
5. The equipment purchased included the Calera CDP-3000XF scanner (later upgraded to the CDP-9000 model), a Compaq Deskpro 386 computer, Hewlett-Packard LaserJet printer with Postscript, and the Ventura Publisher software.
6. We were only able to get half of the manpower originally estimated for the six-month completion schedule. This alone caused a six-month delay.
7. Standard styles were created for such recurring items as section headings, subsection paragraphs, footnotes, arrangement of sections, etc. The header is the text that appears at the top of each page (eg. act name, title and item numbers). The footer is the text that appears at the bottom of each page (eg. page numbers).
8. The graphical user interface (GUI) of Windows is similar to that of the Apple Macintosh. The GUI is widely accepted as the easiest environment to work in. The graphic nature allows the user to see on the screen exactly what will print on the printer.
9. A document file typically contains the text of a single Act, statutory instrument, or other subsidiary legislation.
10. The Revised Laws of Bermuda is printed on 7 by 9.25 inch paper. Typical 8.5 by 11 inch output has to be marked to indicate where the edges should be cut to create the smaller page size. Since Word did not include its own crop marking, we had to create a complex set of instructions to draw the crop marks in the correct places.
11. The 1989 Revision included all laws passed through July 31, 1989.
12. The "Interleaf 5 Document Systems Software" was one example of a loose-leaf publishing system. The high cost and lack of local support in Bermuda were just two reasons we rejected its use in 1990.
13. The network consists of a Novell Network 386 file server connected to personal computer workstations in the Library, each Parliamentary Counsel, and the word processing staff.
14. We use a software product called Zylindex 5.0 to perform search and retrieval of the database of law document files.
15. CD-ROM is the designation for a read-only computer storage medium that resembles the standard compact audio disc. It is a low cost means of distribution, but requires that the end user have a CD-ROM reader attached to their personal computer.
16. The hardware and software to do the data conversion cost about \$75,000 in 1988. In addition, about 3 man-years of effort was needed to perform the actual conversion.