



WHITE PAPER

USING TECHNOLOGY AS A SURROGATE FOR MANAGING AND
CAPTURING VITAL PAPER BASED RECORDS

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What are Vital Records?

You have heard it many times but it is worth repeating. The term 'vital records' refers to that collection of information which is **essential for the ongoing operation of your business**, without which your business may fail. A more formal, text book definition is:

"Records that are essential for the continuous operation of a business and must be specially protected against possible disasters, both natural and man-made." operation of a business and must be specially protected against possible disasters, both natural and man-made."

Vital records aren't just "secret" things like formulae, patents, specifications and source code. Vital records are also records of company registration, tax records, contracts, agreements, etc.

Whereas it isn't the purpose of this paper to explain the processes necessary for the identification of vital records, it is important that you have some idea of the types of information it is necessary to capture using technology **because different types of information may require different technology**.

One more very important point to consider. There isn't one set of 'static' vital records which you can put away once and then forget about. Most organizations create vital records each and every day as part of the business process. Vital records are dynamic.

This fact is a major consideration when choosing appropriate technologies.

What Format?

We tend to think of vital records as paper, file folders, letters, reports, contracts etc. However, this is 1996 and in 1996 records are in many more formats than paper. Whereas we will look at the use of say, imaging technologies to capture vital records, we also need to realize that some of our vital records may already be in an 'image' or electronic format, for example:

- Microsoft word format on a hard disk drive
- WinFax Pro format on a hard disk drive
- Lotus notes format on a Unix server
- Microsoft mail format on a Novell server
- Voice mail format on a NT server
- Video image on VHS or Beta tape
- Transaction records in our corporate databases on the IBM mainframe.

This 'difference' of format is an extremely important consideration. It also makes the choosing of an appropriate technology even more difficult. In many cases, it dictates the need to use **several different technologies** to capture your vital records.

What do we mean by "Technology"

The New Collins Concise English Dictionary defines technology as:

"the application of practical or mechanical sciences to industry or commerce" and "the methods, theory and practices governing such application", or even more broadly, "the total knowledge and skills available to any human society". sciences to industry or commerce" and "the methods, theory

and practices governing such application", or even more broadly, "the total knowledge and skills available to any human society".

These definitions give me, and you, enormous scope. I am now able to use whatever aspect of technology that is appropriate to the problem at hand. Most importantly, I am not limited to computers, optical drives, DAT tape or microfilm. If appropriate, I could use a thumb nail dipped in tar or even paper, (heaven forbid!).

What are our Objectives?

Let's not get confused. The objective is not to have fun spending the boss's money using the latest, greatest, whiz-bang technology. The real objective is:

"to store an original record or facsimile, (an exact copy or reproduction), in such a manner that it is protected from harm or deterioration and can be retrieved and viewed or read at some indeterminate time in the future".

The technologies available to us are limitless and range from biscuit tins sealed with solder and wrapped in sewn hessian bags, as used in the First World War, to High Density ROM writing technology using UltraHigh Focused Ion Beams encoding up to 23GB per square inch of disk surface at the rate of a terabyte a day.

What are our Alternatives?

Magnetic

When we speak about magnetic media we generally mean conventional hard disk drives and floppies utilizing either a SCSI or IDE interfaces.

When considering the use of magnetic media, two things are certain:

- we are nowhere near the limits of conventional 'hard' disk technology; and
- the cost of 'hard' disks will continue to fall at a rate of 50% a year or greater.

So, we can be assured that the hard disk vendors will continue to be able to cram more and more data per square inch and that the cost per byte stored will continue to fall at a very rapid rate.

This means that conventional 'hard' disks will always be a most cost-effective way to store information, significantly more cost effective and 'user friendly' than optical disks. In today's market, \$1,000 buys at least two Gigabytes of reliable, high speed, easy to install, easy to use, **standard interface**, SCSI storage.

However, is this an appropriate medium for storing vital records?

Absolutely, given that the facility is 'off-site', regularly updated, regularly backed up and that the back up is regularly transferred to the latest hardware and software technology. **Have you recently tried to read an ESDI hard disk written on a PC XT in 1983?** (I bet that you, like me, can't even find the interface cables.)

Tape Units

Magnetic tape is a reasonably durable medium.

I have several 'twenty-four-hundred-foot' tape reels written at 1600 bpi on an IBM mainframe about eight years ago that I can still read on any 'open reel' tape drive. I don't need the original tape drive or computer or operating system because all vendors wrote their tapes in an industry standard

manner. I can use practically any similar tape drive today on virtually any operating system and have an excellent chance of reading these tapes. This is one of the strengths of this type of media.

However, I have great difficulty reading a 40MB tape cartridge from a proprietary drive installed in one of my 286s about the same time, 1988 or so, because the format used to encode the data was not an industry standard.

The 'cartridge' situation, unfortunately, has not improved much since 1988. Let me give you an up-to-date example of 'non-standards'. You can go out today and buy DAT tape drives from several different vendors at several different capacities (1GB, 2GB, 4GB, 8GB and 16GB) and I guarantee that you will have major problems with tape compatibility because of the compression technology used in the hardware of each tape drive and the differences in the backup software used by each vendor. This is a major weakness of the current generation of DAT tape drives.

So, is magnetic tape a good medium to use for vital records?

It is fine as long as each backup is verified, regularly tested and regularly transferred to your most current technology, e.g., 2GB drive.

Optical

In the past, 'imaging' has been incorrectly linked to optical disks. I have as recently as a few months ago heard an IT Manager talk about "optical disk" all of his company's data. When I said, "*I presume you mean to capture images of your data*", he replied, "*yes, optical disk it!*"

You don't need optical disks to process images. Images can be written to conventional hard disks, floppies, magnetic tape and even microfilm. Optical disk is only one of many storage options.

Imaging and optical disk are not synonyms!

So why do we see so many organizations using optical disk for information storage? The reason is normally associated with cost and media 'life', (the remainder or extent of its life.)

Whereas the initial capital cost of an optical device is usually higher than that of a conventional 'hard' disk drive, the use of removable media, (i.e., optical cartridges and platters), can reduce the average cost per byte stored to a level below that of conventional 'hard' disk.

Most optical disk vendors claim between 10 and 100 years as the 'life' of their devices. This means that you will be able to read them again when required. However, the "100 years" certainly hasn't been put to the test and we severely doubt, without major improvements in medical technology, that the sales person guaranteeing this performance today will be around to sue in 99 years if it doesn't work!

Why isn't optical disk in more sites? Why is the current use of optical technology far less than predicted by the industry five years ago? Largely, because in the past:

- it was too costly;
- the I/O (Input/Output) technology was 'non standard'. The optical drives weren't supported under the standard operating systems of the day and 'special' software, drivers and interface code were required often putting it into the 'too hard' and 'too expensive' category; and
- there was no standard for encoding, an optical disk on one vendor's drive couldn't be read on another vendor's drive.

What is the situation today?

- Imaging is becoming an essential part of any application. We talk of 'image enabled' applications. Imaging as a feature is becoming ubiquitous. Every user now expects an application to be able to handle images.

- Optical drives are now low cost and largely supported under standard operating systems, (though there are still many propriety, 'non standard' examples). Recordable CD ROM drives for example can be bought for around \$1,500 whereas only a few years ago it would have cost \$250,000 to buy a device capable of mastering CD ROMS.
- These new recordable drives attach to your PC in the same manner as a normal CD ROM and work as drive "D" or "E". They are cheap to buy, easy to install and use.
- They support industry standard formats so that CD ROMs produced in this manner can be read by any other CD ROM drive the same way a 1.4MB floppy can be read on anyone's PC.

Is optical technology suitable for vital records? Absolutely yes. However, if you plan to use optical disk for the storage of vital records try to ensure that they write data according to a common industry standard. Don't get locked into proprietary technology. Also ensure that, just as with magnetic media, you regularly transfer your vital information to the latest technology in use.

Microfilm

Are you aware that John Benjamin Dancer first invented microfilm in 1839? Or that it was used by the French during the Franco-Prussian war of 1870?

With Paris completely surrounded by the Prussian armies, the French postal authorities used pigeons and microfilms to communicate with the guerrilla forces fighting in the provinces. Is this the first example of P-Mail with a FLAPI interface? (This is an in joke for the aware IT.)

The use of microfilm in the commercial world began with a New York banker called George McCarthy in the 1920's who used microfilm to make a positive record of cheques that were returned to depositors or forwarded to other banks.

Did you realize that a four by six-inch microfiche, utilizing a 75X-reduction technique, can store more than 1,600 pages? That the new 'Ultrafiche' technology using 150X and above reduction technology can store up to 3,300 pages on this same microfiche card?

And finally, did you know that using a 'ScreenScan' microfilm scanner, you can convert microfilm into images (automatic retrieval of blip encoded microfilm images) and transfer them directly onto your PC's disk drive in TIFF Group 4 format?

Microfilm is an entirely appropriate technology for the storage of vital records. It is durable, low cost, requires little storage space and is not dependent upon current technology so you can be assured that it will be 'readable' ten, twenty, fifty or even hundred years in the future.

Paper

I can still read a document I created over 13 years ago when I first set up my company. I can go to the library and read books, which are hundreds of years old. However, I am no longer able to read a WORM optical cartridge I created six years ago and I have no chance of reading backups I took on my Burroughs ET2000 PC eight years ago.

- Paper is not bad.
- Paper is one of the greatest inventions of all time!
- Paper lasts for centuries, modern 'archive' quality paper will probably outlast you, your children, your grandchildren and your great grandchildren and your great great grandchildren. Modern, specially designed 'archive' quality paper is the result of advanced technology. It is a perfectly acceptable medium for vital records.

Please don't disregard paper out of hand. It is always one of the mediums you should consider when building your vital records program.

Other

Technology is changing at an enormous rate. For example, today most CD ROM cartridges hold around 600MB of information (say 10,000 A4 pages) yet the technology now exists to store more than ten thousand (10,000) times this amount (100,000,000 A4 pages) on a single CD ROM cartridge.

An example of this new technology is called 'Focussed Ion Beams' and was developed by the Los Alamos National Laboratory (LANL) in the US. As mentioned earlier, it can encode up to 25GB (Gigabytes) of information per square inch of disk surface.

The first examples of this technology are now being marketed by a US company called Norsam. They will release a CD ROM writer in August this year called the 'Rosetta Analogue Data Storage System'. It can store one million (1,000,000) A4 pages on a five and a quarter inch CD. Furthermore, any data thus encoded is permanent and not subject to abrasion, electromagnetic pulses, temperature or atmospheric changes. The only way to destroy the data is to destroy the disk!

And finally, **this same optical disk can also be read by-any conventional CD-ROM drive!**

The down side to this technology is cost. A mastering system will cost around one point six million dollars Australian, (\$1,600,000). Just a smidgin more than most of us are prepared to pay. However, I am prepared to bet that the cost drops significantly over the next few years. I am also prepared to bet that we will also see service bureaus offering this technology within twelve months.

In my opinion, this particular technology represents the first serious threat to microfilm technology for large volume archival procedures.

Dispelling Some Myths

Paper is an inappropriate medium for vital records storage.

Not true. Modern archive quality paper is a durable medium and may well be an appropriate choice for some of your vital records. Even old, non-archival quality paper has proven to be a remarkably durable medium. Try visiting some of the great libraries of the world, read books and manuscripts, which are many hundreds of years old.

However, when contemplating using paper as the storage medium for vital records remember that the environment is all-important. Paper should always be stored in a climate-controlled environment and this cost should be taken into account when deciding on the most appropriate medium for your vital records.

Optical disk is an ideal medium for vital records storage.

Earlier, I gave you an example where I was no longer able to read a WORM cartridge I had created some years previously. The reason I couldn't read it were:

1. the drive was no longer installed;
2. the software drivers used only worked on the then, 1988 version of SCO Unix; and
3. the format used was proprietary.

The data is probably still intact on the cartridge, (of this I have little doubt), but to read it I would have to resurrect the old hardware drivers and vendor's software, hire a programmer to upgrade them to the latest version of SCO Unix, (or install an old 1988 version of SCO Unix if I could find it and the activation key), find the cables and the interface card, install the original Maxtor drive (hoping that it still works), and then pray, (we had plug and pray long before Microsoft coined the phrase).

In fairness to the optical industry, this isn't just a problem with optical drives. I have also old backups in the following formats:

- Apple 2E diskettes (128KB format)
- Burroughs ET2000 diskettes (810KB format)
- IBM PC XT diskettes (1 MB format)
- Burroughs BTOS diskettes (1MB format)
- 40MB DC2000 half inch cartridge tapes

I can't read any of these without enormous effort and the resurrection of museum type hardware, (most of which I actually do have stored away). Even then, the possibility is that at least 50% of the diskettes and cartridge tapes will be unreadable.

This is not to say that optical drives aren't an appropriate medium for vital records. It is just that, in my humble opinion, they aren't as good as paper or microfilm; (now I am going to have the optical disk industry up in arms or after my head!)

If you write to any kind of magnetic or optical media you must regularly transfer the records to then current technology. Don't expect to be able to read a twelve-inch optical platter written in 1995 in 2005 because you won't have the physical drive or any of the required software **and the optical drives of 2005 will not be able to read it!**

The use of any kind of magnetic or optical media means a commitment to regularly transfer the records to new technology. The fact that an optical cartridge may have a guaranteed life of 100 years is totally irrelevant because of the need to transfer the information every five years or so.

Microfilm is out-of-date technology

Hardly! Microfilm is in fact far better than magnetic or optical media when it comes to 'safe' technology, (the only kind we are interested in for storing vital records). I can still read microfiche I used twenty years ago when I worked for Sperry Univac. I don't need the original reader, any reader or even a good magnifying glass will do!

This same twenty-year-old fiche is in perfectly good condition even though it has never been climate protected and has shared a drawer with a variety of substances including stale pizza, (I used to be a programmer).

You will recall that I spoke earlier about the microfilm produced by Rene Dagrón during the Franco Prussian war. Fortunately some of these earlier microfilms have survived and they are still perfectly legible after more than one hundred and forty years!

The current technology of microfilm and the ongoing improvements to this technology make it an entirely appropriate, convenient, low cost and 'safe' technology for the storage of vital records.

A Final Warning - The Data Explosion

When we installed our first Novell file server in 1988 or thereabouts, it was a NEC Powermate 286 with 80MB of disk space. Our workstations were also 286's with either 10MB or 20MB hard disks.

My current file servers hold 20GB of data and our latest Pentium workstations have 800MB hard drives, (the smallest now available).

That's a growth of 250 times or 25,000% in just ten years!

Have you looked at the growth of your records lately?

Whereas traditional vital records may not have experienced this same explosive growth, they have certainly grown at a significant rate. Is this not the era of the 'data warehouse'? What proportion of your corporate database could be considered to be 'vital'? How many of the millions of records stored in your corporate file servers and mainframes should be considered 'vital'?

This explosive growth factor is a critical ingredient when deciding what technology to use to store the various types of vital records in your organization.

Conclusions

Fifty years ago, the problem was much more straightforward. You identified your vital records, which were all paper based, you bought a fire proof safe or you held them off site, probably in a bank vault or safe deposit box. The more frugal stored them either in the attic or basement of their house.

Today (and tomorrow) the vital records problem is both much larger and much more complex. Your vital records are in multiple formats and are much more dynamic. Just identifying your vital records today is a hundred times more complex task than it was fifty years ago.

You have no choice but to use a variety of technologies to safeguard them.

The good news is that there is any number of appropriate technologies available including:

- magnetic media
- optical media
- microfilm
- paper

Recommendations

1. Hire an expert to identify your vital records and prepare a vital records program and retention schedule.
2. Formally review the vital records program and schedule at least once a year.
3. Ensure that your expert and your IT department **work together** to implement an acceptable, cost efficient solution using proven technology that is consistent with your IT direction and business goals.
4. You don't have to spend a fortune, but you do have to spend enough!

It's no wonder that the end users are confused when the vendors' definitions for the above software applications are often confusing, overlapping and sometimes downright misleading. It is patently obvious that some software vendors write their documentation long before they actually produce the product. Comparing the functionality of the "glossy" to the actual product can sometimes be more than disheartening.

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