

Supreme and Federal Courts Judges' Conference

Technology for Judges and in Courts

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When I was in high school one of my most highly regarded teachers had the vision to introduce my class to computers. Computers will, in the future, be important, he said, but unreservedly he assured us these machines would never have the capacity to compete with a human being. Certainly, for example, they would never be capable of dealing with the complex logic of Chess.

When I sought tertiary qualification in Science and Law in the mid 70's the idea was treated with derision. At that time not a solitary University offered a combined Science Law program. My master solicitor advised me in his wisdom that I had the promise to become a good lawyer if only I would concentrate on Law and stop wasting time with irrelevant science study.

In spite of his advice, I continued and after quite a few years of uncertainty I had the good fortune to be re-engaged as a consultant by his office, now under new management, and did not need to say I told you so. By the early 80's a team of 12 legal practitioners and a substantial para-legal and secretarial team undertaking conveyancing had been replaced by 2 qualified lawyers, 3 clerks and 3 word processor operators.

These were the first days of technology applied to legal practice. Since then, the use of technology in the law has increased exponentially, progressively moving its focus from relatively routine areas of practice to the more arcane specialties. While not all legal practitioners and Judges yet agree, I would contend that even now at most levels law cannot be practiced effectively without the regular use of computer technology.

Today, ignoring new technologies on the doorstep, we are confronted with a plethora of devices and systems each capable of revolutionising the way we work creating a danger that technology may become an end in itself. The pivotal importance of designing effective procedures and weaving into them technologies to improve the fabric is often lost. The ambition of some technologists and others to be at the leading edge has resulted in many basic, low cost technologies being neglected.

In this paper I am attempting to redress this balance, focusing on the capabilities and benefits of easily accessible low cost technologies, the technologies which should now be the foundation of all information based professional practice. The value of proven higher level technologies is easily demonstrated. Two factors, however, conspire against their wide availability in the short term. First, the effort of their initial implementations and hence cost is high, consequently return must be dramatic before funding will be found. Second, there exists an extreme shortage of persons with the appropriate technical and business analysis skills.

What then are we trying to achieve with technology for Judges and in judicial process?

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Judicial Technology Vision

There is no shortage of criticism of the processes of law. Regularly it is claimed the processes are too expensive, too slow, unequally accessible and ultimately that they produce results not in keeping with developing community views. It is not my role to assess the validity of these claims. Regardless of these assessments, however, various technologies have the capacity to improve the performance of our system of justice. We should measure suggested technologies in these terms.

Technologies should be fostered which:

Reduce the Duration of Hearings.

If we can reduce the duration of hearings without compromising quality, the judicial system will be capable of carrying a greater load without increasing demands on state resource.

Improve the Availability of Materials.

If we can make evidence and legal authority more readily available, judicial deliberation will be more comprehensive improving the quality of decision making.

Reduce Direct Costs.

If we can reduce the demands placed on parties to proceedings and reduce costs, the accessibility of justice will be improved.

Reduce the Workload of Judges and Legal Practitioners.

If we can reduce the workload of Judges and others during the course of hearings the capacity of our system of justice will be increased.

Judicial Technology Must Contribute To Higher Quality, More Accessible Justice.

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Session Structure

Identify Technology Options

The first part of this paper examines four levels of technology, which may be applied in judicial practice. The four levels move historically from the earliest computing capabilities to the more recent and in parallel from the simplest lowest cost options to the most complex integrated systems currently in use. The identified levels are:

Level 1 - Databases to Organise Materials

Level 2 - Full Text Search to Support Research

Level 2a - Real-Time Transcript the Instant Searchable Court Record

Level 3 - Images to Replace Paper

Level 3a - Simulation Technology to Animate Images

Level 4 - Communications and System Integration; the Virtual Courtroom

At each level I will seek to:

Identify and describe the capability of the technology.

Identify and compare the conventional equivalent method.

Illustrate the technology by demonstration.

Examine the resource and effort requirements necessary for implementation.

Examine the most prominent issues to be considered before using the technology.

Without dismissing higher level technology, my intention is to focus on base level, low cost technologies. With the exception of Internet research sources, which will be dealt with by Professor Greenleaf and Ms Davey, and the case management systems currently being developed by Court administrations, it is intended that the review will touch the full range of major technologies available to address the objectives previously identified.

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Examine Legal and Courtroom Management Issues and Implementation Options.

Throughout my presentation, apart from identifying issues requiring judicial consideration, I will try to avoid the temptation to debate the approach which presiding Judicial Officers should take to the implementation and management of technology within Courtrooms. These issues will be raised by Justice Smith of the Victorian Supreme Court, the presiding Judge in the Estate Mortgage civil litigation, who will present a case study using his experience in that case.

Project a View of Future Technology.

Finally, I will look briefly to technologies that have not yet been seriously applied in the courtroom or other parts of judicial practice examining change in both technology and process, which should be planned for. I will also look at resource requirements and the implementation alternatives, which could make the required technology and systems available.

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Level 1 – Databases to Organise Materials

Conventional Equivalent

In the conventional environment evidentiary materials are typically analysed to extract a range of structured data and made available through lists, which are ordered by single criteria. The discovery list is typically a chronology of documents which includes some descriptive detail, usually at least, the document date, subject, author, addressee and document type.

The parties typically supplement the discovery list with private analysis and secondary indexes, which group materials by issues, by author or by other key indexes dependent upon the nature of the matter.

In the courtroom, new lists are created sequencing documents by Exhibit and MFI number. These lists are often the only index of materials available to the Judge.

In the strictly paper environment this means that if the Judge wishes to examine all documents written or received by a particular person or relevant to an identified issue, the exhibit list must be read, relevant documents identified, selected manually and ordered as required. This process is repetitive and laborious.

Database Capabilities

A database stores the same data elicited by the process of analysis applied conventionally. The essential difference is that analysis collected in a database can be “searched, sorted or grouped” using the capabilities of the database on any category of information, “field”, or combination of fields, which have been collected.

Search provides the capacity to immediately identify material, by reference to a single or multiple criteria such as author, issue, date or any other data collected in a field.

Sort provides the capacity to sequence materials within the collection. Alphabetical list of authors, chronologies, issues and other sequences can be created with the click of a mouse, dynamically.

Grouping provides the capacity to establish dynamic subsets from the complete collected data. Grouping by author will divide the complete collection between identified authors, sorting the resulting groups by date will then create dynamic chronologies for each author.

Compound retrieval processes can be applied, for example, to identify materials in the collection written by or addressed to an identified person, about a particular issue between a commencement and end date or on any other compound criteria which can be identified within the collected data.

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Database Resource Needs

Facility – Software and Hardware

Database software capable of the functions described above is provided with the majority of base level home computer packages offered by retail outlets. Typically a computer of this type currently costs between \$2,000 and \$2,500, inclusive of software. Suitable quality software purchased independently of a computer is available for less than \$500. Currently the most widely used product of this type is Microsoft Access.

Today, a typical new home or basic office computer will consists of a 300 Megahertz (Mhz) Pentium processor, will provide 32 or 64 megabytes of active memory, "RAM", and 4 Gigabytes GB, 4,000 Megabytes MB of data storage.

From a volume perspective a base level computer of this type is capable of containing the data relevant to a collection of more than 500,000 documents. By comparison, the Estate Mortgage database (distinct from the library of images) required only 50 MB of storage, 1-2% of the capability of a current basic office or home computer.

Different parameters apply if the system is to be networked or if imaging is contemplated. The overheads of imaging are described later.

Effort.

The effort required to establish a database is essentially identical to that required to create an initial index list. In fact, all large firms and many others are already preparing the majority of significant discoveries using this technology. I would contend it would be reasonable for a presiding Judge, to require parties to provide either a fully functional database or, as a minimum, a suitably defined list in machine-readable format. Within the limits of my knowledge, all medium and larger law firms are now technically competent to generate and deliver such systems.

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Database Implementation Issues

Databases share effectiveness issues with conventional approaches to materials organisation. If the data and outcomes required are understood and the document analysis properly reflects that understanding, then generally it will be possible to locate the required material.

The essential risk with databases is the temptation to collect excessive volumes of marginal information. The cost of additional analysis effort is often forgotten or underestimated and the end result may be a complexity, which serves to obscure rather than assist the retrieval process. Put simply, if the required data has not been collected, retrieval on that basis is impossible. Conversely, too much data increases cost dramatically and may serve to obscure core issues.

As with all new practices, the need for skill development and the risk of lost effort during the course of learning must be recognised. It is almost inevitable that the new database user, particularly if unsupported and/or untrained, will damage or destroy some information while becoming proficient with the technology.

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Level 2 - Full Text Search to Support Research

Conventional Equivalent

The capacity to search the content of the text of documents has no real equivalent in the conventional environment apart from simple reading, notation and recall. In complex documents, indexes and tables of content provide some assistance.

Full Text Search Capabilities.

The essential differences between free text searching and the search capabilities which are typical of the conventional structured database revolve first about the material content which is being addressed and second about the structure of the data itself.

Material Content and Data Structure

A free text search retrieves documents based on the actual words within the document. This is unlike the search of a structured database which retrieves based on the words and other data, which have been written about the document during the course of professional analysis.

Generally, when searching the full text of a document, the retrieval process does not distinguish a date, the author's name or issues from each other or the body of the text. This means that chronologies, author and issue sets etc, automatically produced in the database environment, cannot be easily created. Another problem is that the words used for a free text search are not necessarily the same words, which being used in the proceedings to describe a particular concept. Some years ago, I was involved with an inquiry into bribery. The participants in the inquiry consistently used the word "drop" to describe the bribe, to the exclusion of the actual word bribe.

A database should be used to capture structured professional analysis while full text search capability should be used to research and retrieve materials outside the scope of that structure.

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Search Capabilities

Free text search capabilities allow a word or phrase to be located and more complex logic to be applied to determine relationships between words and phrases in a document. Hence, documents may be sought which:

1. Include both the words "A" AND "B"
2. Include either of the words "A" OR "B"
3. Include the word "A" but NOT the word "B"
4. Include the word "A" within a defined proximity of the word "B"

In the full text environment, the concepts of sorting and grouping and complex structured queries as they apply in the conventional database environment do not apply. When using this process it is thus still necessary to locate, sift and refine search criteria in a manner typically unnecessary in the structured database.

Full Text Search Resource Needs

Facility – Software and Hardware

Again, a current generation basic office or home computer is capable of supporting quite substantial collections of full text libraries. Typically collections of 20,000 to 50,000 documents will present no difficulty.

All systems are delivered with some full text search capability, but typically these free services are limited. Higher level commercial products, of which ISYS is the largest selling relevant product in Australia, are available for approximately \$500.

Effort

The process of creating indexes to support full text search is simple and in many environments, fully automated. The complication associated with the creation of full text libraries comes with the need to first obtain the text in machine-readable form. I have dealt with this as an implementation issue in using this technology.

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Full Text Search Implementation Issues

Full text search can only be applied if the relevant material is available as machine-readable text.

In the case of research materials, found on the Internet or on CD based subscription services this does not present any difficulty. Typically these services are delivered with fully functional integrated full text and structured services.

In the case of transcript, the availability of machine-readable text is generally not a problem but the user must structure the library for retrieval. Transcript is normally available from transcript providers on diskette in machine-readable format. In cases where it is not, printed transcript can usually be subjected to a character recognition process, which will work with necessary reliability provided the original copy is reasonably clean text.

In the case of documentary evidence the situation is most often complex to the point of practical impossibility. Normally, machine-readable text is not available and even if it is, the version provided cannot always be relied upon as an accurate rendition of the material submitted in evidence. Often, for example, a witness statement will be prepared and signed only after some handwritten, normally critical, amendment has been made. In more than one case I have been provided with an original word-processed text version of a statement unamended to conform to the final.

Typically, other documentary evidence consists of old, marked paper, which cannot with current technology be reliably automatically converted to text. In these circumstances the capture process, copy typing, is expensive, difficult to justify in anything other than exceptional circumstances.

Finally, perhaps repetitiously, it is important to reinforce the distinction between structured data, collected in a database and full text, collected in discrete unstructured files. Traditional databases store data made available through the professional analysis of collected materials. Full or free text is the capturing of the actual words within the materials.

The mechanics of the two technologies and their appropriate applications are quite different. Neither one can effectively satisfy the central purpose of the other.

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Level 2a - Real-Time Transcript

Conventional Equivalent

In superior courts, transcript is most often delivered in hard copy or on diskette within a relatively short period of the completion of the day's sittings. Conventional transcript may or may not be made accessible through the full text retrieval tools referred to above.

The traditional approach is limited in that the presiding Judge and practitioners must make notes during the proceedings, which must subsequently be associated with the printed transcript as necessary.

Real-Time Transcript Capabilities

Immediate Availability of Record

The most evident capability of real time transcript is the appearance of the text of words within a few seconds of them having been spoken. At this level, a number of benefits are delivered:

- The record of the proceedings can be challenged and is for most practical purposes confirmed immediately. This allows immediate correction, reduces the need for evening reading of the transcript and largely eliminates any challenge to the record at the beginning of the next day of sittings.
- It reduces the need to repeat questions and provides a greater degree of accuracy when a witness loses track of a line of questioning.
- It facilitates the examination of hearing impaired witnesses.
- It aids Judges and legal practitioners who may have difficulty understanding witnesses who are difficult to hear or who have accents.
- Facilitates the handling of objections to questions.

It does not help if it is the real-time operator who has failed to hear the question or answer.

Free Text Search on Immediate Record.

The availability of machine-readable text makes possible the immediate search of transcript using the facilities described previously. This means, for example, that practitioners who perceive a contradiction in current evidence can find the relevant earlier material and focus their cross-examination on it without the need to seek delay for preparation. Similarly, the Judge can quickly refer to the record when arguments arise about previous evidence.

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Capacity to Mark and Annotate During Proceedings

Similarly, the availability of text provides the opportunity to legal practitioners and the Judge to mark and annotate transcript during the course of hearings.

Automatic Witness and Exhibit Lists

During the course of evidence, real-time transcript writers put in place markers which identify the commencement and conclusion of a witness's testimony and which identify the marking or admission of exhibit materials.

Based on these markers, real-time transcript systems are capable of automatically generating witness and exhibit lists.

Real-Time Transcript Resource Needs

Facility

The receiving and management of real-time transcript does not demand high level computing power. Again, the current basic office or home computer is more than adequate to the task. Commonly, however, portable computers are preferred to standard computers for this purpose because of their small size, reducing the occupation of bench and bar table space, and portability, making it possible to remove the computer to chambers, office or home as necessary.

A suitable laptop computer configured similarly to the current base level computer specified previously retails for approximately \$3,000. The pricing of transcript receiving and management software is highly volatile, a consequence current vigorous competition in this market segment. In some instances software is made available at very nearly no charge, on other occasions products range up to \$50.00 per sitting day or \$2,000 for a permanent licence.

Effort

Real time transcript is a product of the effort of two highly skilled operators. In this respect real-time transcript is more effort intensive than conventional transcript service. Typically, the cost of generating real-time transcript ranges from \$1,500 to \$2,000 for a full day of hearing.

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Real-Time Transcript Implementation Issues

Perception of Cost

In some environments the cost of real-time transcript is perceived to be high but most often in the current climate the daily fee is a total figure shared between the parties. As a result, for a multi-party hearing it is often the case that real-time transcript is now significantly cheaper than conventional service.

In Estate Mortgage, for example, the component cost of real-time transcript was \$1,500 per day, less than \$150 per party per day, less than 25% of the then current page rates of the major conventional service providers.

Availability of Quality Writers

It is unlikely real-time transcript, as we currently understand it, will ever become the norm for transcript service simply because proficient writers are scarce. Training and development of acceptable proficiency requires time and a high level of commitment. The work itself is highly stressful.

Encroaching Alternative Technologies.

While I am sure current writers will never be without work, ultimately, alternative transcript management technologies will replace real-time transcript writers.

In the short term, audio transcript management offers an effort free alternative to the use of real time transcript. Audio management technologies allow the marking and text annotation of a point in a digital audio record, which can then be recalled, for review at the end of sittings. Audio transcript management is currently limited by its relatively high capital cost and relative restriction when compared with text based real-time service.

In the longer term, it is probable voice recognition will be developed to the point where near simultaneous machine generated text from multiple speakers will be possible. This capability, however, presents serious technical challenges and is in practical terms is at very least several years distant.

Disadvantage to Parties Without Access.

In the absence of the widespread use of real-time transcript and in the context of the continuing reduction of prices for capable computers and software it is unlikely any represented party will be unable to make use of real-time transcript whenever it is being generated.

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Level 3 - Images to Replace Paper

Conventional Equivalent

The traditional courtroom examines the recollection and opinion of people in the context of physical evidence. The physical evidence, mainly documents, is copied, passed around the courtroom through the hands of Counsel, the Sheriff, and Associate, Judge examined and commented on by all participants to the proceedings. Where large numbers of documents are involved the physical copying and handling of the materials becomes a significant part of the cost and duration of the proceedings.

This process of locating materials is assessed to average 2 minutes per document in substantial proceedings.

Image Capabilities

In the image driven courtroom, the image of the item substitutes for the paper copy, dramatically reducing the time required to make evidence available to participants and reduces or eliminates the cost of document reproduction.

The image is best likened to a photograph or photocopy of a document but it is distinguished by its presentation on a screen in place of paper.

The essential benefit of screen presentation in the courtroom in place of paper is the simultaneous availability of the image to the Judge, legal practitioners, witness and others as necessary, eliminating the need for each participant to separately locate a copy of the document before the proceedings can continue.

In the basic imaging courtroom, the images are made available from a local network, which is not connected, to the private systems of the parties, the Internet or other external systems. At this base level, images can be made available either through screens, which are a slave to the operator's computer, or by independent retrieval using separate computers attached to the network.

The second significant benefit of images is their portability and potential availability through communication links. A single CD will store 10-15,000 pages of document images, the equivalent of 50 lever arch folders of material. Across a properly configured communications link a page will become visible within 10 seconds of being requested.

The image is not text. It is not, in its base form, searchable using the mechanisms described previously in levels 1 or 2.

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Imaging Resource Needs

Even at its most primitive level, imaging technology requires a more substantial computer and in my view in the courtroom requires the presence of an independent system operator.

Computer Facility

At its minimum level the courtroom must be equipped with a high powered stand-alone computer which the operator uses to deliver images to large, high resolution screens available to the Judge, witness and legal practitioners. This base level facility, including an operators computer (400Mhz, 64Mb, 12Gb) and 6 large high resolution screens (21" 1600X1280 resolution), has a current approximate capital cost of \$25,000 or a sitting day rental of approximately \$125.00.

A more advanced facility at this level, providing independent access to the image library for the Judge and legal practitioners requires the introduction of a file server and local area network facility. The core of a facility of this type has a current approximate capital cost of \$50,000 or a sitting day rental of approximately \$250.00. These figures are indicative. They do not include installation effort and would depend on minimum rental periods.

The largest component of this cost is attributable to the provision of large, high-resolution display screens. While it is tempting to reduce cost by reducing the quality of these display devices in my experience this approach makes the use of images significantly less comfortable for participants, creating resistance to the technology which in turn reduces its effectiveness.

Effort

The use of images is dependent upon the availability of a library of images. Commonly, particularly in larger matters, these libraries will have been created by parties to the proceedings and can be simply made available to the court. In the event that an image library must be created, the cost, using contractors set up to handle high volume, is approximately equivalent to the cost of creating a complete photocopy set, roughly \$0.20 per page. Subsequent copies of images can be generated at virtually no cost, typically less than \$0.01 per page for CD versions.

The presence of a trained independent operator in the courtroom, considered by some unnecessary, but in my view essential at this technology level, is approximately \$750.00 per day.

For more complex level 3 systems, particularly those delivering both independent imaging and real-time transcript service in multi-party proceedings, consideration should be given to the engagement of technical support service. If required these services are available at approximately \$750.00 per day.

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Imaging Implementation Issues

Saving 1/3rd of Hearing Duration.

There is strong agreement that the use of imaging in the level 3 technology courtroom significantly reduces hearing duration. In the assessment of Justice Slattery, the presiding justice in the Kalajzich inquiry, hearing duration was reduced by more than 1/3rd, a saving to the State of more than \$3,000,000.

Clearly the extent of savings is dependent upon both the extent of the technology applied and the specifics of the proceedings.

Judicial and Practitioner Skill and Acceptance.

Hearing duration savings are achieved without hands-on participation by Judges or legal practitioners and are therefore essentially independent of their acceptance of technology and skills

Other benefits at this level, those derived by the private retrieval of images, use of free text retrieval and structured databases, however, rely upon the direct use of the technology by Judges and practitioners and are therefore dependent upon the acceptance and skill of those participants. More complex implementations of imaging create both the opportunity for greater benefit and the risk of limited value if participants are resistant or untrained.

I should observe that the general level of computer literacy of Judges and legal practitioners has improved dramatically in recent years. Resistant, unskilled practitioners are now the exception rather than the rule.

Capital and Operating Cost.

At level 3, both the capital and operating costs, which associate with the technology, are substantial. Consideration of technology must balance this cost against a realistic projection of savings.

Integration with Lower Level Technologies

More advanced implementations of imaging technology readily integrate lower level technologies, including limited database, full text and real-time services addressed previously. These services can all be made available through a single computer.

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Security

The use of images in a computing environment contained within the physical boundaries of the court raises only limited concerns.

As indicated previously, basic image operation does not provide for any interaction between the court system and the presiding Judge or practitioners, hence no data is available other than that which is necessarily public.

More sophisticated implementations integrate other technologies to record the private observations of the Judge and practitioners. The securing of these interactions, in the absence of level 4 technology, is not technically difficult, but users must be aware of the exposure and should question technical staff to ensure proper protection has been implemented. I have been exposed to circumstances in which, with only basic technical knowledge, the transcript annotations of a Judge could have been captured by anybody with access to the court network.

I should observe that this risk does not exist where real-time transcript operates without network connection.

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Level 3a - Simulation Technology – Animated Images

Simulation technology is used to supplement the testimony and static illustrations of expert opinion given in proceedings. Four examples illustrate its use:

1. In the re-creation of an accident event, graphic animation can be used to substitute for a series of drawings and commentary to describe the detail of the event, as it is believed to have occurred.
2. In attempting to describe a complex series of financial transactions believed to be intended to obscure the ultimate application of funds, graphics may be used to illustrate connections between transactions which would otherwise be difficult to understand.
3. In an engineering case the calculated consequences of engineering deficiencies can be illustrated graphically or by animation to show progress over time.
4. In development applications, views of the planned development can be simulated to identify impact on adjoining properties or other characteristics of the proposal.

Conventional Equivalent

In each of the above cases the, alternate to simulation software is the narrative testimony of experts supported by static drawings and other documents.

Simulation Technology Resource Needs

Little can be said about the resource requirement of simulation technology. Many and progressively more simulations require no more than the basic office or home computer identified previously. Others, however, require computing capability at the very highest level.

For the presiding Judge this is perhaps not significant. Normally the party seeking admission of a simulated view will provide the required technology.

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Simulation Technology Issues

Potential to Mislead.

High-level simulation technology can be highly persuasive; creating a risk that the simulation will be viewed as the objective truth of the event rather than simply the expert opinion which it in fact represents. The significance of this issue is dependent upon the nature of the simulation.

In considering simulations of anticipated future events, a proposed building development or perceived future structural failure, deviations can be reasonably accommodated. In the event that the simulation is in error the proof of error will be evidenced over time and an appropriate remedy can be provided.

In considering representations of objective historical data, a transaction chain for example, the validity of the data can be objectively proven without dependence on opinion.

In considering representations of objective historical data in combination with expert opinion and inference the situation is most difficult. The simulated crash of an aircraft may have the appearance of a video recording of the actual event while, in fact, relying on a series of untested assumptions. With this possibility in mind it would seem very explicit instruction to a jury is necessary to eliminate the risk of misinterpretation providing a basis for appeal.

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Level 4 – Communications and Integrated Systems

Level 4 technology, is characterised by the extensive use of communication services and the integration of a multitude of previously disparate technologies. It uses a network infrastructure available to the court and the parties for both public and private purposes. These are in turn connected to the Internet and other public and private systems external to the Court.

Video conferencing, allowing the examination of remote witnesses is currently the best known and used component of this technology level. These services, however, are typically not integrated with other capabilities and represent less than the tip of an iceberg.

At this level, subject to judicial management, capabilities include:

- In-court systems and a broadcast of proceedings accessible to practitioners and others outside the court.
- Systems that reside outside the courtroom, both public and private, available to the Judge and practitioners appearing in the court.
- Public and private systems are, subject to security, accessible to be integrated together into a single seamless system reporting public and private information simultaneously.
- The physical boundaries of the court are blurred; evidence can be received from remote witnesses by video link.
- Views can be effected by live video broadcast without the need to transport participants to the site. Witnesses can be examined on-site from the courtroom, reducing the need to remove objects of evidentiary interest from evidentiary context.
- Transcript and exhibit images are automatically linked.

There is no conventional equivalent to this technology level.

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Communication and System Integration Resource Needs

Computer Facility

Identifying the resource needs which attach to the creation of an integrated hearing system is as difficult as attempting to define the limits of the court itself.

At this level the core facility will consist of a file server and conventional local network infrastructure as required for a more advanced imaging system, supplemented by communications devices sufficient to allow secure connection to private external services.

In developing public systems capable of interconnection with private computer based materials, a greater adherence to industry base standards is required.

Auxiliary systems are added and integrated as required to meet the specific requirements of the proceedings.

Based upon the inclusion of most commonly selected requirements for a large case, and subject to minimums and/or installation and removal charges, indicative costs are as follows:

Component	Description	Capital Cost	Sitting Day
Core computer facility	File server with image library and database judicial bench and chambers work-stations witness screen, communications capability and network infrastructure.	\$150,000	\$750 (alternative to capital)
Real-time Service	2 operators to capture and edit transcript.		\$1,500
Courtroom Operations	1 operator to identify and display images and otherwise control the delivery of technology services in the court.		\$750
Technical Support	1 technician to resolve technical issues, capture new materials and train and support users both in the courtroom and remotely.		\$750
Total Daily			\$3,750

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Level 4 Case Study - Estate Mortgage Civil Litigation

Background

The Estate Mortgage civil claim heard by Justice Smith in the Supreme Court of Victoria between January and November 1997 is the largest civil claim yet to go to trial in Australia. It applied the full range of technologies described up to and inclusive of level 4.

The new trustees of the Estate Mortgage Trust initiated proceedings after much of the value of the trust was lost at the end of the late 80's property boom. Action was commenced against the previous trustees, auditors and a number of other professional advisers, a total of 12 parties were joined by the time hearings commenced.

The claim was for a total \$650m plus interest. The discovery included 1.5 million documents; the court book ultimately consisted of 700,000 pages of material. More than 50 PC workstations were installed in the courtroom and a larger number were directly attached to the network from workrooms inside the court complex.

The core courtroom systems were resident on a group of 7 file servers. Three concurrently provided core systems, including the image library and database, others supported communication and other secondary systems. 4 normal telephone lines (PSTN service) provided external access to courtroom systems. The parties attached private file server systems and supplementary communication capacity to the network behind private security arrangements.

Technology Services

The core of the Estate Mortgage system was the library of images, which constituted the court-book, made accessible through a database constructed using Intranet capabilities.

During the course of hearings, an independent system operator made document images available for general view. The contract for provision of services required that images appear on the public view (a set of screens provided for the witness, Judge and counsel) within two seconds of being requested. The operators system maintained logs of the viewing of documents and a record of the admission and marking of exhibit materials.

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The system integrated a real time transcript service capable of being received and managed by any of the then current real-time transcript management products. For public purposes, simple real-time display provided a current and historical service, which linked automatically to the image of documents as they were mentioned. In addition to this the Judge and most parties made use of Transcript Analyser or Caseview to enable the making of private annotations.

The third primary internal system was a complex mix of audiovisual components, which provided:

- A public address system for the court and workrooms within the court complex.
- A programmed, automatically mixed audiovisual broadcast to the isolated public gallery and capacity for broadcast across the Internet or through conventional television services.
- Capacity for the maintenance of an audio and video recording of the proceedings.
- Capacity for the viewing of historical and real-time video evidence including remote views, the remote examination of witnesses and the viewing and capture of expert manipulations.

Finally, the system included extensive communication and private systems integration capabilities:

- The ability to dial-into courtroom systems from any external location.
- The ability to link public databases with independent private databases to deliver a single fully integrated service showing public and private data on a single display.
- The ability to link from the courtroom to external private systems, the Internet and other public systems.
- Integrated e-mail providing an address for service to each of the parties.

If each party had required a single copy of the courtbook in the courtroom, 11,000 lever arch folders needing some 400 bookcases would have been required to contain the materials. In fact, the 32 bookcases provided by the Court remained essentially empty throughout the hearings.

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Benefits

Participants identified the following primary benefits:

- A substantial increase in the rate of progress during the hearings. A net saving of at least 1/3rd courtroom time or \$3 million during the course of hearings.
- An order of magnitude reduction in the size of the required Courtroom.
- An improved ability to accommodate sight and hearing impaired witnesses.
- For legal practitioners the ability to prepare and instruct counsel from remote locations.
- For parties, the ability to observe proceedings from any location worldwide. Connections were regularly established from Melbourne, Sydney and London.
- The automatic linkage of transcript to exhibits eliminated the need to manually confirm the validity of references.
- After hours effort was substantially reduced.
- Very substantially reduced direct costs. The plaintiff estimated a saving of \$2.5 million in photocopy costs and substantial travel expense savings.

The Contract

A major contract for provision of courtroom technology was put in place between all parties to the proceedings and a single supplier organisation, Systematics. A smaller contract between the Court and Systematics made available those facilities and services which were specific to the requirements of the Court.

The major contract required Systematics to put in place and operate the full range of services described previously for a single sitting day fee of \$5,900. This figure was divided proportionally between the 12 parties ranging from 25% being met by the plaintiff to 4% for minor parties. For small parties this meant the daily charge was \$236, for transcript, database access, operations technical support and other services, a very substantial reduction on what would otherwise have been the normal charge for transcript only.

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Specific terms of relevance included:

- A liquidated damages provision making the contractor liable for a sum of \$30,000 per hour in the event of a systems failure delaying proceedings. The damages provision was supported by Bank Guarantee.
- A minimum total of 50 sitting days and a monthly minimum of 10 sitting days.
- A requirement that public image displays be available within 2 seconds.

It should almost go without saying that contract negotiations with 12 firms were a nightmare. Systematics was selected and work was commenced on 2nd August 1996. The contract was signed in mid January 1997.

Summary Observations

- The total cost of technology in the proceedings, including transcript services, was less than the typical cost of transcript alone.
- The systems received very broad professional acceptance. The level of computer literacy of legal practitioners involved was unexpectedly high. As a result, planned training was reduced dramatically.
- Throughout the proceedings, paper in the court was minimal.
- Members of the profession made very active use of the technology.
- Remote connection capabilities were in constant use.
- Litigants, presumably recognising the value of technology, were prepared to meet cost.
- Guarantees of performance were a major factor in the selection of the supplier. Several participants had been disappointed by previous courtroom technology experiences.

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Judicial Management of Courtroom Technology

The character of the technology courtroom is significantly different to that of the traditional court. This difference raises a series of issues, which must ultimately be addressed by presiding Judges.

Judicial Management of Remote Participants

Participants in the level 4 technology courtroom may be physically located anywhere. The capacity of the Judge to control behaviour in these circumstances is both legally and practically limited.

Witness and Legal Practitioners

The capacity to compel the attendance of witnesses is constrained, just as it is at present when a witness is outside the jurisdiction. The capacity to compel answers even after a witness is sworn is for all relevant purposes equally constrained. Perhaps treaties for physical extradition could be extended to provide for the extension of the domestic law of the country of hearing to the site of the video link or to provide for the taking of evidence from the jurisdictional enclave of the local embassy.

The restraint of unacceptable behaviour on the part of a remote practitioner or representative of a party is not possible, as it would be in a conventional court by calling upon the Sheriff to restrain or remove a person. The closest equivalent would be the severing of the relevant communications link.

Views

The opportunity to undertake views using live video connection, as an alternative to transporting participants to a remote location offers very substantial cost savings. Clearly, however, it is important that the limits of the video connection are not used to obscure significant material. In practice this suggests that all parties should have an opportunity to control the video operation and provide commentary. The use of live video, rather than recordings, provides the opportunity for objection and judicial interaction. The use of an independent video operator reduces the risk of unfairness to one party.

The opportunity for taking expert evidence by interactive video link to a site, in place of views or removing evidence to the hearing room, should be examined. In proceedings like the Longford Incident (Victorian Gas Plant Explosion) Royal Commission, for example, it would have been possible, for the Commission, from the hearing room with the benefit of transcript and other courtroom infrastructure, to examine experts on-site. This approach would reduce the pressure to remove evidence from context and would allow the identification and manipulation of items of large-scale interest.

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Optimising Technology Benefit

Early Consideration

Perhaps self evidently, the active participation of the Judge is a major factor in the effectiveness of technology applied in litigation. In Estate Mortgage, Justice Smith encouraged the parties to use imaging as vehicle for the exchange of documents at discovery, directly reducing the cost of discovery and eliminating the cost of preparing images for the electronic courtroom.

The overheads associated with implementing image technology are essentially the same whether it is introduced at or before discovery or only at the time of hearing. The benefits accrue through all stages of the litigation. While the possibility of settlement invariably discourages parties from bringing effort forward, the benefits of technology are optimised by early adoption.

For Judges, I would encourage consideration of technology at the earliest practical opportunity.

Independent Operator

It is sometimes suggested that public image operation should be performed either by parties from the bar table or by the Associate or Sheriff. This suggestion has its origin in the reasonable effort to reduce cost but in my view ultimately works to diminish the net benefit of the technology. At least three arguments support the use of an independent operator.

First, the operator should be specifically trained in systems operation and information management. An untrained operator is unlikely to have been able to meeting the level of performance required by the Estate Mortgage contract.

Second, the Associate and Sheriff have other tasks which often preclude them from concentrating on the flow of proceedings further reducing their capacity to anticipate and respond quickly to document requests.

Third, the Judge should direct the operator. In some instances display should not initially be exposed to the witness and/or the public. Operation from the bar table creates a risk that inappropriate materials will be displayed before the Judge has the opportunity to control the viewing.

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Aide Memoir

Technology may provide opportunities for the Judge to introduce management initiatives to prompt the parties into a generally more organised and efficient approach to the presentation of their case. In *Estate Mortgage*, the use of the Aide Memoir, a text narrative version of the parties openings with links to the images of referenced documents was seen as an effective mechanism to control and structure the commentary of counsel

The Image as Evidence

Capacity for forgery

The image, like its paper equivalent, is a potential forgery target.

At one level, forgery in the image environment is more threatening than in the paper environment. Unprotected images are extraordinarily easy to modify and the modification is effectively impossible to detect.

At another level, the situation is much more promising, in that a vast array of tools are available to secure computer based data, such that interference in this environment can be made orders of magnitude more difficult than similar interference in the conventional environment.

From the perspective of the Judge, awareness of the risk of interference and a regular questioning of the steps that have been applied to secure data is critical.

Best Evidence Rule

At this point there is little doubt that the application of the best evidence rule, as I understand it, would allow a party to insist on the production of original documents if they are in existence. As a consequence, image based proceedings, at least for the moment, must rely on the consent of the parties. It is uncertain what practical need exists for any consideration of restriction of the rule. To date, I am not aware of an occasion when the image as evidence has been challenged.

The issue will, of course, change as paper records recede. The tax office has issued a ruling that for its purposes an image record is sufficient and progressively more companies are converting administrative processes to be paperless.

Systematics has now been totally paperless for almost three years. Already, we have conducted a civil claim where no hard copy records existed, our case consisted totally of e-mail files, contemporaneous notes made as computer text files and images. In those proceedings, our procedures were considered a novelty but not challenged.

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Access to Courtroom Systems

Judges will inevitably be called upon to control the extent of access to courtroom systems. The communications technology at level 4 provides opportunities to improve courtroom operations substantially but it includes technologies that have traditionally been considered sensitive in the Courtroom environment. Level 4 technology potentially delivers sound, pictures, evidence, the record of proceedings and the capacity to interact to any person at any telephone point in the world.

Technically, control of access presents no difficulty whatever. Judges will, however, need to question the extent of access being made available and be positioned to identify the limits required. Perhaps obviously, the controls appropriate to legal practitioner remote access will be different to those, which should be applied to the public and media. If differential access is necessary, the security that is applied to the access must be confirmed.

In Estate Mortgage, public video broadcast access was sought by media but restricted to the courtroom complex. Real time transcript was made available to media remotely though secure connection. The Longford Incident Royal Commission real-time transcript is being published on the Internet.

Security

Technology based proceedings involve a set of security risks which parallel those found in the conventional environment. Where previously the Judge was at risk of losing notes by the loss or theft of his or her briefcase, in the technology environment it is the portable computer or material on a communication link, which is at risk. There are two essential differences between security requirements in conventional and technology courtrooms.

In the technology courtroom, the definition of the boundaries of the court which need protection are blurred. Consequently, risks are wider spread, less visible and more complex, much more difficult to identify than in the conventional environment. In an unmanaged technology environment, the ease with which systems can be penetrated is frightening.

On the other hand, as with forgery risk, mechanisms are available to prevent identified security risks creating a total environment that is order of magnitude more secure than the conventional alternative.

For Judges contemplating high-level technology implementation in court, I would strongly recommend a review of security risks and an independent analysis of the security strategies of the technology supplier before the commencement of hearings.

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Sources of Advice

The majority of the technologies discussed in this paper are now the subject of substantial study at secondary school level. Many of our clients are now turning to their children and grandchildren for first level technical advice and training. Apart from this obvious source of assistance, a growing number of organisations are now offering specialist support services to supplement the services provided by the various Court administrations.

Courtroom automation is a relatively narrow specialisation within which even narrower focus is normal. Unfortunately, there are very few individuals and fewer organisations, which are independent of both specific technology products and large law firms.

I would be happy to recommend individuals and where appropriate organisations specific to location and requirements on request.

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Near Future Technologies

Electronic Process Filing and Case Management

A number of jurisdictions are taking early steps toward the elimination of paper from the process of the court. This includes the filing of electronic process; the management of process using computer based workflow and the acceptance of supporting materials as images.

From a foundation that simply substitutes electronic forms in place of the traditional paper forms, it is very easy to envisage a process driven by technology, including the generation of the court's internal materials and electronic service. From that point another small step has those systems hosting high-level courtroom automation and ultimately, managing the enforcement process. In turn, the integration of police, social security and tax systems with the court system becomes both technically feasible and arguably appropriate.

At the extreme, these systems have the potential to become all embracing, subsuming all the previous technologies discussed and more to produce a totally paperless court system, part of a totally integrated system of paperless justice. Clearly this has dangerous undercurrents; it is the responsibility of others to address these risks.

The good news for those concerned about these possibilities is the consistent failure of attempts to create all embracing super-systems, most have degenerated into high cost fiascoes. In the immediate future I would anticipate the most successful of these systems will be those which are most modest in their objectives.

Linkage of Process and Evidentiary Materials

At the lower end of electronic filing opportunities, the simple filing of electronic documents in place of equivalent paper documents of primary process is readily achievable. Similarly, the attachment of images of referenced materials to that electronic process, to produce a self-contained electronic claim again presents few technical challenges.

The Electronic Appeal Book Project of the Council of Chief Justices' addresses this possibility and more recently a number of appeal books have been successfully delivered in electronic form. It is reasonable to anticipate the development of electronic Statements of Claim and Defences, inclusive of supporting materials, in the near future.

Further discussion of this development follows.

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Artificial Intelligence as Primary Filter of Cause

Artificial intelligence is the area of computer science devoted to the study and development of computer programs that emulate behaviour normally associated with human intelligence. In recent years a great deal of work has been undertaken in this area resulting in progressively more environmental management being released from human control.

At this point, the prospect of machine based legal problem solving and ultimately judgment is at the extreme periphery of a realistic view of the future. It is reasonable to anticipate the progressive development of technology capable of interpreting the objective content of documents and testimony, such that the machine could advance a view that the required elements of a cause or offence had been established. However, the capacity to objectively sense demeanour and the complex range of other more intuitive issues, which are at the core of our process of justice, is beyond any technology known to be planned.

In this context it is reasonable to project the availability of artificial intelligence which may serve to provide initial advice to a potential claimant or to a police officer to identify or eliminate possible heads of claim or offence. Similarly, this technology could be applied to identify possible remedies and penalties or to suggest compromise settlements.

In the initial stages I would expect these technologies will be the tools of legal practitioners and law enforcement officers, effectively interactive or intelligent texts, being given the same cloak of warning of the possible consequence of use in unskilled hands as currently surrounds do-it-yourself conveyancing and will kits.

Ultimate extension of the use of artificial intelligence to the point where it would have identifiable impact on the work of Judges depends on the development of a level of public confidence in the technology (and lack of confidence in human Judges), which I cannot foresee.

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Non-linear Process

It is contended that human expression and consequently thought has been constrained by the essentially linear nature of paper based written expression. While the physical and logical worlds consist of multi-dimensional networks the representation of those worlds has been essentially confined to linear expression on paper.

While it is not my place to enter into a philosophical debate, I would contend that the truth of this is quite probably both more evident and more significant in the writing of legal materials than in most other disciplines. The writer of a novel or journalist is not as constrained to be as rigorous or exhaustive as the writer of a statement of claim, defence or judgment. At the most simplistic level, the writer of a statement of claim must trace the progress of two or more vehicles as they move in space and time toward a collision. As claims become more complex so does the challenge of this parallel expression. In a complex civil claim a hundred or more threads may be identifiable as sources of an ultimate catastrophic failure. It is only by relating these threads in time and space that meaning can be derived. It is contended the technology offers mechanisms, which can present these relationships much more effectively, breaking the linear mould of the paper document. Perhaps both the need and approach are best understood by example.

The failure of the State Bank of South Australia could be clearly traced through a series of parallel events that occurred over a period of more than six years. Each Division and subsidiary of the Bank had its own story, people within and outside its boundaries had their own stories and other organisations with relationships to the Bank had separate stories. Each of these was necessary to understanding the Bank's failure. The Bank had made in excess of 100 loans for more than \$1 million dollars, which had gone bad. Each of these could have reasonably been the subject of a separate claim. It is sufficient to say that the extent of the claimed loss consequent upon the failure was very large and the story behind that loss was very complex.

The legal team assembled to pursue the claim was substantial and as highly qualified and experienced as possible. The team's first attempt to recount the story in a Statement of Claim generated a 2,600-page document. In fairness, it should be observed that the pleading rules in South Australia, unlike those in other states, require the inclusion of particulars in the SOC. In this context, the SOC was concise, only briefly addressing those issues, which were considered to be critical to the plaintiff's position but sufficient, in the view of the team, to satisfy the conventional rules of pleading. As an account of history, however, it was virtually incomprehensible. Also, the presiding Judge did not share the view of the team. In a second attempt, the team produced a document described as "Formulation of Claim", a document intended to better capture the essence of the Plaintiff's position but not formally adequate to satisfy the rules of pleading. The FOC was still very difficult to comprehend and was struck out.

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As an alternative, a system was commissioned to make the pleadings accessible to the Judge through a variety of alternate approaches, linking all component text in logical hierarchies:

- To read the Formulation or Statement level claims sequentially, following the logical approach applied at the original formulation and statement levels.
- To link materials using a table of content type hierarchy to address the logical groupings previously identified as the Parts and Paragraphs of the FOC and SOC.
- To access materials using an Issue based index to create a hierarchy of detail drawn from across the Formulation and Statement level documents.
- A free text retrieval approach to support add-hoc inquiry based on the specific words found in the documents

The System was also to support the following links:

- From any reference to a document, opinion or legal source in formulation or statement level text, directly to an image of that document or the text of the opinion or legal source material.
- From any defined term to a caption definition of that term.
- Diagrammatic representation of Hierarchies and Links were also to be attached.

In short, the system was intended to allow the Judge to approach the claim in a summary manner from any identified perspective, reducing the claim to a series of relatively simple short stories.

This approach is equally applicable to the presentation of any complex legal documentation. As far as I am aware, however, it has yet to be applied in any matter that has advanced to hearing and judgment. Newer technologies are now available and planned, which could be applied to provide levels of flexibility, which considerably exceed those described above.

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Finally

What Technology, Which Cases

The range of technologies reviewed has application to different purposes in the judicial context.

- Databases can be valuably applied wherever previously significant lists would have been created.
- Full text searching is perhaps more limited only because text of transcript and other materials is not always available.
- Real-time transcript is limited by the shortage of capable writers, pending the availability of new technology,
- Image use is limited by the cost of infrastructure and acceptance in certain circumstances.
- Communication and system integration technologies rely on the existence of circumstances appropriate to the technologies being communicated and integrated.

At the lower end of the scale there is no logical limit to the scale or nature of cases that should be addressed by technology. In essence, the necessary technology is very widely available. Use is essentially only constrained by the limited availability of suitable skills. This issue is being addressed, change is occurring rapidly. In my view, the management and operation of databases and text retrieval systems is now a core clerical and administrative skill. The use of this technology should be much more extensive.

The constraints upon higher level technologies have, to date, tended to confine their application to more complex, higher profile proceedings. There is little question that in these cases very significant cost saving and quality of justice benefits can be achieved.

For smaller scale proceedings, three issues should be considered before dismissing higher level technology.

- The cost of putting image infrastructure in place is the highest cost component of making image services available. On average, the implementation and removal of technology is more than half the total cost of providing the computer facility. If permanent technology was in place this cost component could be eliminated.

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- Perceptions of cost of the imaging process itself are largely out of date. The cost of imaging for Systematics first image based hearing was several dollars per page. Current costs are now indistinguishable from photocopy cost, by contract ranging from \$0.15-\$0.20 per page. In some instances cost can be as low as \$0.02 per page.
- Time frame for production of images and an image database have similarly reduced dramatically. Most production bureaus will handle imaging loads of more than 20,000 pages overnight, simple management databases are generated virtually automatically. This means that in a permanent technology court a case consisting of 3 lever arch folders of materials could be delivered to a single operator at 8.00am to be available as images for the commencement of the hearing of the matter at 10.00am the same day.

Simply then, my view is that the application of higher level technology, with the exception of real-time transcript, is constrained essentially by the unavailability of infrastructure and to a lesser extent by the unavailability of skills and operational standards in more limited proceedings.

Infrastructure Development Options

The development of courtroom technology in Australia is, by international standards, advancing rapidly. The number of cases that have applied higher level technologies is now too extensive to list fully, landmark cases include Rothwell's, Kalajzich, Fairfax, NSW Police Royal Commission, Estate Mortgage and the Thredbo Coronial Inquest. At this point there are two unfortunate observations which must be made:

- In each case facilities have been built and decommissioned, a very considerable waste of resources.
- In cases using image technology the total cost of technology delivery has ranged from as little as \$30,000 to figures in excess of \$1,000,000.

It is very difficult to understand these cost divergences. Until a market for this type of service is established the need for effective competitive supplier selection, tendering in most cases, is essential if value for money is to be achieved.

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State Funding

To date, while permanent technology initiatives are in progress in New South Wales, Victoria and South Australia, only Western Australia has operational permanent courtrooms to the level 3 and 4 standards identified in this paper. In that State, public funding has been made available on the understanding that that savings to the State (and the parties) will well exceed the cost of implementation and operation.

In other States, the capital cost of implementation has been perceived to be outside the scope of funding priorities.

In the Federal Court and in New South Wales, parties must independently commission technology if they require it but in both places the administration is seeking to foster the use of technology by developing lists of vendors who operate in this area.

In Victoria, the new County Court complex, a privately funded venture, is expected to provide a state of the art facility but to date the contract has not been let. In the Victorian Supreme Court, court 13 is being refurbished using State funds with a view to providing foundation infrastructure which will reduce the work required of private technology contractors engaged for specific cases.

In South Australia effort to establish a permanent technology court through private and public sector collaboration has been deferred in response to the settlement of two very large claims which had been scheduled for hearing commencing this year.

Overseas, the most prominent work is being done in the US National Centre for State Courts in Williamsburg. The Centre includes a permanent model courtroom, Courtroom 21 which is used as a development platform and for the training of new legal practitioners. It is understood that in the UK a working group has recently been formed with responsibility to establish a permanent operating technology development court. The War Crimes Tribunal in The Hague is understood to operate primarily using images.

Private Sector Participation

Since the early 90's, technology vendors have been promoting the implementation of permanent high level private technology in Australian courts.

The suggestion is that on a term concession basis the required facility and services could be made available at no cost to the State parties paying at rates significantly lower than those currently charged for one-off facilities. It is argued that lower charges would generate sufficient demand from parties for technology courts to sustain permanent facilities in most superior court jurisdictions.

It seems unfortunate that, notwithstanding substantial judicial support, to date, administrative concerns have prevented the granting of any concession of this type.

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The Inevitability and Extent of Change

The rate of information technology take-up in the wider community is now overwhelming.

Hotmail, only one of a large number of well established free e-mail services started 1998 with 10 million subscribers and ended the year with more than 30 million subscribers (subscribers are removed from the system if their accounts are inactive for 12 weeks). At this rate of growth e-mail will be the dominant form of written communication in the developed world in less than 5 years. Traditional mail could well be doomed.

Progressively more systems are becoming paperless. The tax office ruling on image records is changing accounting systems. Systematics three years of totally paperless operation is progressively being emulated by larger organisations.

Very soon, the Internet and its derivatives will replace, in the forms we recognise them now, newspapers, radio, television, libraries, business records repositories and the information based need for office-based work and commuting. Arguably, even the need for cities themselves will be eliminated. Many existing industries will simply cease; I cannot identify a solitary job that will be isolated from change.

It will not be very long before Judges are confronted with substantial claims, which have no documentary or traditional business basis. At that point, systems of justice will have no alternative but to implement the technology of the community and business and legislators and Judges will be forced to develop a new set of rules to deal with these circumstances.

Inevitably, in the not too distant future, technology will permanently change judicial practice and ultimately the law itself at all levels. In my view, the extent of change, within our lifetimes, will be greater than any previous event in the history of law.

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