



Courtroom 21 Research Report

The Use of Technology in the Jury Room To Enhance Deliberations



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Abstract

Modern courtroom technology permits the use of technology in the jury deliberation room to enhance deliberations in both traditional trials and technology-augmented cases. SJI-funded research conducted by the Courtroom 21 Project surveyed the law of the United States with respect to statutory and case law governing the use of exhibits during deliberations; surveyed the state courts and, with the assistance of the Federal Judicial Center, the United States district courts concerning their deliberation practices and courtroom technology use; and conducted two controlled studies of the use of deliberation room technology in both traditional and technology-augmented trials.

The Courtroom 21 protocol and technology design formulated as a result of the surveys and experiments was then field-tested in actual cases in Florida's 9th Judicial Circuit and the United States District Court for the District of Oregon. Following the field trial the Courtroom 21 Project prepared the Manual for Jury Deliberation Room Technology for use by court administrators and technologists. The research results include survey and empirical data dealing with jury exhibit practice and courtroom technology use not previously available.

Located in Williamsburg, Virginia, the Courtroom 21 Project is a joint project of William & Mary Law School and the National Center for State Courts. See www.courtroom21.net. Questions concerning this report or the Courtroom 21 Project may be directed to ctrm21@wm.edu, or the Project may be reached by telephone at (757) 221-2494 or via fax at (757) 221-3708.

This report and the research that it reflects was made possible by the assistance of the State Justice Institute. We would like to acknowledge both that assistance and SJI's consistent efforts to improve the administration of justice in our state courts.

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§ 1-10.00 Introduction

Long accepted as one of our essential civil liberties, the right to trial by jury is one of the key defining elements of our legal system. Recent years have seen a renewed effort to determine how to assist jurors in their highly demanding task. It is no surprise that in our modern, increasingly computer-oriented world technology has been suggested as a potential tool that might be of value.¹ The results of this SJI-funded project support the proposition that technology can be of help to jurors in the deliberation process.

The growing and pervasive use of technology at trial is clear. Although no accurate estimate of the number of integrated high technology courtrooms exists, the Courtroom 21 Project estimated two years ago that the number exceeded 500. To those courtrooms can be added the large number of additional facilities in which technology is used in a less comprehensive manner. The common thread to nearly all courtroom technology uses is technology enhanced evidence presentation. The use of display technologies to visually show evidence to judge and jury is believed to enhance fact finder recollection and understanding and to decrease substantially the amount of trial time. Although we have striven to improve case presentation through the use of technology, we have spent little effort on the all important process of jury deliberation. This study sought to remedy that omission.

After the close of the evidence, submission of final arguments, and receipt of jury instructions, jurors must retire to deliberate and reach their verdict. During deliberations, jurors customarily exchange their memories and interpretations of the key pieces of evidence. Most jurisdictions supply the jurors with at least a substantial amount of the evidence that was formally received during trial. Jurors can then review the evidence and argue its meaning to one another. In some cases in some jurisdictions each juror will have a personal copy of documentary evidence, supplied in a “jury book” or similar compilation.

This study sought to determine two things: whether jury deliberations in traditional, non-technology cases could be assisted through the use of modern technology, and whether jury deliberations in the new technology-enhanced cases could be assisted through the use of technology during deliberations.

The primary experimental hypothesis was that jurors would find helpful the ability to collectively and concurrently see a large displayed image of documentary evidence. The results of this study confirm that hypothesis. Jurors found deliberation room display technology highly useful, whether used in traditional trials in which no courtroom technology was used or in trials that used technology-enhanced evidence presentation. In addition, we were able to create a simple and highly usable system for jurors to review high-end computer-based evidence.

As a result of the data collection and numerous experiments conducted pursuant to SJI’s support, we have formulated recommendations for the use of jury room technology and prepared a brief manual that supplies court administrators with the critical information necessary to enable jurors to have technology-enhanced deliberations.

¹ See Nancy S. Marder, *Juries and Technology: Equipping Jurors for the Twenty-First Century*, 66 Brooklyn L. Rev. 1257 (2001).

This report includes not only the manual but also the data collected from legal research, two national surveys, technology reviews, trial experiments, and real-life field trials, as well as the results of informed consideration of the intersection between deliberations and technology.

§ 1-20.00 Methodology Summary

The study consisted of five primary phases: data collection, jury room technology evaluations, two controlled studies, field trials in real cases, and preparation of this report with an accompanying Manual for Jury Room Deliberation Technology.

As we initially formulated this study it became immediately apparent that we were proceeding from basic *assumptions* about court practice. We held a number of suppositions about both the law and practice governing jury review of evidence during deliberations. All of those suppositions were suspect, and, as events eventually demonstrated, a number proved to be wrong. Among other things, we discovered that jury room technology is already in actual use in some courts.² In order to test the potential use of technology during deliberations it was essential to know what was actually happening in America's courts. To accomplish this, we designed a four part data collection process.

We first conducted legal research to determine the law that governs the use of admitted evidence during deliberations (Appendix B). With the assistance of a panel of experts (the Grant Advisory Panel listed in Appendix A) consisting of Matt Benefiel (Court Administrator, Ninth Judicial Circuit of Florida); the Honorable B. Michael Dann (Visiting Fellow, National Center for State Courts); Gregory P. Joseph, Esq. (New York); Nancy Marder (Associate Professor of Law, Chicago-Kent College of Law); Thomas Munsterman (National Center for State Courts), and the Honorable Donald E. Shelton (Washtenaw County, Ann Arbor, Michigan), we prepared a survey for the state courts (Appendix C) that would collect data dealing with what exhibits went to the jury, the degree to which display or other technology was in use for deliberations, the process by which technology-presented evidence was reviewed by the jury, and related questions. While we were surveying the state courts, we conducted a review of potentially useful jury room technology and carried out first level jury room ergonomic and placement display technology experiments. With the assistance of Dr. Beth Wiggins and her colleagues at the Federal Judicial Center, those questions were included in a national survey of the United States District Courts as well (the results are in Appendix E). Although the critical state court survey was conducted in the Fall, for a variety of reasons the federal survey was conducted in late Spring, 2002.

Based upon the legal and empirical data that we collected, we then conducted three experimental trial phases. Trial Phase I, conducted in the Fall 2001 academic semester, was a controlled study consisting of the repeated trial of an experimental one hour traditionally-tried civil personal injury tort case, *Matthews v. Morton*. Using the results of the data collection phase these trials had three types of possible jury room deliberation technology: none, a 40-inch plasma display linked to a document camera, or a front-projection unit linked to a document camera that displayed evidence on a portable screen. Trial Phase II, conducted in the Spring

² Answers to Question 8 of our state survey, set forth below, show 12 courts with projection devices in the deliberation room and 4 with computers or computer monitors.

2002 academic semester, was a controlled study consisting of the repeated trial of *Matthews v. Morton*, but in these experimental repetitions trial evidence was electronically presented to the jurors. This time two jury room technology options were available: none or full technology (document camera, computer, plasma display, large rear-projection display for annotation, and a chalk board). The case repetitions in Trial Phases I and II were tried by four third-year William & Mary Law School student counsel (two men and two women) and two faculty judges (one man and one woman).³ Jurors came from College of William & Mary psychology students and were predominantly freshmen. To ensure consistency, counsel used the same highly detailed trial sequence. The sequence included all points to be presented and all the evidence to be introduced.⁴ Neither counsel nor judge knew whether any given jury would use technology, or, if so, what type until the very end of the case when during closing instructions the judge would flip over a previously prepared card that indicated the type of deliberation. The data from Trial Phases I and II were analyzed by Dr. Kelly Shaver of the Psychology Department of the College of William & Mary. In Trial Phase III, jury room technology was used in real cases in Florida's 9th Judicial Circuit (Orlando) and the United States District Court for the District of Oregon (Portland).

Based upon all of the data collected, recommendations for jury room technology use were formulated, the Manual for Jury Room Deliberation Technology was prepared, and the Manual and this Report were submitted to the Peer Review Panel and then to the State Justice Institute.

§ 2-10.00 The State of the Law

§ 2-11.00 In general

When jurors deliberate, they consider both the evidence received at trial and the inferences that can be drawn from it. Although much of the evidence is made physically available to the jurors during deliberations, not everything is.

From a legal perspective, the law governing the use of exhibits during deliberations requires a consideration of two topics: the law of evidence, which governs admissibility of information at trial, and the procedural rules dealing with the use of exhibits during deliberations. Ordinarily, the jury may receive an exhibit during deliberations only if it has been received into evidence at trial *and* the judge also sends it to the jury for use during deliberations.

The primary evidentiary issue of significance to juror consideration of exhibits during deliberations is how demonstrative or summary evidence is to be treated. Strictly speaking, “demonstrative evidence” is not “evidence” at all. Rather, it is usually visual material that is

³ Each trial used two counsel, one plaintiff's counsel and one defense counsel. Under Dr. Shaver's guidance, trials were conducted so as to control for gender variations, and each case was tried by two counsel of the same gender. Of the four counsel, three (two men and one woman) were white; one counsel, a woman, was black. Of the two judges, one was male and one female; both were white. We did not control for race.

⁴ The trials were not literally scripted in order to ensure that they appeared realistic. The two judges report that there was a remarkable degree of consistency across all trial repetitions. Although there were differences between the two pairs of opposing counsel, those differences were controlled for as part of the gender control.

used at trial to assist the finder of fact to understand the formally presented evidence. The traditional rules of evidence do not deal directly with demonstrative evidence, although concepts of relevance and unfair prejudice, among others, are applied. Thus, whether a graphic, summary chart, or a high technology animation is “evidence” or “demonstrative evidence” depends upon the court, and perhaps the individual trial judge. Traditionally, demonstrative evidence does not go to the jury room because it “has no independent probative value.”⁵ Notwithstanding, depending upon the court, such a classification may not bar demonstrative exhibits from going to the jury during deliberations.

A survey of the law governing consideration by the jury of various types of exhibits is attached in Appendix B. The material that follows seeks to summarize the applicable federal and state law.

§ 2-12.00 Federal Law

The general rule followed by the federal courts is that the use of exhibits in the jury room is permitted, so long as the exhibits have been admitted into evidence.⁶ The Fifth Circuit has held that the court has discretion in allowing the jury to view summary charts and other visual aids summarizing items already admitted into evidence, but absent consent of the parties, this demonstrative evidence should not go to the jury room.⁷ Other courts, however, have held that sending demonstrative evidence to the jury room is not, at the least, an abuse of discretion.⁸ A district court is not required to send exhibits to the jury room when the jury “has not requested to view any exhibits and only one party has made [such a] request.”⁹

“The circuits are split as to whether a summary chart should be admitted and allowed into the jury room or whether it is just a pedagogical device that should be admitted to aid the jury in weighing the evidence that has already been presented;¹⁰ in the latter case it does not go to the jury during deliberations. In *United States v. Johnson*,¹¹ the Fourth Circuit, applying Federal Rules of Evidence 611(a) and 1006, opined that “the concern is not so much with the formal admission as it is with the manner in which the district court instructs the jury. . . .” Although hinting that formal admission is not required for use during trial, the court resolved the issue of whether the summary testimony chart in question had properly gone to the jury room by simply holding that as it was properly admitted into evidence at trial, it was not error to send it to the jury room.¹² Similarly, “[a]bsent some special circumstances the trial judge should allow the

⁵ Michael Sudman, *The Jury Trial: History, Jury Selection, and the Use of Demonstrative Evidence*, 1 J. LEGAL ADVOC. & PRAC. 172, 178 (1999).

⁶ See generally *United States v. Samples*, 713 F.2d 298 (7th Cir. 1983).

⁷ *United States v. Taylor*, 210 F.3d 311 (5th Cir. 2000).

⁸ *United States v. Salerno*, 108 F.3d 730 (7th Cir. 1997).

⁹ *United States v. Thomas*, 521 F.2d 76 (8th Cir. 1975).

¹⁰ Emilia A. Quesada, *Summarizing Prior Witness Testimony: Admissible Evidence, Pedagogical Device, or Violation of the Federal Rules of Evidence?*, 24 FLA. ST. U.L. REV. 161, 169-171 (1996).

¹¹ 54 F.3d 1150, 1159 (4th Cir.1995), cert. denied, 116 S. Ct. 266 (1995).

¹² *Id.* at n.11.

jury to have access during its deliberations to tape recordings that have been admitted as exhibits during trial.”¹³

Abuse of discretion is the proper standard for reviewing the admission of demonstrative evidence or determining what is actually a “demonstrative exhibit.”¹⁴ The appellate review process examines whether the district court’s decision to allow demonstrative evidence into the jury unfairly prejudiced the defendant.¹⁵ The appellate court will look at such factors as the judge’s instructions regarding the use of the demonstrative evidence and whether the defendant’s objections to the use of the demonstrative evidence were timely.¹⁶

§ 2-13.00 State Law

Most states follow the federal rules that govern what evidence may be taken by the jury to the deliberation room. As discussed above, the general federal rule is that use of exhibits in the jury room is permitted, so long as the exhibits have been admitted into evidence. With only a few exceptions, the states are split into two major camps that divide over the expressed prohibition on the jury taking depositions into deliberations. While it may not be standard practice for those jurisdictions that have no expressed prohibition to allow depositions in the deliberation room, the permissive language is not present in the actual procedural rules of the minority.

The majority of states adopt the standard delineated by the Arizona Court of Appeal stating, “Whether tangible evidence should be given to the jury for use during deliberations is a matter left to the discretion of the trial court.”¹⁷ More than half of the states follow the policy of allowing broad discretion to the trial judge as to what the jury may take into deliberations.¹⁸ In *Thomas*,¹⁹ the Indiana Supreme Court delineated the guidelines that a trial judge should apply to the decision of what materials are permitted to go to the jury room:

- (a) The court in its discretion may permit the jury, upon retiring for deliberation, to take to the jury room a copy of the charges against the defendant and exhibits and writings which have been received in evidence, except depositions.
- (b) Among the considerations which are appropriate in the exercise of this discretion are:
 - (i) whether the material will aid the jury in a proper consideration of the case; (ii)

¹³ *United States v. Scaife*, 749 F.2d 338, 347 (6th Cir. 1984). *See also* *United States v Samples*, 713 F.2d 298, 303 (7th Cir. 1983).

¹⁴ *United States v. Abonce-Barrera*, 257 F.3d 959 (9th Cir. 2001).

¹⁵ *See* *United States v. de Hernandez*, 745 F.2d 1305, 1308 (10th Cir. 1984).

¹⁶ *Id.*

¹⁷ *State v. Snowden*, 138 Ariz. 402, 675 P.2d 289 (Ariz. App. Div. 1983).

¹⁸ In *Thomas v. State*, 259 Ind. 537, 540, 289 N.E.2d 508, 509 (1972), the Indiana court adopted § 5.1 of the Standards Relating to Trial by Jury (American Bar Association Project on Standards for Criminal Justice), which now appears with insubstantial changes as Standard 15-4.1 in 3 AMERICAN BAR ASSOCIATION, STANDARDS FOR CRIMINAL JUSTICE (2d ed. 1980).

¹⁹ *See Thomas*, 259 Ind. at 540, 289 N.E.2d at 509.

whether any party will be unduly prejudiced by submission of the material; and (iii) whether the material may be subjected to improper use by the jury.²⁰

ABA Standard 15 - 4.1, adopted in *Thomas*, is designed "to guide judges in deciding which materials should be permitted in the jury room during deliberations."²¹ In total, at least 29 states use this standard.²²

A few states vary slightly from this general approach. The rule in Illinois was stated in *People v. Blue*²³ when the court applied the following summarization of an earlier intermediate appellate court decision:²⁴

Tangible objects admitted into evidence that are probative of any material issue may be taken into the jury room during jury deliberations. Whenever physical evidence is allowed into the jury room, the proximity of the exhibit to the jury and the potential that the exhibit may be in the jury's possession for an extended period of time give the proponent of the exhibit a distinct advantage over the opposing party. For this reason, the court will closely scrutinize the exhibit to ensure that its prejudicial value does not outweigh its value as evidence.²⁵

Iowa adds a corollary to its procedural rule that states, "Depositions shall not be taken unless all of the evidence is in writing and none of it has been stricken."²⁶ This corollary allows for some depositions to be allowed in the jury deliberation, but ensures that juries will not have access to depositions that may contain information not properly admitted into evidence or read to the jury during the presentation of evidence.

A minority of states differ by not expressly prohibiting depositions in the jury room.²⁷

²⁰ *Id.*

²¹ *Id.* at 541, 289 N.E.2d at 510.

²² See *Robinson v. State*, 699 N.E.2d 1146 (Ind. 1998); ALASKA R. CIV. PROC. 43.1, 48(g) (2000); CAL. CODE CIV. PROC. § 612 (2001); FLA. R. CRIM. PROC. 3.400 (2001); IDAHO R. CIV. PROC. 47(p) (2000); MD. RULE 2-521 (2001); MINN. R. CRIM. PROC. 26.03 (2000); MISS. CODE ANN. § 11-7-151 (2001); MONT. CODE ANN. § 46-16-504 (2000); NEV. REV. STAT. ANN. §175.441 (2001); N.D. CENT. CODE § 29-22-04 (2001); OHIO R. C. 2945.35 (2002); OR. R.CIV. PROC. 59 (2000); TEX. R. CIV. PROC. 281 (2001); UTAH R. CIV. PROC. 47 (2001); WASH. C.R. 51(h) (2001).

²³ *People v. Blue*, 189 Ill. 2d 99, 123 (2000).

²⁴ *People v. Burrell*, 228 Ill. App. 3d 133, 143-44 (1992).

²⁵ *Id.* The Supreme Court of Illinois found *Burrell* "persuasive in the context of the instant appeal." 189 Ill.2d 99 at 123.

²⁶ IOWA R. CIV. PROC. 198(b) (2001).

²⁷ See *Buckner v. United States*, 154 F.2d 317 (1946); *State v. Corbin*, 759 A.2d 727, 2000 Me. 167 (Maine 2000); *State v. Barnett*, 980 S.W.2d 297 (Mo. 1998); *Wilson v. Williams*, 261 Kan. 703, 933 P.2d 757 (1997) ("Only evidence is allowed into the jury room during deliberations. Thus, the trial court should not permit formula charts, which can be used in oral argument but not admitted into evidence, to be taken into the jury room."); *State v. Robinson*, 79 Haw. 468, 903 P.2d 1289 (Hawai'i 1995); *State v. Girolamo*, 197 Conn. 201, 496 A.2d 948 (1985); *Carson v. State*, 241 Ga. 622, 247 S.E.2d 68 (1978); *Barber v. Stratton*, 111 Vt. 43, 10 A.2d 211 (1940); *Iden v. State*, 112 Neb. 454, 199 N.W. 734 (1924); *Krauss v. Cope*, 180 Mass. 22, 61 N.E. 220 (1901); ARIZ. R. CRIM. PROC. 22.2 (2001); ARK. CODE ANN. § 16-89-125(d)(3); COLO. R. CRIM. PROC. 47(m) (2001); KY. R. CRIM. PROC. 9.72 (2001); LA. REV. STAT. 38:379 (2001); MICH. COURT R. CRIM. PROC. 6.414 (2001); N.J. COURT RULES, 1969 R. 1:8-8 (2001); N.M. DIST. CT. R. CRIM. PROC. 5-609 (2001); N.Y.C.P.L.R. § 310.20 (2001); N.C. GEN. STAT.

This represents a broadening of the discretion allowed to the trial courts. The strongest stance may be in the state of Georgia, where in *Carson v. State*²⁸ the Supreme Court stated,

All properly introduced documentary and demonstrative evidence will be taken into the jury room when the jury retires. This includes photographs, guns and other objects . . . The jury may examine and evaluate objects taken to the jury room, so long as their examinations and tests do not have the effect of introducing new evidence. Thus they may use a magnifying glass to examine evidence. The jury may smell and taste the contents of a jug to determine if it contained whiskey.²⁹

The Wisconsin Supreme Court restated the guidelines a trial judge should use in determining what evidence or exhibits may be taken with the jury to the deliberation room in the context of written confessions.³⁰

Written confessions are obviously testimonial in nature. Yet many jurisdictions permit written confessions to be taken into the jury room in criminal cases despite the generally accepted rule that written depositions are not submitted to the jury. These jurisdictions have apparently concluded that a jury should, in some cases, have access to a written confession because the confession is central to the case and because there are adequate safeguards built into the process of admitting confessions as evidence. . . . [W]e conclude that the better rule is that a defendant's written confession should be treated like other exhibits. It is within the circuit court's discretion to determine what exhibits are permitted in the jury room. . . . A circuit court's decision to send a written confession into the jury room should be guided by the same criteria as its decision to send other exhibits into the jury room, including consideration of whether the exhibit will aid the jury in proper consideration of the case, whether a party will be unduly prejudiced by submission of the exhibit, and whether the exhibit could be subjected to improper use by the jury.³¹

Only one state specifically permits the use of depositions in the jury room. West Virginia allows all evidence read to the jurors "to be carried from the bar by the jury."³² The section of the West Virginia Code respecting the carrying from the bar by the jury of depositions or other

§15A-1233(b) (2000); 22 OKLA. STAT. § 893 (2000); PA. R. CRIM. PROC.1114 (2000); S.C. R. CIV. PROC. APP. FORM 3 (2000); S.D. CODIFIED LAWS § 23A-25-7 (2001); TENN. CODE ANN. § 20-9-510 (2001); VA. CODE ANN. § 8.01-381 (2001); WASH. R. SUPER. CT. CIV. C.R. 51 (2002).

²⁸ 241 Ga. 622, 625 (1978)(jurors could determine length of sawed-off shotgun themselves).

²⁹ *Id.* (quoting 11 EGL Evidence, § 91, citing, inter alia, *Moss v. State*, 166 Ga. 517, 143 S.E. 900 (1928); *Smith v. State*, 122 Ga. 154, 50 S.E. 62 (1905); *Union v. State*, 7 Ga. App. 27, 66 S.E.24 (1909).

³⁰ *State v. Jensen*, 147 Wis. 2d 240, 259-60 (1988).

³¹ *Id.* (citations omitted).

³² W. VA. CODE § 56-6-23 (2001).

papers read in evidence “leaves the subject in the sound discretion of the court; and, unless such discretion is clearly abused, the action of the court will not constitute reversible error.”³³

In most states, the decision of a trial judge allowing exhibits not properly admitted into evidence to be taken to the jury room does not necessarily constitute per se reversible error.³⁴

§ 3-10.00 Actual Practice in the Courts

§ 3-11.00 The State Courts

To ascertain state court practice we used a web-based survey. Following input from the Peer Review Panel, an online research instrument (at <http://ctrm21.ncsc.dni.us/jurysurvey.asp>, Appendix C) was sent to the Chief Court Administrators from all 50 states, the District of Columbia, American Samoa, Puerto Rico, the Northern Mariana Islands, the Virgin Islands, and Guam.

A total of 163 responses were received from courts in the following 23 states and protectorates: Alabama, Connecticut, Delaware, Georgia, Guam, Indiana, Kansas, Louisiana, Michigan, Minnesota, Missouri, Montana, North Carolina, North Dakota, New Hampshire, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Washington, and Wisconsin. Four states alone (MO, PA, WA, and WI) comprise 61.9% of the response group with an average response per state of 25.25, $\delta \pm = 6.95$. 98.8% responding were trial rather than appellate courts. 93.3% of the trial courts were courts of general jurisdiction.

A searchable database was created by respondent data entry into the web survey form. A detailed analysis of the data, including graphical depictions, is included at Appendix D.

§ 3-11.10 Deliberation Practices

Exhibits available during deliberations

Question 6 of the Survey asked: “Please indicate which, if any, of the following items jurors take with them to the jury room when they retire to deliberate and which, if any, are made available to them upon request during deliberations.”

Analysis of the results shows:

³³ Cobb v. Dunlevie, 63 W. Va. 398, 60 S.E. 384 (1908); Burdette v. Maust Coal & Coke Corp., 159 W. Va. 335, 222 S.E.2d 293 (1976).

³⁴ See Janson v. State, 730 So. 2d 734 (1999) (“Janson argues that the trial court erred in allowing the jury, over objection, to have the transcript of two witnesses in the jury room. We agree this was error . . . Having found error, we must now consider whether that error is reversible. Just as the supreme court. . . found that allowing (a) videotape to go to the jury room was not per se reversible error, we find that allowing a witness’s transcribed testimony in the jury room is likewise not reversible.”)

Juror Technology	Take technology to jury room		Available upon request during deliberations		None	
	Number	Percent	Number	Percent	Number	Percent
Evidence and exhibits	92	56.4	58	35.6	13	8.0
One set of written jury instructions	88	54.0	19	11.7	56	34.4
Individual sets of jury instructions	23	14.1	22	13.5	118	72.4
Equipment to view evidence and exhibits	22	13.4	49	30.1	92	56.4
Calculators/spreadsheets	5	3.1	45	27.6	113	69.3
Notes taken by jurors during trial	85	52.1	10	6.1	68	41.7
Worksheets/index for reference to evidence and exhibits	9	5.5	23	14.1	131	80.4

We draw the following conclusions:

1. The availability of evidentiary exhibits to jurors varies markedly by location, even within a given jurisdiction. Full data analysis (see Appendix D) shows that jurisdictions with multiple responses show no consistency in the availability of evidence and exhibits to jurors. In Michigan, for example, six courts show that exhibits are regularly taken to the deliberation room while in five other courts they must be requested. Pennsylvania shows 13 courts which regularly supply exhibits and 13 in which they must be requested. Wisconsin splits 16/13.
2. A surprising 8% of reporting courts do not supply jurors with exhibits, even upon request.
3. In slightly over one third of reporting courts, exhibits are furnished only upon request.
4. In 71.1% of reporting courts, jurors receive one or more copies of the jury instructions. The majority of respondents indicated that they provide one set of jury instructions (65.5%) versus individual sets (27.6%). About one fifth of respondents (22.1%) reported that they provide one set and individual sets of jury instructions, but it is not known if this is determined by the judge, the type of case, or other factors. 28.8% reported that they do not provide any written copy of jury instructions to the jurors in the deliberation rooms.
5. In slightly more than half of the reporting courts, jurors may make use of written notes.

6. Although undefined in the responses to this specific question, approximately one half of the reporting courts are used to supplying jurors with some form of equipment to view evidence and exhibits;³⁵ Although 30.1% of the respondents will do so on request, 22% do so without.

Use of technology to view exhibits during deliberations:

Question 7 of the Survey asked: “*In trials in which technology is used to present evidence and exhibits, how do jurors usually view the evidence and exhibits during deliberations?*”

Analysis of the results shows:

Viewing Method	Number of Court Responses	Percent of Total
Jurors brought back to courtroom to view	77	47.2
Equipment transported into jury room	61	37.4
Not applicable	15	9.2
Sometimes equipment transported into jury room; sometimes jurors brought back to courtroom	4	2.5
Hard copies of evidence/exhibits provided	3	1.8
Equipment permanently installed in jury room	1	0.6
Not sure	1	0.6
None of the above	1	0.6

We draw the following conclusions:

1. Courts are highly accustomed to using equipment to assist jurors in their deliberations.
2. Respondents indicated that most of the time, jurors are brought back into the courtroom to view evidence and exhibits (47.2%) or the viewing equipment is transported into the jury rooms (37.4%). Only 0.6% of respondents indicated that viewing equipment is permanently installed in the jury rooms.

Question 8 of the Survey asked: “*Please check all types of technology available for juror use during deliberations.*”

³⁵ Based on Question 8, *infra.*, this is most likely VCR’s.

Analysis of the results shows:

Technology	Number of “Yes” Responses	Percent of Total
Pen and paper	155	95.1
Chalk boards	77	47.2
Paper flip charts	68	41.7
Video cassette player	50	30.7
Calculators	44	27.0
Television	44	27.0
Audio cassette player	30	18.4
Copy machine	14	8.6
Projection screen	12	7.4
Spreadsheets	10	6.1
Overhead projectors	9	5.5
Transcripts from real-time transcription, voice, or steno	9	5.5
Speaker phones	7	4.3
Computer to view computer-based exhibits	4	2.5
CRT monitor	4	2.5
Printer	4	2.5
Video camera	4	2.5
Computer to calculate damages	3	1.8
Document camera	3	1.8
Computer whiteboard	3	1.8
Other	3	1.8
Scanner	1	0.6
Individual monitors for jurors	0	0.0
LCD monitors	0	0.0
Computer annotation device	0	0.0
Touch screen control	0	0.0
Plasma screen	0	0.0
Laptop computers	0	0.0

We draw the following conclusions:

1. Although electronic technology is less common than chalk boards and flip charts, video cassette recorders are available in 30.7% of the responding courts.
2. Televisions are the most common form of electronic display device.

3. Between 18% and 30% provide video cassette players, televisions, calculators, and audio cassette players. Interestingly, more respondents reported providing video cassette players (30.7%) than televisions (27%).
4. High technology enhanced deliberations are not unknown; three courts are providing document cameras and computer white boards; four are providing computers to view computer-based exhibits. There is a small overlap in technology; courts with document cameras are more likely to be using other forms of technology as well.

Question 9 of the Survey asked: *“When equipment is required to view evidence and exhibits during jury deliberations, who generally operates the equipment?”*

Analysis of the results shows:

Equipment Operator	Number of Responses	Percent of Total
Court personnel assist jurors	96	58.9
Jurors are instructed and operate it themselves	34	20.9
Not applicable	28	17.2
Lawyers	5	3.1
Equipment owner	1	0.6

We draw the following conclusions:

1. Inasmuch as the majority of respondents (58.9%) reported that court personnel assist jurors with technology in the jury room, courts are not likely to find objectionable some form of court personnel involvement in explaining deliberation room technology to jurors.
2. Although the technology that jurors operate themselves is unspecified, a substantial number of responding courts apparently have had sufficiently acceptable experience to trust juror operation of deliberation room technology.

§ 3-11.20 Courtroom Technology

The survey thus establishes a baseline for current jury deliberation room practice. However, in order to deal with the increasing amount of technology-augmented trial practice, we thought it useful to obtain information from the responding courts as to the nature of their courtrooms and trial practice. That yielded the following data:

Question 1 of the Survey asked: *“Please indicate which pieces of technology are currently installed in your courtrooms.”*

Analysis of the results shows:

QUESTION 1 :

Category	Technology	Number Having One or More	Percent of Total
Audio Devices	Speaker Phones	86	52.8
	Audio Cassette Player	74	45.4
Video Devices	Video Cassette Player	97	59.5
	Overhead Projector	44	27.0
	Document Camera	15	9.2
	Video Camera	29	17.8
Computer Devices	Computer Whiteboard	13	8.0
	Scanner	4	2.4
	Desktop Computer for Viewing Evidence	12	7.4
	Laptop Computer and Laptop Connection	58	35.6
	Touch Screen Control System	3	1.8
	Computer Annotation Devices	7	4.3
	Monitors and Screens	Television	110
CRT Monitor		22	13.5
Projection Screen		47	28.8
Individual Monitors for Juror Viewing		6	3.7
Plasma Screen		0	0.0
Court Record Devices	LCD Monitor	3	1.8
	Real-Time Transcription	65	39.9

Ranking the technologies from most reported to least reported:

Technology	Number Having One or More	Percent of Total
Television	110	67.5
Video Cassette Player	97	59.5
Speaker Phones	86	52.8
Audio Cassette Player	74	45.4
Real-Time Transcription	65	39.9
Laptop Computer and Laptop Connection	58	35.6
Projection Screen	47	28.8
Overhead Projector	44	27.0
Video Camera	29	17.8
CRT Monitor	22	13.5
Document Camera	15	9.2
Computer Whiteboard	13	8.0
Desktop Computer for Viewing Evidence	12	7.4
Computer Annotation Devices	7	4.3
Individual Monitors for Juror Viewing	6	3.7
Scanner	4	2.4
Touch Screen Control System	3	1.8
LCD Monitor	3	1.8
Plasma Screen	0	0.0

Technology in Courtroom by Category

Category	Technology	More	Percent	One	Percent	None	Percent
Audio Devices	Speaker Phones	41	25.2	45	27.6	77	47.2
	Audio Cassette Player	26	16.0	48	29.4	89	54.6
Video Devices	Video Cassette Player	28	17.2	69	42.3	66	40.5
	Overhead Projector	10	6.1	34	20.9	119	73.0
	Document Camera	5	3.1	10	6.1	148	90.8
Computer Devices	Video Camera	17	10.4	12	7.4	134	82.2
	Computer Whiteboard	1	0.6	12	7.4	150	92.0
	Scanner	1	0.6	3	1.8	159	97.5
	Desktop Computer for Viewing Evidence	6	3.7	6	3.7	151	92.6
	Laptop Computer and Laptop Connection	28	17.2	30	18.4	105	64.4
	Touch Screen Control System	1	0.6	2	1.2	160	98.2
	Computer Annotation Devices	3	1.8	4	2.5	156	95.7
	Television	35	21.5	75	46.0	53	32.5
Monitors/ Screens	CRT Monitor	13	8.0	9	5.5	141	86.5
	Projection Screen	14	8.6	33	20.2	116	71.2
	Individual Monitors for Juror Viewing	5	3.1	1	0.6	157	96.3
	Plasma Screen	0	0	0	0	163	100.0
	LCD Monitor	0	0	3	1.8	160	98.2
Court Record Devices	Real-Time Transcription	31	19.0	34	20.9	98	60.1

We draw the following conclusions:

1. Over half of the responding state trial courtrooms permit the use of technology-enhanced case presentation in some form.
2. Although televisions were the most common technology with 67.5% of responding courts having at least one and 21.5% having more than one, a substantial number of responding

state courts have computer display capabilities; 35.6 % reported having at least one laptop computer,³⁶ and 28.8% reported a projection screen.

3. Only 8% of the reporting state courts had computer whiteboards,³⁷ and none had the plasma display screens that Courtroom 21 experimentation concluded were the most useful forms of deliberation room display technology.
4. 39.9% had real-time transcription capability, a critical technology for the hard-of-hearing.
5. 6.7% of the courts reported more than 9 of the listed technologies. However, these are not necessarily high-tech courtrooms; the data indicates that most are weighted towards more traditional low-end technologies.

The reader must keep in mind that although this is the first known survey of its type, our data is incomplete, coming as it does from a relatively small percentage of the total number of state courtrooms. Based upon the numerous visitors to the Courtroom 21 Project, we are confident that a much larger number of courts and courtrooms have document cameras, for example, than is substantiated by the above data. We believe that there are more front-projection display units than are reflected in the data.

We know of no source that would allow even a reasonable estimate of the number of integrated high technology courtrooms in the United States; even the Administrative Office of the Courts lacks a formal accounting.³⁸ We define such a courtroom as one with a high technology evidence presentation system (computer based but usually with at least one document camera), court access to electronic legal materials, a high technology court record system, and increasingly, video-conferencing capability. In percentage terms there are few of these courtrooms, although our anecdotal evidence indicates that the absolute number is increasing rapidly. The data above indicates that the number of courts that have at least the core components of such a courtroom are significant.

The courts are not dependent, however, upon their own resources when it comes to technology augmented litigation. With the court's permission, lawyers may bring in their own equipment.

Question 2 of the Survey asked: *“If your court has used any technology listed in Question 1 during trials, who usually provides the equipment?”*

Analysis of the results shows:

³⁶ Note that desktop computers were treated as a separate category. There are a total of 12 courts that reported having at least one desktop, and 58 that reported having at least one laptop. Nine of the 12 that had desktops also had laptops (5.5% overlap in the sample total). 75% of those that had desktops also had laptops. 15.5% of those that had laptops also had desktops.

³⁷ Unfortunately this capability includes products ranging from a high tech chalkboard to high-end rear projection video displays with annotation features.

³⁸ The federal survey that follows is the federal judiciary's current efforts to obtain that data.

Technology Source	Number of Responses	Percent of Total
Court provides	96	58.9
Lawyers/parties bring what they use	35	21.5
Court and lawyers/parties provide	13	8.0
Court obtains from outside source and makes it available	4	2.5
Lawyers/parties bring what they use and local agency or group loans equipment to court as needed	3	1.8
Court, lawyers/parties, and outside sources provide	2	1.2
Court, lawyers/parties, outside sources, and local agencies/groups provide	2	1.2
Local agency or group loans equipment to court as needed	1	0.6
Court and outside sources provide	1	0.6
Lawyers/parties and outside sources provide	1	0.6

We draw the following conclusion:

Although the majority of equipment is provided by the court (65%), 22.7% is provided by counsel while outside sources sometimes also provide technology. In short, courts considering whether they need deliberation room technology to cope with technology-augmented litigation must take into account more than the court's own equipment.

§ 3-12.00 The Federal Courts

Although our primary focus in this SJI-funded study has been the state courts, federal practice is of considerable interest as the United States district courts deal with significant litigation and are, by and large, better supported by courtroom and related technology. We acknowledge with deep gratitude the assistance of the Federal Judicial Center in obtaining critical federal court information.

The questions used in our state court surveys were modified by the Federal Judicial Center and incorporated into a national survey of the technology use of the United States district courts. We are especially grateful to Dr. Beth Wiggins and Dr. Meghan Dunn of the Research Division of the FJC, and their colleagues, for the data that follows. The data made available to us is from a very preliminary report, *Federal Judicial Center Survey on Courtroom Technology, A Draft Report on Selected Survey Questions* (July 2002) (Appendix E), and its conclusions should be considered

subject to modification in the final report. The conclusions and opinions contained within the draft federal report are those of its authors and not necessarily those of the Federal Judicial Center.

The draft report “summarizes the responses to selected survey questions of the thirty-one districts that responded to the survey by the initial due date.” Unless otherwise noted, the reader should assume that the material that follows is taken from the Draft Report in verbatim or near verbatim fashion.

The following table lists the 31 districts that responded to the survey by the due date, the number of courtrooms used by magistrate and district judges in these districts, and the number of those courtrooms about which they were reporting.

District	Number of Courtrooms Used by Magistrate and District Judges	Number of Courtrooms Reported on in this Survey
Alabama Northern	21	2
Arizona	36	36
California Northern	26	26
California Southern	25	25
Colorado	15	2
Connecticut	17	0
Florida Southern	2	2
Georgia Middle	11	11
Guam	1	1
Illinois Northern	47	47
Iowa Northern	6	4
Iowa Southern	7	7
Kentucky Eastern	13	13
Louisiana Middle	6	6
Massachusetts	30	30
Mississippi Northern	8	8
Mississippi Southern	13	1
Missouri Western	17	17
Nebraska	12	12
New York Western	12	12
North Carolina Eastern	11	4
North Carolina Middle	8	8
Oregon	19	19
Pennsylvania Eastern	46	46
Tennessee Eastern	13	13
Tennessee Middle	9	9
Tennessee Western	9	9
Texas Northern	26	26
Virginia Western	15	15
Washington Eastern	10	10
Wisconsin Eastern	8	8
Total	540	446

§ 3-12.10 Deliberation Practices

The federal survey asked in its Question 7:

For each item below, please indicate whether jurors take the item into the jury deliberations room as a matter of course, whether it is available to jurors upon request, or whether it is never available to jurors. If the practice varies by judge, please select the option that describes the most common practice and use the comment section to explain how the practice differs among judges. Also, indicate whether party consent is required before each item is made available to jurors.

Table 7
Availability of Evidence, Illustrative Aids, Written Instructions, Equipment, and Other Items During Jury Deliberations

Item(s)	Jurors take it with them into deliberations as a matter of course	Available on Request	Never Available	Can't Say
Documentary evidence (e.g., papers, photographs) and non-sensitive physical evidence (e.g., clothing, paint chips)	16	9	0	6
Sensitive physical evidence such as weapons and guns.	3	16	2	10
Illustrative aids, not admitted as evidence	0	3	16	12
One set of written jury instructions	11	4	3	13
Individual sets of written jury instructions for each juror	3	7	6	15
Equipment to view evidence and exhibits	1	18	3	9
Calculators	1	17	3	10
Notes taken by jurors during trial	18	2	2	9
Worksheets/index for reference to evidence/exhibits	9	4	4	14

Courtroom 21 Conclusions

We draw the following conclusions:

1. As in the state courts, there is substantial difference in the way the United States district courts treat exhibits; 16 districts report that customarily documentary evidence is taken into deliberations as a matter of course, 9 supply them on request, and 6 can't say. "Sensitive evidence" which need not be restricted to weapons, is largely made available only on request with 16 districts taking that position, and 3 supplying it as a matter of course, but notably 10 districts "can't say."
2. Although a majority of 18 districts report that "equipment to view evidence and exhibits" is available on request, 3 report that it is never available and 9 can't say; only one makes it available as a matter of course.
3. Interestingly, 16 districts report that "Illustrative aids, not admitted as evidence" are never provided. Although 12 districts can't say what their practice is and 3 districts do make such material available on request, we *may* conclude that many courts would not permit the replay during deliberations of courtroom animations and similar material.
4. Many districts are permitting written copies of the jury instructions to go into deliberations, enhancing the potential utility of deliberation room display of instructions.

The federal survey asked in its Question 8:

In trials in which technology is used to present evidence, how do jurors usually view the evidence during deliberations?

Table 8
How Jurors View Evidence During Deliberations in Trials in Which Technology is Used

Viewing Method	Number of Districts
They view most evidence in physical form in the jury room (e.g., actual paper documents, photographs, physical objects), but are brought back into the courtroom to view/hear evidence such as videotapes and audiotapes and perhaps also to view certain types of physical evidence such as drugs and guns.	15
They view most evidence in physical form in the jury room (e.g., actual paper documents, photographs, physical objects), but view and hear evidence such as videotapes and audiotapes using equipment in the jury deliberation room.	3
They view most evidence using equipment in the jury deliberation room.	3
Jurors are brought back to the courtroom when they ask to view evidence.	4
Can't Say or Missing	6

Courtroom 21 Conclusions

We draw the following federal conclusions:

1. Deliberation room technology, including VCR's and the like, appears to be rare.³⁹
2. We cannot surmise whether the absence of deliberation room technology embodies past traditional reality, reflects limited technology resources, or is the result of judicial decision that prefers especially careful judicial control.

The federal survey asked in its Question 9:

Please indicate whether the following types of equipment and technology are available as needed for juror use during deliberations.

³⁹ Subject to the number of "can't say or missing" districts.

Table 9
Districts Having Equipment and Technology Available as Needed for Juror Use During Deliberations

Equipment	Available as Needed	Not Available	Can't Say or Missing
Pen/pencil and paper	27	0	4
Calculators	22	3	6
Chalk boards	20	7	4
Paper flip charts	25	2	4
Analog audiotape player	18	7	6
Analog videotape player	17	6	8
Laser disk player	2	23	6
Traditional slide projector	3	22	6
Overhead projector	12	13	6
Television	17	8	6
Copy machine	6	20	5
Scanner	3	22	6
Laptop or desktop computer for making calculations of, for example, damages	2	22	7
Evidence camera	7	18	6
Laptop or desktop computer for evidence retrieval and viewing	5	20	6
Digital monitors for use by group of jurors (CRT, LCD, or plasma monitors)	7	19	5
Individual monitors for juror viewing of evidence	3	22	6
Digital projector and projection screen	5	20	6
Color video printer	2	24	5
Other printer attached to computer	3	23	5
Annotation equipment (e.g., touch screen, light pen, or telestrator)	3	23	5
Electronic whiteboard	1	24	6
Transcripts from real-time court reporting	9	15	7
Digital audio recording	5	19	7

Some notes have been omitted.

Courtroom 21 Conclusions

We draw the following conclusions:

1. Most districts do not have available high end display technology for jury room use.
2. A number of districts do have available high end display technology: 7 reflect document cameras and at least 5 report computer availability; for display 7 report digital monitors, 5 report front projection equipment, and 3 even have individual monitors available for jurors. Although the data available to use does not allow us to determine whether the same districts have multiple forms of technology for deliberations, it is apparent that the potential exists in at least some districts for high technology deliberations.

The federal survey asked in its Question 10:

When equipment is required to view evidence during jury deliberations, who generally operates the equipment?

Table 10
How Equipment is Operated During Jury Deliberations

Equipment Operator	Number of Districts
Court personnel assist jurors	10
Jurors are instructed and operate it themselves	11
Equipment is never used	2
Can't Say	2
Other	2

Courtroom 21 Conclusions

We draw the following conclusions:

1. Table 10 suggests that 21 of the 31 reporting federal districts use some type of equipment during jury deliberations, although the type of equipment used is unspecified.
2. In almost half of these 21 districts, court personnel assist jurors with the operation of the equipment. In the other half, the jurors operate the equipment themselves. The survey does not tell us the type of equipment jurors operate. A similar pattern of results was seen in the reporting state courts.

§ 3-12.20 Courtroom Technology

As was true of the state courts, federal court use of courtroom technology can suggest the degree to which jurors will have to deal with digital and other forms of high technology evidence. The federal data shows:

The federal survey asked in its Question 1:

Listed below are a number of technologies that can be permanently installed in courtrooms, shared between courtrooms, or brought into the courtroom by attorneys. For each technology, please indicate (1) in how many of your district's courtrooms, if any, the following technology is permanently installed; (2) whether the technology is shared between courtrooms and if so, the number of courtrooms with access to the shared equipment; and (3) finally, whether attorneys have brought any of the equipment into a courtroom within the past twelve months. We understand that your district most likely does not keep a record of when attorneys bring equipment into the courtroom; your best estimate in response to the third question is sufficient.

The following is taken verbatim from the draft report:

The first number in the cells of the second column of Table 1 (labeled “Number with permanent installations”) indicates how many of the 31 districts that responded to the survey have at least one courtroom with the indicated technology. The second number in the cells indicates how many of the 904 courtrooms reported on by the 31 districts have the technology (see the shaded rows).

Similarly, the first number in the cells of the third column (labeled “Number with shared access”) indicates how many of the 31 districts that responded to the survey have at least one courtroom with shared access to the indicated technology. For some technologies, a second number indicates how many of the 429 courtrooms reported on by the 31 districts have shared access to the technology.

The number in the cells of the fourth column (labeled “Brought in by attorneys”) indicates the number of districts that reported an attorney brought the indicated technology into a courtroom in the past 12 months.

Table 1
Permanently-Installed, Shared-Access, and Attorney Provided Technology

Technology	Number with permanent installations ¹	Number with shared access ²	Brought in by attorneys ³
Evidence Camera	27/103	15 ^c	17 ^a
Wiring to Connect Laptops	26/97	22 ^c	18
Laptop computers	2/15	5 ^b	27 ^a
Desktop Computers	7/26	5 ^b	13 ^b
Monitors built into jury box	14/54	-	-
CRT Monitors outside the jury box	13/41	10 ^b	14 ^b
Plasma Monitors outside the jury box	8 ^a /25	6 ^b	9 ^d
Other types of Digital Monitors outside the jury box	4 ^a /7	3 ^c	6 ^e
LCD/Digital monitor at the Bench	26/163	9 ^b	9 ^c
LCD/Digital Monitor at Witness Stand	25/105	8 ^b	9 ^c
LCD/Digital Monitor at Counsel Table or Lectern	25/116	9 ^b	12 ^b
Digital Projector and Projection Screen	12/26	13 ^a	16 ^b
Monitors or screens targeted at audience	19/44	9 ^b	8 ^d
Color Video Printer	21/76	6 ^b	2 ^f
Annotation Equipment	26/90	10 ^b	8 ^b
Sound (Audio) Reinforcement System	27 ^a /418	7 ^d	5 ^a
Noise Masking	27/166	7 ^d	0 ^c
Signaling System	25/161	5 ^d	1 ^d
Time Over Lights	9 ^a /53	0 ^d	1 ^b
Telephone Interpreting System	13/70	7 ^c	0 ^d
Infrared Interpreting System	29/188	12 ^d	3 ^d

Table 1 continues on next page.

Table 1
Permanently-Installed, Shared-Access, and Attorney Provided Technology (cont'd)

Technology	Number with permanent installations ¹	Number with shared access ²	Brought in by attorneys ³
Kill Switch and Control System	26 ^a /120	8 ^e	4 ^b
Scanner	0/0	2 ^c	1 ^g
Electronic Whiteboard	7/11	4 ^d	3 ^h
Integrated Lectern	23/70	12 ^d	4 ^b
Audioconferencing Equipment	28/248	12	0 ^b
Videoconferencing Equipment	17/43	12 ^c	1 ^a
Control Room (Hub-based) Support for Videoconferencing	2 ^a /10	-	-
Echo Cancellation System	12/23	3 ^d	0 ^c
ISDN lines for Videoconferencing	20/174	8 ^c	1 ^b
Real-time software for use by a real-time court reporter	20/136	11 ^c	5 ^e
Real-time transcript viewer annotation system	18/130	7 ^d	5 ^c
Digital Audio Recording	18/60	7 ^d	0 ^d
Internet Connections for Lawyers	4/25	2 ^d	1 ^d
Wireless Technology other than Wireless Microphones	4 ^b /25	0 ^f	1 ^g
Analog Audiotape player	17/122	14 ^d	16 ^e
Analog Videotape player	27/124	18 ^c	13 ^d
Laser Disk Player	2 /2	0	1 ⁱ
Traditional Slide Projector	0/0	2 ^c	10 ⁱ
Overhead Projector	4/9	16 ^b	17 ^d
Television Set	9/34	21 ^c	14 ^d

a = 1 missing or can't say responses
b = 2 missing or can't say responses
c = 3 missing or can't say responses
d = 4 missing or can't say responses
e = 5 missing or can't say responses

f = 6 missing or can't say responses
g = 7 missing or can't say responses
h = 8 missing or can't say responses
i = 9 missing or can't say responses
j = 10 missing or can't say responses

k = 11 missing or can't say
l = 12 missing or can't say
m = 13 missing or can't say
n = 14 missing or can't say
o = 15 missing or can't say

[Table Notes continue on the next page:]

Table notes

1. The first number in the cells indicates how many of the 31 districts that responded to the survey have at least one courtroom with the indicated technology. The second number in the cells indicates how many of the 446 courtrooms reported on by the 31 districts have the technology.
2. The first number in the cells indicates how many of the 31 districts that responded to the survey have at least one courtroom with shared access to the indicated technology.
3. The number of districts that reported an attorney brought the indicated technology into a courtroom in the past twelve months.

The federal survey asked in its Question 2:

In approximately how many trials and evidentiary hearings has each of the following technologies been used during the past 12 months? In approximately how many other hearings and non-ceremonial court proceedings has each of the following technologies been used during the past 12 months? We understand that your district most likely does not keep a record of how often equipment is used. Your best estimate is sufficient.

The entries in the second column of Table 2 (labeled “Trials and evidentiary hearings in the past year”) are: (1) the number of trials and evidentiary hearings in which technology has been used in the last 12 months across all reporting districts, and (2) the lowest number of such matters reported by any given district through the highest number reported (i.e., the range).

The entries in the third column of Table 2 (labeled “Other hearings and non-ceremonial hearings in the past year”) are: (1) the number of other hearings and court proceedings in which technology has been used in the last 12 months across all reporting districts, and (2) the lowest number of such matters reported by any given district through the highest number reported (i.e., the range).

The numbers provided in Table 2 are lower than the actual number of trials and evidentiary hearings and of other hearings and court proceedings in which the indicated technologies have been used in the past 12 months, and should be interpreted only as lower bounds. They represent the lower bound because (1) some districts responding to the survey did not provide a count of the number of times the technology had been used or provided a count that could not be quantified (see Table 2b and lettered notes in Table 2), and (2) some districts indicated their estimate was a lower bound (e.g., they responded 100+). In addition, the counts for some technologies are largely due to just one district. For example, of the 1325 other hearings and proceedings in which an infrared interpreting system was used, 1113 were from one district.

Table 2
Use of Technology in Court Proceedings

Technology	Trials and evidentiary hearings in past year¹	Other hearings and non-ceremonial court proceedings in past year²
Evidence Camera*	809 ^f , 0-160	596 ^k , 0-300
Computer and Monitor or Screen for Evidence Retrieval and Presentation	785 ^g , 0-180	542 ^k , 0-300
Color Video Printer	76 ^g , 0-10	37 ^l , 0-20
Annotation Equipment (e.g., touch screen, light pen, or telestrator)	662 ^e , 0-150	455 ^k , 0-300
Telephone Interpreting System	753 ^g , 0-706	226 ^h , 0-185
Infrared Interpreting System*	207 ^h , 0-89	1325 ^m , 0-1113
Audio-conferencing Equipment*	202 ⁱ , 0-50	1442 ^l , 0-755
Videoconferencing Equipment*	105 ^g , 0-25	259 ^h , 0-75
Real-time software for use by a Real-time Court Reporter	500 ^l , 0-120	1937 ^o , 0-1497
Real-time Transcript Viewer Annotation System for Judges and/or Attorneys*	340 ^k , 0-120	340 ⁿ , 0-150
Digital Audio Recording*	92 ^e , 0-50	1422 ^h , 0-500

- a = 1 district gave missing, can't say, or nonquantifiable response
- b = 2 districts gave missing, can't say, or nonquantifiable responses
- c = 3 districts gave missing, can't say, or nonquantifiable responses
- d = 4 districts gave missing, can't say, or nonquantifiable responses
- e = 5 districts gave missing, can't say, or nonquantifiable responses
- f = 6 districts gave missing, can't say, or nonquantifiable responses
- g = 7 districts gave missing, can't say, or nonquantifiable responses
- h = 8 districts gave missing, can't say, or nonquantifiable responses
- i = 9 districts gave missing, can't say, or nonquantifiable responses
- j = 10 districts gave missing, can't say, or nonquantifiable responses
- k = 11 districts gave missing, can't say, or nonquantifiable responses
- l = 12 districts gave missing, can't say, or nonquantifiable responses
- m = 13 districts gave missing, can't say, or nonquantifiable responses
- n = 14 districts gave missing, can't say, or nonquantifiable responses

Table Notes:

1. Table entries in this column are (1) the number of trials and evidentiary hearings in which technology has been used in the last 12 months across all reporting districts, and (2) the lowest number of such matters reported by any given district through the highest number reported, i.e., the range.
2. Table entries in this column are (1) the number of other hearings and court proceedings in which technology has been used in the last 12 months across all reporting districts, and (2) the lowest number of such matters reported by any given district through the highest number reported, i.e., the range.

Table 2b summarizes the number of districts that reported that a particular technology was used in all trials and evidentiary hearings and in all other hearings and court proceedings, or reported that the technology was used daily in such matters.

Table 2b
Number of Districts Using the Technology in All Proceedings or on a Daily Basis

Technology	Used in All . . .		Used Daily . . .	
	Trials and Evidentiary Hearings	Other Hearings and Court Proceedings	In Trials and Evidentiary Hearings	In Other Hearings and Court Proceedings
Evidence Camera	1	1	-	-
Computer and Monitor or Screen for Evidence Presentation	1	1	-	-
Infrared Interpreting System	-	-	1	1
Audio Conferencing Equipment	-	-	1	1
Real-time Software for Use by a Real-Time Court Reporter	2	2	2	1
Real-time Transcript Viewer Annotation System for Judges and/or Attorneys	1	1	2	1
Digital Audio Recording	2	1	-	-

Courtroom 21 Conclusions

We draw the following conclusions:

1. The United States district courts have adopted courtroom technology to a substantially greater degree than have the reporting state courts discussed above.
2. A substantial number of courtrooms have evidence display technology such as document cameras that could possibly be relocated to jury deliberation rooms. Fifteen of the reporting districts, for example, report sharing of document cameras among courtrooms.

3. The large number of high technology federal courtrooms implies an increasing need for the federal courts to consider how jurors might most efficiently review digitally presented evidence during deliberations

§ 4-10.00 Jury Room Deliberation Room Technologies

Survey data established that jurors regularly review exhibits, either as a matter of course or upon request. The nature of those exhibits is somewhat less certain. The detailed federal data shows that documents are customarily available to the jurors. Case, statute, and rule analysis suggest that courts disfavor juror review during deliberations of testimonial or demonstrative exhibits.⁴⁰ Some courts, for example, will be unwilling to permit jury review of a videotaped or multi-media deposition, reasoning that such a practice would give the deposition more weight than the testimony of those witnesses who actually testified at trial. Again, the federal data supports this; far fewer courts permit demonstrative exhibits in the jury room compared to documents and other forms of formal evidence. We can conclude therefore that documents are the single most fundamental and traditional form of evidentiary exhibit. Further, they are less likely than photographs or videotapes to be subject to unfair prejudice objections. Accordingly, any form of jury room deliberation technology must at minimum be able to display paper documents to the jurors. Similarly, technology augmented trials and courtrooms are more likely to display documents than more sophisticated forms of evidence, such as computer-created animations. We therefore conclude that any form of deliberation room technology must have as its minimum ability the capability of displaying documents to the jurors. At the same time, the substantial number of courts that responded to our state court survey that provide VCR's for deliberations makes it clear that other forms of technology are also needed for deliberations.

§ 4-11.00 Potential Technologies for Use in Deliberations

Our review of those technologies of potential value during deliberations resulted in formulating the following categories:

- “Input” technology - e.g., those devices which provide information (exhibits) to the jury when displayed electronically;
- Display technology;
- Annotation technology - e.g., the ability to write and/or place markings on exhibits; and
- Assistive technologies - e.g., those technologies helpful to jurors with difficulties, hearing, seeing, and the like.⁴¹

There are, of course, critical differences between traditional largely non-technology trials and technology-augmented trials, and these differences can affect what may be desirable in the deliberation room. Technology augmented trials are predominantly visual.⁴² Counsel use document

⁴⁰ See § 2-10.00 *supra*.

⁴¹ These are addressed separately at § 6-10.00 below.

⁴² See generally Fredric Lederer, *The Road To the Virtual Courtroom? A Consideration of Today's – and Tomorrow's – High Technology Courtrooms?* (1999 State Justice Institute), 50 S.C. L. Rev. 799 (1999).

cameras and computers to display electronically most or all of the evidence. Increasingly, much of the evidence, e.g., e-mails, electronic charts, data compilations, or computer graphics, may not even have existed in physical form. From an evidentiary standpoint, technology augmented-trials are best characterized by the use by counsel of notebook computers to display evidence and argument to the fact-finder.

§ 4-12.00 Input Technology

If we assume a traditional trial, the evidence will consist primarily of witness testimony, documents, photographs, charts, and, possibly, audio or video tapes. The type of technology that will most easily permit the presentation of documentary evidence to jurors is the document camera:

Most document cameras consist of a vertically mounted color television camera aimed downwards at a horizontal base upon which a document or object can be placed. . . . Most document cameras have at least a manual or autofocus control as well as the ability to zoom in or out so as to enlarge or diminish the area of the document or object to be displayed. Sophisticated document cameras increasingly tend to have hand-held remote controls.

Many document cameras provide overhead lighting of the base in order to enhance the visibility of the item to be displayed. In some cases this lighting is provided by bulbs that are mounted on moveable arms; the arms may take up significant vertical space.

Nearly all document cameras are designed so that they can show transparencies, x-rays, and slides. Some cameras come equipped with internally illuminated bases for this purpose; others have optional light boxes that can be placed on the base to provide similar functionality.

Document cameras must be connected to some form of display device. Ordinarily this would be one or more televisions, monitors, or projection units.⁴³



WolfVision Visualizer

⁴³ Leigh Kades, *Document Cameras*, COURTROOM 21 COURT AFFILIATES TECHNOLOGY WHITE PAPER 2002-06-01 (Draft June, 2002).

Document cameras are simple to operate. The most basic provide zoom-in, zoom-out, and autofocus. During Trial Phases I and II we used a portable WolfVision Visualizer, which proved ideal for the purpose.⁴⁴ All that a juror need do is place a document, photo, chart, etc., on the base, and an image immediately appears on the display device.

Other input devices of potential application to deliberations are audio tape players and video tape players. As law enforcement increasingly shifts to CD recordings, CD players will be necessary for wiretaps and the like. We can anticipate a similar move from tape to DVD in the years to come; we have already moved some video footage to CD's.

When a trial is truly high tech, much or all of the evidence will be in digital form. Other than printing it out and supplying the printed copies to the jurors as evidentiary exhibits, the only easy way of permitting juror review of computer-based evidence is through the use of a computer in the jury room. The computer then becomes a highly desirable input technology.

§ 4-13.00 Display Technologies

If the primary goal of deliberation technology is to enable the jurors to collectively view evidence at the same time, display technology is critical. The primary display means available are traditional televisions, television monitors,⁴⁵ computer monitors capable of displaying traditional video, LCD or plasma displays, and rear-projection and front-projection devices.

Traditional televisions are inexpensive and as noted above, common in the courts. They are, however, potentially limited to showing ordinary video,⁴⁶ such as the image sent from a document camera or a VCR. Television monitors and video-capable computer monitors permit the display of both ordinary video and computer output. At present, most LCD screens are designed for personal use, and those that are reasonably priced will range up to 18 inch inches in diagonal measurement. Use of these monitors is customary in high-tech courtrooms, where jurors often use them either on a one juror to one screen basis or two jurors to a single screen. So long as these monitors were linked to equipment that could also show traditional video,⁴⁷ they would be highly desirable. Given the need for multiple monitors ordinarily they would best be used in a permanent or semi-permanent installation.

Plasma screens are large, high-resolution screens, usually with diagonal measurements ranging from 40 to 61 inches. Customarily they can display any usual video image. Although they are fairly common in high-technology courtrooms, none of the responding state courts in our survey reported possessing one. They can be wall-mounted or placed on any large flat surface via an optional stand. Their chief (perhaps sole) disadvantage is their cost; high-resolution units frequently cost \$15,000 or

⁴⁴ The Courtroom 21 Project used its in-house (loaned) equipment for this study. The Project uses document cameras supplied by DOAR Communications, Samsung, and Wolfvision. All would have been highly usable. The WolfVision was used in deliberations primarily because it was the simplest of the models available.

⁴⁵ Capable of displaying computer output as well as traditional video.

⁴⁶ Unless computer output is supplied to them with a converter. Such converters are easily available and inexpensive; some notebook computers can output composite or S video.

⁴⁷ It is easily possible to design a deliberation room in which all display images are digital in nature. However, this would entail such expense or complexity that we believe that most courts would *for the moment* prefer the ability to show a document camera or VCR images more easily, especially as equipment must often be moved from one jury room to another.

more apiece. They are becoming cheaper, however, as manufacturers position them for home TV use.⁴⁸

Projection units are simply units that display images on a flat surface. They range in size from small models the size of a large hard-cover book to the enormous desk-sized units often used in rock concerts; most are highly portable. Projection units can display images from either the rear or the front. Rear projection is highly desirable because viewers do not see the projection unit - only the screen. Unfortunately, rear projection is not ordinarily possible except in large rooms where the projector can be located far enough to the rear of the screen. The critical exception to this statement takes place when manufacturers install projection units in special enclosures with mirrors that eliminate the need for a large physical distance between projector and screen. Although a number of manufacturers produce these products, SMART Technologies is best known in the legal world for their rear-projection SMART Boards. These single-unit rear- projection displays are especially useful in conference/jury room sized spaces. Although technically portable, their size makes significant movement difficult, and they range in price from \$10,000 to about \$20,000.⁴⁹ Front-projection units are usually placed on stands or tables and project their images onto screens or, if need be, walls. They can cost from about \$5,000 to \$15,000 for units of potential interest in jury rooms. Critical concerns include resolution, the fact that cheaper models may not be able to handle all customary computer outputs, and brightness. Those units that cannot cope with bright indoor lights or the results of windows will require dimming room light or using drapes, or both. Their noise and often the need to put them on the jury room table are problematic. However, inasmuch as many high-tech courtrooms were equipped with such projectors and many courts are now replacing those units either with more capable devices or alternative display devices, a number of courts are likely to find themselves with available projectors that could be used in jury deliberation rooms.

As part of this study, we compared the relative utility of using televisions, rear-projection units, plasma screens, and front-projection units as a primary jury deliberation room display device. Our results are discussed below in the Comparative Advantages of Display Devices. As a result of that evaluation in Trial Phases I and II, we used plasma screens and front-projection units.

§ 4-14.00 Annotation Technology

Question 8 of our survey established that many courts supply jurors with chalk boards or flip charts; nearly all supply them with paper and pencil/pen. Giving jurors the ability to communicate with each other through writing would seem to be an important need - especially when jurors are attempting to present their views of physical relationships, create visible calculations, or visually argue their points. Annotation technology permits this electronically though what are usually called “whiteboards.” Speaking generally, there have been four “generations” of electronic⁵⁰ whiteboards. The first generation permitted a person to write on the board, and the writing was then subject to either being printed out electronically or displayed electronically, or both. The second generation

⁴⁸ In July, 2002 the Courtroom 21 Project agreed to install Polyvision plasma screen units, capable of annotation, that retail for about \$12,000.

⁴⁹ Units that can be built into the wall are less expensive.

⁵⁰ The original whiteboard, of course, was exactly that - a flat white surface, usually wall-mounted, that could be written on with erasable colored markers.

added a separate front-projection unit so that the writer could also mark or annotate on a displayed image, such as a street intersection.⁵¹ Third-generation whiteboards are rear-projection display units that provide the writer with the ability to write on the display screen, with or without an underlying image. Fourth-generation whiteboards are large plasma display screens fitted with overlays that turn the screen into a touchscreen. Coupled with the proper software this permits the writer to mark or annotate on the screen, with or without an underlying image. Both third- and fourth-generation whiteboards may be capable, as are SMART Boards, of controlling a remote computer via the writer's use of a finger or lightpen. All generations of whiteboards are commercially available and have potential use in a jury deliberation room. A number of firms now market inexpensive products that can be placed on or over flat surfaces to convert them into first-generation whiteboards.⁵²

Although features such as the ability to print out what a juror has written on a whiteboard may be desirable, it is unclear that that capability alone would justify the price differential between a piece of electronic equipment and a traditional plain whiteboard or chalkboard. And, indeed, in Trial Phase II experiments, most jurors chose not to use a rear-projection whiteboard configured solely to display writing. Where electronic whiteboards are especially useful is in their ability to permit a juror to display a video or computer image and then write on the image. One can easily imagine, for example, jurors debating how an intersection collision could have occurred, with differing jurors drawing electronically a still photograph of the intersection.

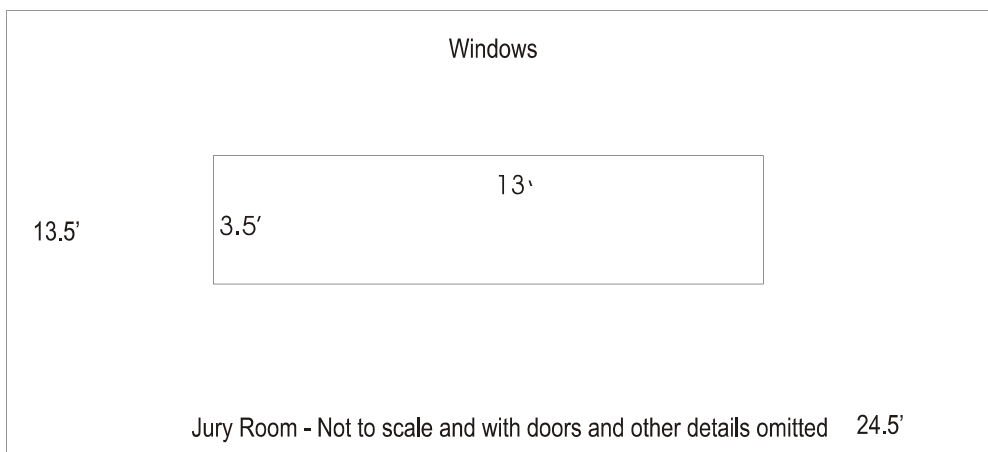
⁵¹ This requires careful projector location to keep the writer from stepping between the projector and the whiteboard. The Courtroom 21 Project has considered these boards relatively undesirable because of that concern.

⁵² Polyvision, for example, has a "CopyCam" that "is an image capturing system that uses NASA-level optical technology in a wall-mounted arm to snap pictures of everything written on an ordinary white board or chalkboard. . . . [U]sers can send the contents of the board to a diskette, a Web site, or a wireless color printer. . . ." I The Insider News, # 1, Summer, 2002 at 4 (Infocomm promotional materials). The Courtroom 21 Project will install and test a copycam to be loaned by Polyvision in the Courtroom 21 jury room.

§ 4-20.00 Comparative Advantages of Selected Display Devices

After having evaluated potential deliberation room technologies, we concluded that the single most important issue was the relative utility of the varying display devices.⁵³ In light of their ready and inexpensive availability, we began with televisions. Based on our prior evaluations and experience, we then experimented with rear-projection units, plasma screens, and front-projection units. We did not consider individual jury monitors in light of the likely need for at least a semi-permanent installation and probable lawyer and judicial concern that such an approach would interrupt jury cohesion.

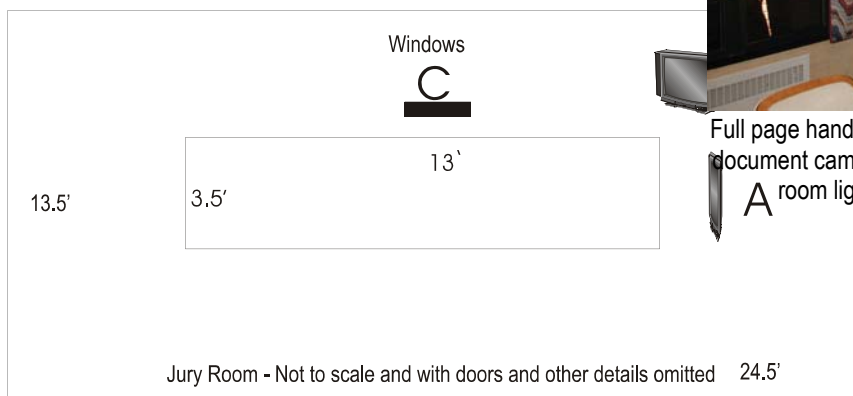
We first ascertained that the Courtroom 21 jury deliberation room's size and shape reasonably replicated a functioning deliberation room. A rectangular room of 24.5 feet x 13.5 feet, our jury room is lit by overhead incandescent lights and has windows along one long wall. The center of the room is filled by a conference table, of 13 feet x 3.5 feet, surrounded by upholstered chairs.



Using both a DOAR Communicator, later a WolfVision Visualizer, and a Dell Inspiron 7500 (running TrialPro software) notebook computer, we displayed evidentiary exhibits, photographs and documents (both “type-written” and with handwriting) used in past experimental Laboratory Trials. By using the same input devices and exhibits with the varying display devices, we were able to ensure a valid means of comparison. We then rotated the display device around the table to at least

⁵³ One can expect significant differences among different products and models of any given technology. Flat-screen televisions will likely yield a somewhat different picture of a document than would a television with a curved picture tube, for example. Conceding that such variation is inevitable, we believe that our comparisons furnish valuable information to courthouse users. It is critical, however, for the reader to keep in mind that the actual utility of any display device cannot be determined until it is actually tried out in the very room in which it is to be used. Not only may the device display differently than anticipated, but room-specific conditions such as lighting may be determinative of the devices' value.

points A, B, and C, as noted in the diagram below, checking for visibility from various distances. We viewed paper exhibits first as a full page, then from margin to margin, and then with a closeup of half the page as close to margin-to-margin as possible.



Full page handwritten memo, at Point B using the document camera. Glare is a function of both the room lighting and the camera flash.

§ 4-21.00 Televisions

We first connected a 25 inch television on a wheeled stand and then checked the image for visibility with the set at points A, B, and C, as shown in the above illustration. We then displayed paper documents. We did not attempt computer output, as the TV was not capable of it.

We determined the following:

1. The curved TV screen causes visible distortion of the image, the severity of which depends upon the overhead lighting and the location of the jurors; in position C (with the set near the window wall), jurors at the far ends of the table on the same side as the TV had problems seeing, although jurors next to the TV could see.
2. Room lighting is a major factor that can best be evaluated only with equipment in place, as display screens vary.
3. Position A, as close to the end of the table as possible, minimized lost space; end jurors could see the image; subject to the amount of overhead lighting, all exhibits were at least visible, although the handwritten memo was just barely readable from the far edge of the table. The half-page manual was readable at about seven feet.
4. Position B, 42 inches from the corner of the TV, was problematic. A full 8.5" x 11" "typed" page of text displayed in whole page mode was unreadable at

almost any distance, even if the room lights were dimmed, although the 6.5" text line could be read at 12 feet when the document camera was zoomed to display the line and nothing else. The half-page engine manual with a large font was barely readable at eight feet although a close-up of its margin-to-margin text was acceptable; the handwritten memo with large handwriting was readable in some form at ten feet in full-page mode; close-ups of individual lines and words were more effective, especially when the room lighting was dimmed. When the set was repositioned to the far corner (on the same side of the table), the image was unreadable from the side of the table the TV was on.

5. The effectiveness of Position C depended upon how close the TV was to the table. When the TV was placed as close to the window wall as possible, all jurors could see the screen. However, the jurors on the far ends of the table on the same side as the TV had difficulties seeing the TV image because of the curve of the screen. With the set moved so that it adjoined the table, the TV was highly effective for jurors on the other side of the table with about a 45% viewing angle; however, it may inhibit juror discussion because of the difficulty that jurors on the same side of the table as the TV would have seeing the TV.

§ 4-22.00 Plasma Screen

We tested a 40-inch low-resolution (640x480) diagonal Pioneer flat-panel plasma screen with both a portable WolfVision document camera and a Dell Inspiron 7500 computer.

We determined the following:

1. Placing the plasma screen at Point A but as close to that wall as possible by standing it on a credenza and using the document camera, photographs were easily visible from throughout the room and of good quality. The large-font engine inspection report was fully readable at all angles from the end of the table, even with full margins; the handwritten memo was also readable throughout the room, and a pen pointer was effective. The full-text page was fully visible from the end of the table without any glare when it was zoomed to eliminate margins; with one inch margins the document was readable but was of poorer quality than when viewed without margins.

When using the notebook computer, the full text page was visible throughout the room but was not readable. due to the small size of the text. Enlarging part of the image made it fully readable throughout the room. The same occurred when viewing the handwritten memo; it had to be enlarged to be readable. Notably, the low



Largely full page handwritten memo, at Point C using the document camera. Glare is a function of both the room lighting and the camera flash.

640x480 resolution of the display was not a problem, much to our surprise. Further, the enlargement feature of the TrialPro software was easy to use and highly effective.

Subsequent use of the plasma screen in Trial Phases I and II placed the plasma on the very end of the table. This proved to be far more effective and made every document readable in at least some form.

2. We next placed the plasma screen at point B in the corner of the room, with the document camera. The picture was visible from throughout the room. The full 8.5" x 11" text page was readable for up to 6.5 feet; zooming to eliminate margins made it readable down the entire table. The handwritten note and engine manual page were similarly readable once they were zoomed to eliminate margins.

When using the computer, the full text document was only visible to about 6 feet; once enlarged it was fully readable. The handwritten note could be seen in full size from all around the room.

3. With the plasma screen placed at point C but close to the window wall (three feet from the horizontal



Zoomed engine inspection form at Point B



Part of full page text letter zoomed without margins at Point C

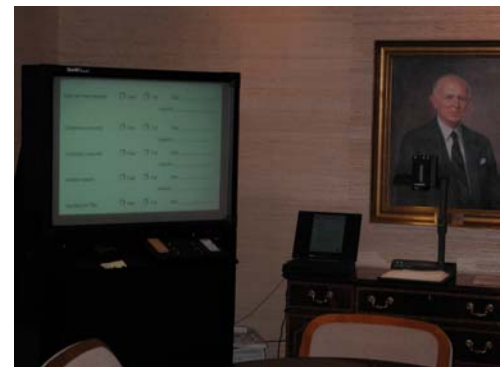
midpoint of the table),⁵⁴ the document camera made the full-text page readable from across the table, but readability diminished as the viewer moved towards the ends of the table. The same document was readable from throughout the room when it was enlarged to show it without margins. The engine inspection report was visible but not readable from the ends of the table; readability improved as the exhibit was enlarged and was easily visible throughout the room when enlarged to text without margins. The photograph was visible throughout the room.

When using the computer the full page of text was easily visible from directly across the table but unreadable from the far ends of the table; readability diminished the closer the viewer got to the ends of the table. Enlarged, the document was more readable. Viewers at the end of the table could read the document when it was enlarged to the point that the text filled the screen without margins. Similarly, the large-type engine manual was viewable but largely unreadable from the ends of the table in full page mode.

§ 4-23.00 Rear-Projection Display

For comparison purposes we tested a 40-inch rear-projection SMART Board,⁵⁵ using it as a display device without use of its annotation capabilities.

SMART Boards are composed of two primary parts: the internal projector and the shell, which, with its parts, surrounds the projector. Although the external shell is fixed for any given model, the projector is not, and different results could be obtained by varying the projector. We used a 3M Projector.



Engine inspection form zoomed without margins, at Point B

We determined the following:

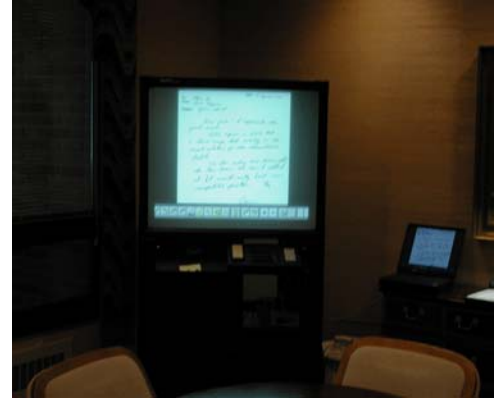
1. Using the WolfVision document camera with the Dell laptop computer yielded a slightly sharper image than did using the camera's composite video output.⁵⁶ The computer's 640x480 resolution was quite useful. Enhancing the resolution to 800x600 and then 1024x768 improved readability only mildly, if at all. Dimming or turning off the room lights yielded only a small improvement in readability.

⁵⁴ Because the plasma screen is very thin, it would not be visible from the sides when placed on or adjacent to the table.

⁵⁵ During Trial Phase II, we used the much larger and more effective 3000i model. As these are very large and relatively new, we used the smaller and more available model for testing.

⁵⁶ The camera has both a y/c and a computer output, both of which likely would have yielded a superior image.

2. The SMART Board's readability was greatest in position A, where the entire jury could face the image. Point B, probably the most aesthetic and functional location in the room, yielded quality readability. Point C, however, made the image unreadable unless the viewer was seated across the table from the SMART Board; viewers at the ends of the table would have difficulty reading documents.



Handwritten memo zoomed without margins, at Point B

3. When using the document camera, full-page documents with large amounts of small text were not readable. Zooming the document was required. The full-text page was visible to the entire table when it was enlarged enough to eliminate all marginal white space. The engine inspection report, with its relatively large font, was only readable to the first half of the table closest to the display; when zoomed to eliminate the margins, it was fully readable to the entire table. The engine maintenance manual, filling only the left half of a landscaped 8 1/2" x 11" page was readable around the table.

4. The laptop computer yielded results similar to those of the document camera. Full-page text was unreadable except, perhaps, by those sitting immediately in front of the SMART Board. The same was true of eliminating the margins but leaving the full page of text. Partial page enlargements, especially call-outs designed to eliminate all marginal white space, were generally readable around the table. When the SMART Board was at Point B, the image was poorer for those at the far end of the table. The handwritten note was visible on a full-page basis for only the closer half of the table. Eliminating the margins made it readable from the entire table.

Had we used the much larger 67-inch diagonal 3000i SMART Board, we would have had substantially different results. The 3000i's screen size is such that substantially greater readability would have been available. Our experience with the 3000i during Trial Phase II indicates that a



3000i SMART Board in jury room in preparation for Trial Phase II

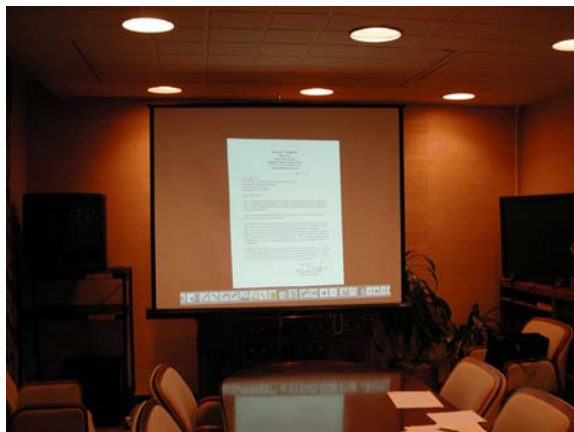
Point B position should be fully functional.



Petra Kemmack tests 3000i in jury room.

§ 4-24.00 Front-Projection Display

We tested a 3M projector. The projector was placed on the table and aimed across the length of the table at a seven-foot diagonal portable screen a few feet from the end of the table (Point A). We did not test other locations because the distance from the projector to the screen would have been too little for an adequately sized image. This was the largest image available in the comparison experiments.



Full page “typed” memo displayed by computer.

We determined the following:

1. When using the document camera, fine focus problems in the document camera became apparent, likely due to the large size of the image. Individuals close to the screen but viewing it from the sides had difficulty in reading documents. Paragraphs of the full-page text and the handwritten note were fully readable; the full-page letter was not, likely due to focus difficulties.
2. When using the computer, the full-text letter was readable only from the far end of the table; turning off the lights yielded only a minor improvement. The engine inspection report was visible to the end of the table.

Conclusions

The comparison experiments are clearly dependent upon the room, lighting, and specific equipment used. Further, visibility and readability are affected by the viewer’s eyesight. With these caveats in mind, we concluded the following:

1. The dimensional size of documents, their text density, and the width of the relevant portion of the exhibit are determinative of readability.
2. Room lighting is especially important and can be determinative of the utility of any given display.
3. The ability to enlarge part of the image or zoom into an image is critical; some documents may not be readable at all without that capability.



Document “call-out” displayed by computer using TrialPro software.

4. Because the readability of any given image is image-, hardware-, display-, and room-dependent, few assumptions can be made about readability without field tests in the room to be used with the equipment to be used.
5. Document cameras with zoom capability and computers with software zooms are both highly useful for reading documents and viewing images.
6. Televisions are of limited use in viewing documents, although they may be adequate or better for photographs or pictures in which fine detail is not critical.
7. Traditional televisions with curved screens are especially likely to be affected by glare from lighting.
8. Plasma screens are highly effective when placed at the end of a table.
9. Although 800x600 or higher resolution plasma may be desirable when displaying computer output, 640x480 are effective, and the difference in readability between 800x600 and 640x480 is of minimal consequence.
10. Rear-projection units are highly effective. They are far less susceptible to glare than are televisions and far less susceptible to overhead or outside lighting than are front-projection units. Their size, however, potentially makes them difficult to use, especially at the end of a table, which is the best position for them
11. Front-projection units provide the largest image ordinarily available. However, unless the room is especially large the only reasonable display position is the far end of the room. Placing the projector on the table, rather than hanging it from the ceiling, is fully functional but likely to be a disturbing element to jurors.
12. Assuming a rectangular jury deliberation room, unless a room is large enough (in which case images other than those displayed via large projection are likely to be too small), the most usable display location is at the end of a jury room table.
13. In rank order of the most likely utility to least, court administrators should consider as jury room display devices plasma screens, rear-projection units, front-projection units, and televisions.

We note that our experiments were conducted in a traditional rectangular room with a rectangular conference table. Different room or table shapes and sizes permit different display outcomes. We speculate, for example, that using a V-shaped combination of tables with a plasma screen in the large gap between the two tables forming the V, might be highly effective.

In light of the results from our comparison studies, we moved to Trial Phase I, the first of our controlled studies. We concluded that our display devices should be placed at Point A with a document camera adjoining the far left end of the table (near the display device). We decided to use

Trial Phase I to test the consequences of using plasma screen displays, front projection units, and no technology at all.

§ 5-10.00 The Impact of Display Technology In Trials - the Controlled Studies

Having determined the types of jury room technology that appeared most likely to be of value to jurors, we proceeded to test the utility of jury room technology in simulated trials. Our initial goal was to determine whether jury room display technology was pragmatically workable in a realistic setting and whether jurors would perceive it as helpful.

We conducted two controlled studies, one dealing with traditional trials tried without technology, and one dealing with basic technology-augmented trials (trials that use technology for all evidence presentation). We used the same mock case for both studies, a Courtroom 21 Litigator Training case, *Matthews v. Morton*, a personal injury case in which both liability and damages were controverted.⁵⁷

§ 5-20.00 Trial Phase I - The Traditional Trial Study

In Trial Phase I (the traditional trial study) we proceeded to try *Matthews v. Morton* nine times, four times with a document camera and plasma screen for display, twice with a document camera and front projection unit and screen for display, and three times without technology. All Trial Phase I trials were traditional with paper evidence and no technology-based evidence display.

§ 5-21.00 Methodology

§ 5-21.10 Participants

The jurors in the experimental trials were 92 undergraduate students (44 female, 48 male) enrolled in Introductory Psychology courses. To ensure that each experimental jury had 8 people, extra participants were recruited for the study. These “alternate” jurors heard all of the testimony, completed the predeliberation questionnaire, and were then dismissed. The remaining participants were run in mixed-sex juries of 8 people per jury; all participants received experimental credit of 2 hours for taking part in the research. Nine sessions were run, with the result that a total of 72 participants (36 female, 36 male) took part in the deliberations. As a precaution against selection bias, we compared the predeliberation questionnaire answers of the dismissed participants to those of the participants who stayed to deliberate. This multivariate analysis of variance did not produce an overall difference between dismissed and remaining participants, so there is no indication of biased selection of participants to deliberate.

Counsel were four especially skilled third-year law students (two men and two women) and two faculty judges (one man and one woman).⁵⁸ Each trial consisted of one plaintiff’s counsel, one

⁵⁷ See § 5-21.30 *infra*.

⁵⁸ Each trial used two counsel, one plaintiff’s counsel and one defense counsel. Under Dr. Shaver’s guidance, trials were conducted so as to control for gender variations, and each case was tried by two counsel of the same gender. Of the four counsel, three (two men and one woman) were white; one counsel, a woman, was black. Of the two judges,

defense counsel (always of matching gender), one judge, the plaintiff (male) and the defendant (female),⁵⁹ and the jurors. A bailiff was available to assist the jurors.

§ 5-21.20 Facility and Equipment

The research was conducted using the facilities of the Courtroom 21 Project's McGlothlin Courtroom at the College of William & Mary Law School. The McGlothlin Courtroom is the world's most technologically advanced courtroom. However, in Trial Phase I, none of the courtroom's technology was used other than sound reinforcement.

As noted earlier, there were three experimental variations in Trial Phase I. The first condition was conducted without technology. The second allowed jurors to display evidence by using a document camera and a projection unit and screen (this is the most likely "typical" technology condition, as it requires only equipment that many courtrooms already possess, but difficulties inherent in room placement and lighting make it inferior in many ways to that of a plasma screen). The third permitted jurors to display evidence by using a document camera and a plasma display screen (this is the "best" technology condition, as plasma screens are especially easy to view from nearly any angle, even in a small room). The plasma screen, a Pioneer 40-inch diagonal unit, was placed on the jury room table at the very end.

§ 5-21.30 Procedure

The experimental design was a 3x2x2 factorial design (Technology Condition x Participant Sex x Before/After Deliberations), with repeated measures on the last factor. It was initially intended that there be four replications of each between-subjects condition to permit complete counterbalancing of the sex of the two teams of counsel. Each replication required eight jurors (four males and four females). So that group size was not a factor in the deliberations, each trial was "overbooked" as noted above. A research assistant called male participants the night before their scheduled session in an attempt to increase the response rate among males. All sessions did, in fact, have eight-person juries, but cross-scheduling of the courtroom to be used for the research made it desirable to stop the experiment with only the replications of each condition that occurred in nine trials, and result consistency permitted this. Nevertheless, it is still fair to argue that the sex composition of the two legal teams should not have played any part in the results.

Participants in the research were met in an anteroom by one of the Law School's graduate research fellows (or other staff), who provided a brief description of the research, noted that the results were confidential, and obtained participants' permission to videotape the jury deliberations. Participants who agreed to continue (all did) were ushered into the Courtroom and seated at the eight flat-screen monitors that serve as the "jury box" (alternate jurors were seated in the auditorium-style seating located behind the jury positions). The graduate research fellow then provided an introduction to the case, described what the participants would be asked to do, and turned the proceedings over to the Law School faculty member who was serving as judge for that particular

one was male and one female; both were white. We did not control for race. Each of the faculty judges had substantial prior trial experience; one had been a part-time judge for seven years.

⁵⁹ The plaintiff was constant throughout all trials. Two women played the part of the defendant.

replication of the trial. (Two faculty members, one female and one male, served as judges in an order counterbalanced across sessions within conditions.)

The judge then initiated the proceedings, describing the civil case in which Plaintiff Matthews, “a farrier in Jedburgh County, was suing defendant Morton, a public stable owner, for injuries sustained when plaintiff was thrown from one of defendant's horses on March 5, 2001. Plaintiff claimed that defendant negligently hired out a vicious horse without telling plaintiff of the animal's true disposition.” The plaintiff was suing the defendant for damages in the amount of \$13,907.50, which consists of \$1,707.50 in medical expenses, \$2,200.00 in lost wages and \$10,000 for pain and suffering. The defendant denied any negligence, denied that the horse was vicious, asserted that plaintiff acted negligently himself, and had assumed the risk of riding. Defendant claimed that plaintiff's actions were the direct cause of the accident. To ensure consistency, counsel used the same highly detailed trial sequence. The sequence included all points to be presented and all the evidence to be introduced.⁶⁰ Neither counsel nor judge knew whether any given jury would use technology or if so what type until the very end of the case when during closing instructions the judge would flip over a previously prepared card that indicated the type of deliberation.

When the case had concluded (in slightly less than one hour), the jurors were given jury interrogatories (specific questions to be answered) as well as a general verdict form. The graduate research fellow or other staff member explained the instructions for the predeliberation questionnaire, and all participants completed this questionnaire. Then the eight participants who constituted the deliberating jury were ushered into the jury room, where their deliberation task was described. All deliberating jurors were told to discuss the case and evidence and to arrive at a unanimous verdict. As the deliberating jurors were led to the jury room, the alternate jurors were interviewed by another assistant, thanked for their participation and excused.

The jury room was set up for the technology condition relevant to that particular trial. Accordingly, the control (non-technology) jurors found no technology in the jury room. The questionnaire, however, necessarily made it clear that the experiment involved technology.⁶¹ The deliberating jurors discussed the case, often for up to about an hour, reached a verdict, and then completed the post-deliberation questionnaire. Upon completing this questionnaire jurors were interviewed, thanked for their participation and excused.

⁶⁰ The trials were not literally scripted in order to ensure that they appeared realistic. The two judges report that there was a remarkable degree of consistency across all trial repetitions. Although there were differences between the two pairs of opposing counsel, those differences were controlled for as part of the gender control.

⁶¹ Being psychology students, the non-technology jurors assumed that they were the controls.

§ 5-22.00 Dependent Variables and Analysis

We did not formally time deliberations. However it is our perception that the nature of the jury room technology or lack thereof had no effect on the length of deliberations. Rather, the psychology of the individual jury seems to have been the controlling factor. The first jury (no technology), which awarded Plaintiff the single largest verdict of \$1,500 was also by far the fastest and in the judgment of staff showed an interest in completing its requirements and leaving as soon as possible. This was unrepresentative; the other jury panels took their task quite seriously and often spent a great deal of time deliberating.

Perceptions of the deliberation process were measured by changes in answers to the questionnaire. The questions were the same from predeliberation to postdeliberation, although the tense of items was changed appropriately. Most of the items had been used in previous studies conducted in the Courtroom, including Schutte (1997), Stegall (1998), and Griffin, Gonzales, Smith, & Lion (2001). The items (scored on 5-point scales, 1 = “not at all,” 5 = “extremely”) were as follows (postdeliberation format):

How easy was it to review the evidence?

How much did you think the deliberation process addressed the important issues presented in the trial?

How much do you think your opinion was taken into account by other jurors during the deliberation process?

How much did the exhibits assist your deliberations?

How helpful were the jury instructions in guiding your deliberations?

How helpful to your deliberations was the technology used during trial?

How much did the jury room technology simplify your tasks during deliberations?

How much did operating the technology in the jury room add significantly more time, beyond what you would have spent otherwise?

How much did your ability to use technology during deliberations enhance your confidence in the deliberation process?

How comfortable did you feel in your ability to personally use the technology to display exhibits?

How helpful was it (or in the non-technology condition, “Would it have been helpful”) to the

deliberation process for (if) all jurors to view (had been able to view) evidence and exhibits at the same time?

How helpful was it (or in the non-technology conditions, “Would it have been helpful) to be able (to have been able) to enlarge exhibits and evidence for better viewing during the deliberation process?

In addition to asking these questions, we videotaped the deliberations. The videotapes are discussed below.

§ 5-23.00 Results

§ 5-23.10 Verdicts

Because our interest in the research was in perceptions of the extent to which available technology might have aided the deliberation *process*, we did not particularly care about the actual verdicts rendered. The case had been designed to produce a mixed set of verdicts. Of the nine trials held, there were four verdicts for defendant and five verdicts for plaintiff. Verdicts for plaintiff awarded judgments of \$1,500, \$1, \$185, \$750.⁶²

The verdict breakdown by technology condition was: control (no technology) - \$1,500 for plaintiff and two defense verdicts; plasma screen: two defense verdicts, a \$1 verdict for plaintiff, and a \$185 verdict for plaintiff; front projection - 750 for plaintiff and unrecorded (25% liability for defendant. Insofar as we can tell, the jury room technology had no effect on verdict.

§ 5-23.20 Analysis

The predictions were tested using the 12 questions asked of the mock jurors both prior to deliberation and following deliberation. In order to minimize experimentwise error, we first determined whether the number of items could be reduced into a series of meaningful scales. This was done by subjecting the items (on the pre-deliberation questionnaire only) to a principal components factor analysis (varimax rotation). The factor analysis used an eigenvalue criterion for terminating the analysis, and cases were deleted on a pairwise basis. This factor analysis produced four separate factors, together accounting for 58% of the overall variance. The factor loadings, initial eigenvalues, variance accounted for, and Cronbach reliabilities for all of the scales are shown in the Table below.

⁶² The dollar verdict was not recorded in one case. In that case Defendant was viewed as being 25% liable.

Factor Loadings For Questionnaire Items

Factor:	Benefit	Deliberations	Evidence	Time
Initial eigenvalue:	3.16	1.64	1.15	1.09
Variance accounted for:	26.39%	13.64%	9.54%	9.04%
Cronbach alpha:	.76	.37	.44	n.a

Item

Expected benefit from enlarging exhibits	0.76	-0.05	-0.08	0.04
Expected benefit from all jurors seeing evidence	0.74	0.01	0.11	-0.05
Expected technology to increase confidence	0.73	0.06	-0.02	0.28
How much technology might simplify tasks	0.70	0.35	0.13	0.24
Expected personal comfort in using tech	0.54	0.21	0.25	-0.31
Expected weight of own opinion	-0.01	0.79	-0.15	0.04
Degree deliberation will address issues	0.12	0.66	0.31	-0.02
Expected value of technology in deliberations	0.19	0.51	0.20	0.51
Expected helpfulness of instructions	0.12	0.21	0.76	-0.08
Expected help from exhibits	0.11	0.04	0.65	0.12
Expected ease of reviewing evidence	0.35	0.22	-0.56	-0.23
Time technology expected to add to process	0.09	0.03	0.09	0.83

Items were considered part of scales if (a) their loadings on the primary factor exceeded an absolute value of 0.4, and (b) they did not have cross-loadings on non-primary factors that exceeded an absolute value of 0.4. The second part of this inclusion criterion would have had one item listed as part of the second factor (the expected value of technology in the deliberations) excluded from that factor. To determine the internal reliability of each factor, we conducted Cronbach α reliabilities on the elements of each factor. As it happened, only the first factor – which we term “overall benefit” of using technology – showed an acceptable level of internal consistency (Cronbach $\alpha = .76$). No other factors showed satisfactory reliabilities (Cronbach $\alpha > .70$) so although the elements of the first factor were combined into a single scale for analysis, all remaining items were treated as individual dependent variables. Mean scores for all variables testing the effects of the deliberation-room technology are shown in the Table below.

Mean Scores For Overall Benefit, Characterization Of Technology, And Impressions Of Process

	Judged Before Deliberation			Judged After Deliberation		
	No Technology	Camera and Projector	Camera and Plasma	No Technology	Camera and Projector	Camera and Plasma
n:	24	16	32	24	16	32

Variables Showing Interaction Of Technology Condition And Before/After

Combined factor score for overall benefit (5 items)						
<i>M</i>	3.38	3.26	3.08	2.00	3.26	3.00
<i>SD</i>	0.85	0.54	0.73	0.56	0.71	1.13
Technology's helpfulness in deliberations						
<i>M</i>	1.79	1.56	1.88	1.21	2.25	2.28
<i>SD</i>	0.72	0.81	0.98	0.51	1.06	1.22
Extra time added by operating the technology						
<i>M</i>	2.63	2.31	2.13	1.04	1.63	1.50
<i>SD</i>	0.71	1.08	0.91	0.20	1.20	1.05

Variables Showing Difference From Before To After Deliberations

One's own opinion taken into account during deliberations						
<i>M</i>	2.96	3.13	3.22	3.71	3.63	3.56
<i>SD</i>	0.55	0.72	0.66	0.75	0.72	0.91
Deliberation addresses important issues presented in trial						
<i>M</i>	3.79	3.75	3.84 ^a	4.04	4.38	4.00 ^a
<i>SD</i>	0.66	0.68	0.73	0.75	0.50	0.93
Helpfulness of the jury instructions						
<i>M</i>	3.54	3.31	3.26 ^a	3.04	3.13	2.90 ^a
<i>SD</i>	0.72	0.79	0.97	0.81	0.81	0.87

^a Count in this cell is reduced by one person.

§ 5-23.30 Tests of Technology Conditions

All analyses were 3x2x2 (Technology Condition x Participant Sex x Before/After Deliberation) with repeated measures on the last factor. Because of the number of separate analyses, we have elected to set the alpha level at .025 (more conservative than the typical .05). Two items, having to do with the ease of reviewing the evidence and the usefulness of having everyone view the exhibits, showed no differences whatsoever. But this means that 10 of the 12 questionnaire items reflected significant differences based on conditions.

The first analysis was conducted on the combined overall assessment of the benefit of technology (created from the 5 items that constituted the first factor). This analysis showed an interaction between Technology Condition and Before/After. Specifically, before the deliberations, participants in all technology conditions estimated that the technology would prove to be moderately valuable (average scores slightly greater than 3.0). After the deliberations, participants in both technology conditions found their expectations upheld, whereas participants in the no-technology

condition now thought that they had previously overestimated the value of technology (mean score for this condition was 2.00), $F(2, 66) = 14.60, p < .001$. The analysis also revealed a main effect for Before/After, $F(1, 66) = 16.11, p < .001$; and a main effect for Technology Condition, $F(2, 66) = 3.93, p < .024$, but both of these main effects are properly regarded as consequences of the significant interaction.

The nature of the display technology used did not appear to be significant. Results using either the plasma screen or the front projection approach were similar.

Two other dependent variables showed comparable Technology Condition x Before/After interactions. On the variable assessing technology's helpfulness in deliberations, participants in the No Technology condition lowered their estimates of technology's value from before to after the deliberations, whereas participants in both of the technology conditions *raised* their assessments of its value, $F(2, 66) = 9.03, p < .001$. The same pattern appeared on the variable measuring participants views concerning the extra time that using technology might take. Not surprisingly, the amount of time estimated decreased most sharply in the No Technology condition, decreasing by a lesser amount in the two technology conditions, $F(2, 66) = 5.05, p < .01$. What is more interesting is that *all* estimates of the amount of extra time that the technology had taken decreased from before to after deliberations, $F(1, 66) = 44.33, p < .001$. Taken together, these findings suggest an interesting combination of "pleasantly surprised" and "sour grapes." Specifically, judgments in the two technology conditions were more positive following deliberation than those estimates had been prior to deliberation – people were pleasantly surprised that the technology was more valuable than they had anticipated. On the other hand, people in the condition where no technology was used appear to have decided that "it wouldn't have helped much anyway."

§ 5-23.40 Other Effects of Deliberations

Three of the dependent variables showed only a main effect for Before/After deliberations. These were the extent to which people believed their opinions would matter, the extent to which they thought the deliberations would touch all of the important issues, and the rated helpfulness of the instructions to the juries. On the opinion item, regardless of technology condition, participants said after the deliberation that their opinions had mattered more than they had predicted before the deliberations, $F(1, 66) = 23.57, p < .001$. On the item asking about the likelihood that important issues would be addressed in the deliberations, there was a similar pattern, with scores in all conditions being higher following the deliberations than they were in advance of the deliberations, $F(1, 65) = 12.73, p < .001$. Finally, on the question about the value of the jury instructions, this pattern was reversed: Regardless of technology condition, participants thought the instructions were *less* valuable following deliberation than they had expected the instructions to be prior to deliberation, $F(1, 65) = 11.30, p < .001$. Taken together, these three findings suggest that mock jurors found the deliberations a valuable experience, although the jury instructions were not as helpful as they had been expected to be.

§ 5-23.50 Analysis of the Videotapes

We reviewed the deliberation videotapes and transcribed a number of them (Appendix F). A summary of the tape reviews follows:

Trial 1 (no technology; \$1,500 verdict for plaintiff):

No comments of interest

Trial 2 (plasma, defense verdict)

Was there any discussion about using the technology? Yes

If so, what was the general substance of the discussion?

The jurors did not believe that they needed to use any technology, since the trial itself did not use much technology. They believed that they were a control group. If the outcome was disputed, they might have used the technology. But the group was in agreement from early in the deliberation process.

Did jurors use any of the technology during deliberations? No

Trial 3 (no technology, verdict for defendant)

Was there any discussion about using the technology? Yes

If so, what was the general substance of the discussion?

Although the group came to a decision without technology, it would have been cool if they could have used it.

Trial 4 (plasma, \$1 for plaintiff)

Was there any discussion about using the technology? No

Did jurors use any of the technology during deliberations? Yes

If so, what did they use? Overhead projector and screen

Who ran the technology? The person seated closest to the document camera.

Is there any evidence that using the technology influenced or changed any of the jurors' opinions?

The technology was used to display the defendant's affidavit, the contract, and the plaintiff's affidavit so that all could see the documents at once. Although the person operating the document camera used the zoom feature, one document was still unreadable by some jurors sitting far away so that it had to be read aloud to the group. Even though the group used technology, at times, some individuals read over documents on paper. The group used the technology to review the documents to

determine what each party exactly alleged, what the contract contained, to discover new facts and to highlight conflicts between live testimony and the affidavits. The technology seemed to be extremely helpful for this group and a way in which they could all approach the evidence together for discussion.

Trial 5 (no technology, verdict for defendant)

Was there any discussion about using the technology? Yes
If so, what was the general substance of the discussion?

One juror wondered if juries could use technology to remember testimony. Also, a juror felt that technology would probably not be very helpful in such a simple trial.

Trial 6 (plasma screen, verdict for defendant)

Because of human error, these deliberations were not taped; the post-verdict interview was, however, and that is discussed below. The jury did use the technology, with the juror closest to the document camera operating it, but not having read the instructions found it difficult to use and frustrating.

Trial 7 (plasma screen, \$185 for plaintiff)

Was there any discussion about using the technology? Yes
If so, what was the general substance of the discussion?

The technology was helpful to have. They did not read the instructions nor did they notice that the zoom feature was present.

Did jurors use any of the technology during deliberations? Yes
If so, what did they use? Document camera and screen
Who ran the technology? The person closest to the document camera
Is there any evidence that using the technology influenced or changed any of the jurors' opinions?

The jurors initially used the document camera due to a suggestion by one juror. They placed the jury questions on the screen since there were so many of them and everyone could see them at once there. They next placed the defendant's affidavit on the projector for all to read and discuss. The group used the pointer to highlight key phrases. The group also put up the medical bill for all to see. Finally, the group completed the jury questions on the document camera. The technology was used to foster their deliberations, not have to rely upon reading the questions out loud and so that the group could work together more efficiently and as a team.

Trial 8 (front projection, 25% defense negligence)

Was there any discussion about using the technology? Yes
If so, what was the general substance of the discussion?

The case is too simple to really use the technology. The jurors decided that they could read most things out loud to one another. They believed that if the case involved more visual evidence, they would probably use the technology to a greater extent. However, the technology that they did use was easy.

Did jurors use any of the technology during deliberations? Yes
If so, what did they use? The document camera, screen and projector in middle of table
Who ran the technology? Juror closest to the overhead projector
Is there any evidence that using the technology influenced or changed any of the jurors' opinions?

There is little evidence that the technology influenced the jury's deliberations. The group did not use the technology as much as other groups did. They used it to place the contract on the overhead for the group to see at once and the picture of the horse (in a joking manner), but not in any deliberate or facilitating way. The group seemed to rely more on vocalization between each other rather than visualization of the evidence.

Trial 9 (front projector, \$ 750 for plaintiff)

Was there any discussion about using the technology? Yes
If so, what was the general substance of the discussion?

The use of technology saved the group time since they could view the evidence all at once. This method made it easier for the group to discuss the documents together.

Did jurors use any of the technology during deliberations? Yes
If so, what did they use? Document camera and screen and projector in middle of table
Who ran the technology? Juror closest to the document camera
Is there any evidence that using the technology influenced or changed any of the jurors' opinions?

A juror suggested placing the documents on the overhead projector, since "that's what it's here for." They used it initially to put up the jury questions to see what they were required to accomplish. They also used the technology to display the contract and the pointer to highlight key phrases. They did not use the zoom feature. The technology assisted the group by allowing them to discuss the evidence together and not wait until each juror had individually read the documents. At the end of the deliberations, a juror was interested if other technology existed so that people's testimony could be replayed for the jury during deliberations.

§ 5-23.60 Post-Deliberation Interviews

The jurors were interviewed by Professor Lederer or Professor Warren after reaching verdict. These interviews proved to be essential to understand the interaction, or lack thereof, between the jurors and the technology.

When we planned Trial Phase I we reasoned that as the document camera was extremely simple to operate with only three optional buttons (zoom in, zoom out, and autofocus), it should be sufficient to place a page of large font instructions on the document camera for jurors to be able to operate it without assistance. Accordingly, we placed a simple set of very large instructions on the camera's base, augmented by a physical pointer that was aimed at the word "Instructions." The image was displayed so that it was the first thing that the jurors saw when they walked into the jury room. We were wrong; the juries had problems operating the equipment. Although most juries noticed the camera and used it, many completely failed to recognize the ability to zoom in or out on the exhibit.

The videotape of the post-trial interview of Trial 6 records the following:

The jurors stated that they tried to use the technology but became frustrated. It was too difficult to use. No one read the instructions on the document camera, nor did the person operating the technology (who initially was the juror closest to it) notice the zoom feature. The group did place one document on the overhead which seemed beneficial for the group to view together. But another document, this one with handwriting on it, was hard to see. They wished that the bailiff could have demonstrated the technology before they began their deliberations.

From this and other post-deliberation interviews we concluded that we could not rely on jurors reading and complying with even the simplest of instructions. In most cases the existence of the instructions did not "register" with the jurors.

To resolve this problem, we reformulated our approach for Trial Phase II. In Trial Phase II, we had the judge include in the closing jury instructions a statement to the effect that the jurors would have deliberation room technology available to them should they care to use it. Upon entering the deliberation room, the bailiff then showed the jurors the camera (with the instructions on it) and demonstrated its features. That completely cured the problem.

When we designed the experiment, we had been concerned that the absence of a designated document camera operator might be problematic. That did not prove to be the case. Juries resolved this in all relevant trials. Ordinarily the person nearest the document camera automatically took over its operation.

During the post-verdict deliberation interviews, it became apparent that the juries strongly endorse the use of deliberation room technology, consistently explaining to the interviewing professor that it was very helpful for the jurors to be able to collectively view exhibits and that that utility would be enhanced in cases with more evidence.

§ 5-24.00 Conclusions from the First Controlled Study - Trial Phase I

We concluded the following from Trial Phase I:

1. Most jurors appreciate and find useful deliberation room display technology;
2. A document camera linked to a display device is highly useful for deliberations and likely the most essential item for technology enhanced deliberations;
3. Absent interaction with a member of the Court staff, most jurors will not be able to take advantage of a document camera's zooming feature, a feature that is essential for proper review of much documentary evidence and the absence of which is frustrating for jurors;
4. The mere fact that a deliberation room has technology does not mean that it will be used by jurors, even if they fully understand its use;
5. There is no need to appoint an operator for a document camera; and
6. Jurors given deliberation room technology tend to value it more highly after deliberations than they expected to before deliberations.

We would also add that in two separate high technology experiment trials (the Courtroom 21 Laboratory Trials), jurors had found especially helpful the ability to use a document camera to review jury interrogatories. In those trials jurors argued over the exact terminology of the questions they were to answer. One of the Trial Phase I juries used the document camera to view the instructions. Given the inability to use the zoom feature, it is unclear whether the others would have done so had it been clear to them that they could have done so usefully.

§ 5-30.00 Trial Phase II - The Technology Trial Study

Having established that deliberation room display technology was functional and perceived as useful in traditional trials, we then proceeded to test whether that would be the case in high technology trials (trials in which the evidence was presented digitally).⁶³

Technology-augmented litigation is most commonly characterized by the electronic display in court of evidentiary exhibits. Although there are a wide range of possible courtroom technologies, *see generally* www.courtroom21.net, the core function is the display of documents, photographs, charts, and similar exhibits. Anecdotal evidence indicates that such trials are substantially faster than traditionally presented cases, and the federal courts are moving rapidly to wholesale adoption of the

⁶³ During Trial Phase I, we had discovered jurors would not read document camera instructions and that their performance was adversely affected as a result. During Trial Phase II we also wished to confirm that our solution to that problem (an addition to the closing jury instructions and demonstration operation by a court officer) was effective. It proved to be, as discussed below.

enabling technology, an adoption that will spur state court adoption. It is at least desirable to enable courts to make digitally presented exhibits available to the jurors during deliberation in the same way in which they were presented at trial. Further, some computerized exhibits have never had a physical form, and jury review of them in an altered nature seems questionable.

Providing jurors with a meaningful opportunity to review electronically presented evidence is not a simple matter. Not only must the deliberation room be equipped with the technology to review computer-based exhibits, but from a practical perspective, the jurors must be supplied with a way to operate that equipment that does not require computer literacy or expertise. After much thought, we formulated a possible solution and moved to test it.

§ 5-31.00 Methodology

In Trial Phase II, we tried six repetitions of our basic case, *Matthews v. Morton*. Unlike Trial Phase I (in which we had three conditions: no technology, document camera and plasma screen, and document camera and front-projection unit) Trial Phase II had two conditions: no technology and full technology. Full technology consisted of a WolfVision Visualizer document camera, a desktop computer with keyboard, a remote control for the 40-inch Pioneer plasma screen that switched between the document camera and the computer, a large 3000i rear projection SMART Board that was used for electronic writing, and a traditional chalkboard. During trial, counsel used the McGlothlin Courtroom's evidence display technology to present all evidence. Whereas in Trial Phase I jurors received physical copies of the evidence, in Trial Phase II they saw the evidence on both their individual LCD computer monitors⁶⁴ as well as the 50-inch diagonal Pioneer plasma screen mounted on the wall behind the witness stand. In addition, the Pioneer plasma screen was equipped with a SMART Technology Matisse overlay that converted the screen into a large touchpad. Both counsel and witnesses were able to highlight key portions of the documentary evidence.⁶⁵

The deliberation room computer was loaded with copies of all of the evidence admitted at trial and copies of the jury instructions. Critically, we used a high-end litigation software package (TrialPro by IDEA, Inc.) to enable access to the exhibits. We supplied the jurors with a list of the exhibits and simple codes with which to recall them, *e.g.*, X1 for the riding instruction contract.⁶⁶ We then modified the usual TrialPro menu to eliminate nearly all of the user options except the ability to enlarge text (to make call-outs).

⁶⁴Most jurors had an individual monitor built into the jury box in front of the juror; two jurors shared with a neighbor.

⁶⁵These "callouts" are customary in technology augmented trials. Their use in these experiments led to an important discovery, addressed later in this report, that jurors became frustrated and angry by what they perceived as the intentional obfuscation by counsel of the underlying full document.

⁶⁶The software also permits the use of a barcode reader which would be even more effective.

§ 5-31.10 Participants

The jurors in Trial Phase II were 58 undergraduate students (29 female, 29 male) enrolled in Introductory Psychology courses. As in Trial Phase I, to ensure that each experimental jury had eight people, extra participants were recruited for the study. As before, these “alternate” jurors heard all of the testimony, completed the predeliberation questionnaire, and were then dismissed. The remaining participants were run in mixed-sex juries of eight people per jury; all participants received experimental credit of two hours for taking part in the research. Six sessions were run, with the result that a total of 48 participants (24 female, 24 male) took part in the deliberations. As a precaution against selection bias, we compared the predeliberation questionnaire answers of the dismissed participants ($n = 10$) to those of the participants who stayed to deliberate. This multivariate analysis of variance did not produce an overall difference between dismissed and remaining participants, so there is no indication of biased selection of participants to deliberate.

Counsel, witnesses, and judges remained the same as in Trial Phase I.

§ 5-31.20 Equipment

As already noted, Trial Phase II differed from Trial Phase I in that counsel used the the McGlothlin Courtroom’s basic evidence display technology. In this second study, the jury deliberation room was set up with comparable levels of technology – permitting jurors to display evidence by using a document camera and a computer, both displayed on a 40-inch diagonal plasma screen. Jurors were also given a traditional chalk board and a 67-inch diagonal rear-projection SMART Board. The SMART Board was set up to permit the jurors to write on it electronically.⁶⁷

All technology-condition juries deliberated in the jury room; the control groups, however, deliberated in another room without technology.

It had been our hope to try an independent repetition of *Matthews v. Morton* to test the efficacy of providing a computer retrievable verbatim transcript to the jurors. We reluctantly abandoned this after consulting further with our Court Record Manager, a highly skilled realtime court reporter. For such a transcript to be usable, it would not only have to be certified as



“Front” of jury room with document camera, computer keyboard, and plasma screen.

⁶⁷ We did not use the SMART Board as a display device. There is every reason to believe that it would have been ideal, surpassing even the plasma screen. However, the probability of a court placing such a unit in a deliberation room in the near future seemed too small to justify such use. Given such a unit, a court would be more likely to use it in a courtroom. Although the 3000i is portable, it is not easily portable, especially when compared to a 40-inch plasma screen, and we wished to make our experiment as realistic as possible. Although our survey of state court technology made it clear that the state courts do not yet utilize plasma screens in any numbers, their declining price will make them more prevalent in the near future.



“Rear” of jury room with chalk board and 3000i SMARTBoard

accurate but it would also have to be purged of all inappropriate material. With the Court Record Manager’s assistance we could have done this for *Matthews v. Morton*, but it is highly unlikely that this would be possible in nearly any real case. Providing a timely accurate transcript would most likely require a scopist, an editor who corrects the court reporter’s rough draft transcript immediately after output. Further, both counsel and judge would need to cooperate in preparing an edited transcript that was devoid of all inadmissible material, a timely and potentially controversial matter. We concluded that this simply would not be done in a real case and abandoned the effort.

§ 5-31.30 Procedure

As noted earlier, the first study in this series had indicated essentially no differences between the “moderate-” and “high-” technology conditions, though both of these were clearly different from the condition in which there was no deliberation-room technology available. In this study, technology-condition jurors were told as part of the concluding jury instructions:

The evidence will be available to you on the jury room computer, which you may use to display the evidence for all of you to review. The bailiff will show you how to operate the equipment.

To avoid expectancy effects, the technology condition manipulation was the last instruction delivered by the judge, immediately prior to deliberation. A set of index cards, placed face down in front of the judge, contained the technology manipulation (in a random order within the counterbalancing for sex of litigants). Thus the judge could not know which technology condition would be delivered until s/he turned the top card over immediately before the jurors left to conduct their deliberations.

Upon arrival in the jury room, the bailiff showed the jurors how to operate the computer evidence retrieval system, the document camera, and the SMART Board, and how to switch between the document camera and the computer. Written instructions were supplied as well.

The resulting experimental design was a 2x2x2 factorial design (Technology Condition x Participant Sex x Before/After Deliberations), with repeated measures on the last factor. Each replication of the trial required eight jurors (four males and four females); as before, the sex of the judge and litigants was counterbalanced across the set of six replications. So that group size would not be a factor in the deliberations, each trial was “overbooked,” as noted in the first experiment. A research assistant called male participants the night before their scheduled session in an attempt to increase the response rate among males. These precautions were successful, and each trial had the requisite eight jurors. Only ten individuals served as “alternates.”

As in Trial Phase I, participants in the research were met in an anteroom by one of the Law School's graduate research fellows or Courtroom 21 staff members, who provided a brief description of the research, noted that the results were confidential, and obtained participants' permission to videotape the jury deliberations. Participants who agreed to continue (all did) were ushered into the Courtroom and seated at the eight flat-screen monitors that serve as the "jury box" (alternate jurors were seated in the auditorium-style seating located behind the jury positions). The graduate research fellow then provided an introduction to the case, described what the participants would be asked to do, and then turned the proceedings over to the Law School faculty member who was serving as judge for that particular replication of the trial.

The judge then initiated the proceedings, using the same civil case (*Matthews v. Morton*) used in Trial Phase I. When the case had concluded (in slightly less than one hour), the jurors were given jury interrogatories (specific questions to be answered) as well as a general verdict form. These were supplied in paper form as they likely would be in a real case. They also provided a potential reason for the jurors to use the document camera in addition to the computer. The graduate research fellow explained the instructions for the predeliberation questionnaire (the same questions asked in the first trial), and all participants completed this questionnaire. Then the eight participants who constituted the deliberating jury were ushered into the jury room, where their deliberation task was described. At this point in the proceeding, the alternate jurors were interviewed by another assistant, thanked for their participation and excused.

The deliberating jurors discussed the case, often for up to about an hour, reached a verdict, and then completed the post-deliberation questionnaire. Upon completing this questionnaire the jurors were interviewed, thanked for their participation and excused.

§ 5-31.40 Dependent Variables

As in the first experiment, the dependent variables included the pre- and post-deliberation questions. We also videotaped the deliberations with the permission of the jurors.

§ 5-32.00 Results

§ 5-32.10 Verdicts

As previously noted, the case had been designed to produce a mixed set of verdicts. Of the six trials, there were two verdicts for defendant and four verdicts for plaintiff (1 \$1,650.00 for plaintiff (psychological damages for defendant laughing); \$485 plus 3 weeks pay for plaintiff, \$500, and \$185). Although this is a slightly larger ratio of plaintiff's verdicts (2:4 compared with 4:5) than in Trial Phase I, we suggest that this is likely the result of improved performance by counsel. Approximately two months separated Trial Phase II from Trial Phase I and although the cases were markedly similar there were small variations in some of the cases. The largest verdict of \$1,650.00 was obtained when counsel, seizing on a gloss added by plaintiff during testimony, argued that the defendant had violated her duty as a teacher when she laughed at the plaintiff after his fall from the horse.

§ 5-32.20 Timing

It was not our intention to time the trials. However, as the Trial Phase II experiment progressed, we realized that conducting fifteen repetitions of the same trial, nine without courtroom technology, and six with, would have been a highly useful experiment in its own right. We lack the data to confirm our impression, but we believe that on average the use of courtroom display technology saved about 10% of trial time. Should this be the case, it would be of consequence, as some judges and lawyers have expressed doubt that courtroom technology results in time savings in cases that do not involve massive document use.

§ 5-32.30 Analysis

The predictions were tested using the same 12 questions asked of the mock jurors both prior to deliberation and following deliberation. With only 58 participants in the second study, it is difficult to justify factor-analyzing the questionnaire items. For this reason, and for consistency in measures across the two studies, we simply used the results of the factor analysis conducted in the first study. Specifically, we retained the five-item “benefit” measure and conducted separate analyses of variance on the remaining seven items. We did examine the Cronbach reliability of the 5-item scale: The overall reliability was .68, very close to the recommended .70. Omitting the final item, expected personal comfort in using technology, raised the α level to .71, but this change was small enough that it did not justify changing the elements of the scale from the first experiment to the present experiment. Mean scores for all variables testing the effects of the deliberation-room technology are shown in the Table below.

Mean Scores For Overall Benefit, Characterization Of Technology, And Impressions Of Process

	Judged Before Deliberation No Technology	Deliberation With Technology	Judged After Deliberation No Technology	Deliberation With Technology
<i>n</i> :	24	24	24	24

Variables Showing Interaction Of Technology Condition And Before/After

Combined factor score for overall benefit (5 items)

<i>M</i>	3.76 ^a	3.58 ^b	2.57 ^a	3.70 ^b
<i>SD</i>	0.64	0.58	0.83	0.51

Technology's helpfulness in deliberations

<i>M</i>	3.13	3.33	2.63	3.71
<i>SD</i>	0.74	0.82	1.06	0.75

Variables Showing Difference From Before To After Deliberations

One's own opinion taken into account during deliberations

<i>M</i>	3.38	3.29	3.88	3.67
<i>SD</i>	0.49	0.81	0.99	0.87

Ease of reviewing evidence

<i>M</i>	3.65 ^b	3.58	3.96 ^b	4.21
<i>SD</i>	0.71	0.65	0.93	0.93

Extra time added by operating the technology

<i>M</i>	2.00 ^b	2.25	1.30 ^b	2.21
<i>SD</i>	0.74	0.74	0.63	1.14

^a Number of participants in this cell reduced to 19 because of failures to answer.

^b Number of participants in this cell reduced to 23 because of failure to answer.

§ 5-32.40 Tests of Technology Conditions

All analyses were 2x2x2 (Technology Condition x Participant Sex x Before/After Deliberation) with repeated measures on the last factor. Because of the number of separate analyses, we elected to set the alpha level at .025, as we did in the first experiment. Two items, having to do with expectations about the degree to which issues would be addressed and ratings of the helpfulness of jury instructions, did not produce differences that reached our predetermined alpha level of .025. There were significant differences on the five-item scale and on five other questions.

The first analysis was conducted on the combined overall assessment of the benefit of technology (created from the five items that constituted the first experiment's first factor). This analysis showed an interaction between Technology Condition and Before/After. Specifically, before the deliberations, participants in all conditions estimated that the technology would prove to be valuable (average scores greater than 3.5). After the deliberations, participants in the technology condition found their expectations upheld, whereas participants in the no-technology condition now thought that they had previously overestimated the value of technology (mean score for this condition was 2.57), $F(1, 38) = 31.98, p < .001$. This is exactly the pattern that was obtained in Trial Phase I. Also as in Trial Phase I, this analysis also revealed a main effect for Before/After, $F(1, 38) = 21.44, p < .001$; and a main effect for Technology Condition, $F(1, 38) = 9.84, p < .003$. As before, both of these main effects are properly regarded as consequences of the significant interaction.

One other dependent variable showed comparable Technology Condition x Before/After interaction. On the variable assessing technology's value in deliberations, participants in the No Technology condition lowered their estimates of technology's value from before to after the deliberations, whereas participants in both of the technology conditions *raised* their assessments of its value, $F(1, 44) = 8.38, p < .006$. Again, this is exactly the pattern found on this variable in the first experiment. Using the technology improved jurors' perceptions of the process, not being able to use it reduced their satisfaction.

§ 5-32.50 Other Effects of Deliberations

Three of the dependent variables showed a main effect for Before/After deliberations. These were the extent to which people believed their opinions would matter, the ease of reviewing the evidence, and the time that technology added to the process. Regardless of technology condition, jurors believed after the deliberations that their opinions had mattered more than they had expected them to matter, $F(1, 44) = 10.30, p < .002$. This is the same pattern as we found in the first experiment. Second, again regardless of technology condition, jurors found it easier to review the evidence than they had expected prior to deliberations, $F(1, 43) = 8.34, p < .006$. Third, not surprisingly, the time taken by technology in deliberations was less than expected, $F(1, 43) = 5.80, p < .020$; this time estimate was lower in the no technology condition than in the technology condition, $F(1, 43) = 8.59, p < .005$. Both of these results for time were heavily influenced by the very small time estimate in the No Technology Postdeliberation cell.

§ 5-32.60 Sex Differences

Unlike the results from Trial Phase I, results of this second study showed one difference based on the sex of the participants. Regardless of technology condition or the time the rating was made (predeliberation or postdeliberation), females considered the exhibits more helpful ($M = 3.67$, $SD = .87$) than did males ($M = 3.37$, $SD = .77$), $F(1, 44) = 5.92$, $p < .025$. We did not predict sex differences, but there are a few possibilities that might be examined in future research. Males might have decided in advance of the deliberations that their minds were made up, so the exhibits would be expected to add no value, whereas females might have remained more open-minded throughout the proceedings. As an alternative, the two sexes might simply have differed in their beliefs about the importance of the exhibits in deciding the issues at hand. Or there might simply have been sex-based differences in a perceived need for visual, as opposed to largely verbal, information. Obviously, our present data do not permit us to choose among these alternatives – or other possibilities not mentioned. What the data do suggest, however, is that future research on the use of technology in court proceedings should certainly involve both men and women, just in case important and meaningful differences between the sexes emerge in the evaluation of technologically intensive trials and deliberations.

§ 5-32.70 Analysis of the Videotapes

We reviewed the deliberation videotapes. A summary of the tape reviews follows:

Trial 1 (technology; defense verdict)

Discussion about technology: No

Use of Technology: Yes

Items Used & By Whom:

The person sitting nearest to the technology used the document camera and flat screen TV to display the jury questions although she still read them out to the entire group and the computer to display the contract. She also used the zoom function to highlight a paragraph of the contract.

Evidence of influence:

The document camera was used to help guide the jury's discussion but the display of the contract through the computer was done after the jury had completed its decision-making process.

Trial 2 (no technology; \$1,650 for plaintiff)

Evidence of influence:

One person in the group read aloud the psychologist's report and the medical bill when determining liability and damages respectively.

Trial 3 (no technology; defense verdict)

Evidence of influence:

One person in the group read aloud the contract and witness testimony in discussing liability.

Trial 4 (technology; \$485 plus 3 weeks pay for plaintiff)

Use of Technology: Yes

Items Used & By Whom:

The person sitting nearest to the technology used the computer and flat screen TV to display the contract and the psychologist's report. The foreperson used the smart board to write down the different items of damages.

Evidence of influence:

The computer was used to facilitate the jury's discussion of important evidence in that all did not have to read these documents individually or try to listen to one person read the evidence aloud. The SMART board helped to lay out each individual item of damage so that the jury could approach each one in a more orderly fashion.

Trial 5 (technology; \$500 for plaintiff)

Discussion about technology: Yes, in a minor way

Substance of discussion:

One person was trying out all the features of the computer rather than participating in the deliberations. He stated that if the technology is present, then the people running this program must know that some jurors will play with the technology rather than participate in the deliberations.

Use of Technology: Yes

Items Used & By Whom:

As no one was sitting immediately next to the technology, the person suggesting use of the document camera for the jury questions was the person who used the technology. Two different people who were sitting across the table from the keyboard used the computer to display evidence of the picture of the horse, the contract, the psychologist's report, the accident report, the medical bill, the medical record, and the

witness testimony. The zoom and highlight functions were used often. Although highlighting was done merely for fun, the zoom function made the evidence available for all to read at one time. Most of the group had difficulty using the remote to change from the document camera to the computer as they passed the remote around to several people. The person nearest to the smart board used it to determine liability by writing down each juror's assessment of damages. That person had some difficulty in writing in a fluid line on the board.

Evidence of influence:

The document camera was used to help guide the jury's discussion with the jury questions. The computer was helpful in that the entire group could consider the evidence at one time, especially since this group relied on multiple pieces of evidence in their deliberations. The SMART Board helped to lay out each individual estimate and item of damage so that the jury could approach this decision in a more orderly fashion.

Trial Six (no technology, \$185 for plaintiff)

Evidence of influence:

The group passed around the plaintiff's statement and the contract during its deliberations.

§ 5-32.80 Post Deliberation Interviews

The jurors were interviewed by Professor Lederer after reaching verdict. These interviews proved to be essential to understand the interaction, or lack thereof, between the jurors and the technology.

Somewhat unexpectedly, the post-deliberation interviews also resulted in a large amount of important information about the use of courtroom display technology. We have separated that data from deliberation information.

§ 5-32.81 Jury Deliberation Material

The jurors consistently opined that the deliberation technology was highly useful and desirable. Overall, they used only what they believed necessary.⁶⁸ In one trial the jurors commented that they wanted to use the SMART Board but found no reason to do so given the speed with which they reached their verdict.

Surprisingly, no one had problems with operating the equipment. In some respects, this was extraordinary. In light of the results of Trial Phase I, in which the jurors had ignored written instructions and consequently were unable to use the zoom feature of the document camera, no juror reported problems with the document camera or, critically, the computer and its software-based “call-out” enlargement feature. Jurors used the computer easily.⁶⁹

One jury felt that our listing of exhibits by title was too vague and wanted a list of the available exhibits labeled with greater sufficient specificity, with copies of the list for each juror.

One jury thought in the beginning of the interview that the chalk board would have been as useful as the SMART Board. After further discussion, the jurors decided that they preferred the SMART Board but that a printing capability with the SMART Board would have been very useful. They also emphasized the ease of use of the computer display and enlargement. A different jury explained that it loved the SMART Board. Although one suggested that an “erase board” might have been just as useful for writing, others disagreed, with one complaining about smell. One person voiced some concern that the line width was so large.⁷⁰ No one thought a printing capability was necessary in *this* case, but thought it might be helpful in other cases.

Reminiscent of the inattention by jurors in Trial Phase I to the document camera instructions, one jury did not use the chalkboard because, as one juror explained, since the bailiff hadn’t mentioned its potential use, she hadn’t realized its use was permitted. Another juror said that he hadn’t even noticed it was in the room.⁷¹

In one interview, a juror voiced concern that although the jury room technology is useful it seemed a questionable allocation of resources in a world in which money was needed for so many other things. Professor Lederer asked what her reaction would be if the court already had the equipment and did not need to purchase it specially for deliberations. Given that assumption, she believed that it would be useful and appropriate.

⁶⁸ As noted above, one juror in one trial spent a great deal of time trying out the computer with its call-out software. During the post-deliberation interview, Professor Lederer was told that the *men* had experimented with the Trial-Pro software, at least partly as a form of playing with the technology. Some of the women suggested that they would not have done so had they been closer to the computer keyboard, sticking to what was necessary to the case determination.

⁶⁹ This could be due in part to the fact that our jurors were computer-literate, whereas in Trial Phase I, few, if any, jurors had document-camera experience. We do not believe that to be the case, however, in that the computer’s use depended on specialized software unfamiliar to the general public. We conclude, instead, that success was based upon the process that we used to familiarize the jurors with the technology.

⁷⁰ This is adjustable, although we had not told the jurors that.

⁷¹ It was hard to avoid, standing as it did right next to the large SMART Board.

§ 5-32.82 Courtroom Technology Material

Jurors strongly supported the use of courtroom display technology. They were, however, vocal with respect to a number of concerns. Chief among these was the use of “call-outs” by counsel. In a call-out, the attorney initially projects a document page and then either personally or through the actions of the witness, chooses text to enlarge and emphasize. Customarily, the text chosen is then enlarged and appears against the backdrop of the original, smaller, page image, which usually is then impossible to see. Jurors complained that they could not read the original document, either because of call-outs, or, sometimes, because of the speed with which counsel presented the case, removing the document too quickly. One woman described counsel’s documentary evidence as “propaganda,” as the short time of display, call-outs, and other visual emphasis prohibited her from reading the entire document and what might have been adverse information. Other juries repeated the complaint, and we later discovered that this problem was customary in real high-technology trials. Unfortunately, judges appeared to be unaware of it, as their courtroom deputies or bailiff had failed to advise the court of the problem. After discussing the issue with a number of our juries, we determined that a possible solution would be for the judge in opening instructions to advise the jurors that display technology would be used; that the lawyers would emphasize the parts they believed of greatest importance, and that the jurors would have the ability to read the entire document in the jury room during deliberations. We have recommended this approach to our Courtroom 21 Court Affiliates and must await their reports on its success. Of course, our survey of deliberation room exhibit practice points to a possible conflict with customary court procedure for many courts; the judge cannot give such an instruction if the exhibits will not in fact be supplied to the jurors. This may suggest the need for a new approach in technology-augmented trials.

The jurors also noted that the visual quality of the jury LCD monitors varied, with some being a bit fuzzy so that they had problems reading small text. Clearly, resolution quality should be a key concern for courts.⁷²

§ 5-33.00 Conclusions from Trial Phase II

We concluded the following from Trial Phase II:

1. Most jurors appreciate and find useful deliberation room display technology.
2. Deliberation room technology will be used, and used properly if, and perhaps only if, it is first demonstrated by a court officer.
3. Jurors can easily use a computer to retrieve and display photograph and document images, so long as the system is designed for that purpose.

⁷²Although most jurors had a personal LCD monitor, one or two needed to “look on” with a neighbor. The jurors reported that this was satisfactory, except for one juror who had a monitor that had an inadequate picture.

4. When using computer-displayed exhibits in deliberation, each juror should be given a master index to the exhibits with the index supplying sufficient information about each exhibit to reasonably identify it for most jurors.
5. The mere fact that a deliberation room has technology does not mean that it will be used by jurors, even if they fully understand its use.
6. Novel electronic deliberation technology will tempt some jurors into “playing” with the equipment. However, this appears not to present a significant problem, either in terms of time or otherwise.
7. Electronic annotation technology, particularly SMART Board-type technology is desirable in deliberation rooms; permitting jurors to print out their writings and calculations is perceived as desirable by some jurors.
8. If juror frustration with electronic call-outs and too rapid exhibit display in the courtroom is to be cured, courts may have to guarantee juror review of the exhibits during deliberations.

§ 5-40.00 Real-life Trials - Trial Phase III

Having determined that jury room technology is used and perceived as useful by jurors, we wished to test it and our basic procedure for its use in real cases. The United States District Court and Florida’s 9th Judicial Circuit, both trial courts of general jurisdiction, agreed to try technology-enhanced deliberation in real cases. The courts agreed to equip a deliberation room with a document camera and a display device, whether plasma-screen or front-projection. With the assistance of the presiding judge, jurors in real cases would have a court officer explain the potential use of the equipment just prior to deliberations. After deliberation and after verdict, the jurors would fill out a questionnaire.

§ 5-41.00 United States District Court for the District of Oregon

The United States District Court tries relatively few jury trials. Following the recommended protocol, the Court installed a document camera and a front-projection unit (which displayed its image on a white-board) in the jury room for two cases. The Courtroom Deputy Clerk escorted the jurors to the deliberation room and demonstrated the equipment’s use. In light of the press of judicial business, the Court was unable to ensure that the post-verdict questionnaires were distributed. The Court then mailed the questionnaires to the jurors in one of the two cases. The case involved was a criminal trial involving seven defendants and approximately 900 pieces of documentary evidence. The Courtroom Deputy Clerk reported that the jurors expressed excitement as she explained the operation of the equipment, expressing concern that they had thought that they would have to view the exhibits individually. As of the close of this report, questionnaires were returned from eight jurors.

Five of the eight jurors had never served on a jury before; one had served twice previously. One of the jurors not only completed the form but also volunteered significant additional information. The jurors reported that:

1. They knew that they could use the display technology to look at exhibits while discussing the case.
2. The jury, as a whole, used the display equipment to look at exhibits as a group; two jurors indicated that individuals or subgroups had also used the technology.
3. Of five categories⁷³ from “very troublesome” to “very useful,” *all* of the jurors reported that the display equipment was very useful. One juror volunteered that “It cut *way* back on paper & I believe it made the time more effectively used.” (emphasis in original).
4. When asked whether the display technology helped them to better understand the evidence in the case or whether it got in the way of their understanding, six of the jurors reported that the display equipment was extremely helpful in understanding the evidence, and two reported that it was “somewhat helpful.” One juror volunteered that the jury “viewed several items multiple times & it aided in our discussion.”
5. When asked whether the “Technology made deliberations move faster or did it slow them down?” seven jurors said that it made deliberations move “much faster,” and one said that it made deliberations move “somewhat faster.”
6. When asked how useful it was to have the ability for jurors to see the exhibits while they were discussing them, *all* of the jurors reported it was “very useful.” One juror volunteered that without the technology, the jurors “wouldn’t have been able to track specifics together otherwise.”
7. When asked whether the juror would want all the jurors to be able to see the exhibits while the jury talked about them should the juror serve in another case, *all* of the jurors replied “yes.”

In addition to the above, one juror wrote on the questionnaire that it would have been helpful to have had available an index to the exhibits.

Because we received so few questionnaires back, and those only from one case, our data has only limited utility. However, the consensus response, which is in accord with the results from Trial Phases I and II, certainly supports the proposition that jury room deliberation display technology is used and perceived by jurors as highly valuable.

⁷³ A sixth category was “cannot say.”

§ 5-42.00 The Ninth Judicial Circuit of Florida

As of July 18, 2002, the 9th Judicial Circuit had conducted four trials using deliberation room technology. All of the trials are described as being short, of two-to-three hour duration, with small amounts of non-testimonial evidence. In all cases the trial judge advised the jurors of their opportunity to use the jury deliberation room technology, if they thought it was desirable to do so. However, contrary to our protocol, the court officer who escorted the jurors to the jury room did not illustrate how to use the technology. Subsequently, the technology was not used in any of the trials, a result in complete conformity with our Conclusion Number 2 from Trial Phase II in § 5-33.00: “Deliberation room technology will be used, and used properly, if, and perhaps only if, it is first demonstrated by a court officer.

We have asked the 9th Judicial Circuit to utilize our requested protocol in additional cases and will update this report on the web should we obtain further data.

§ 5-50.00 The Courtroom 21 Laboratory Trials

Every year the William & Mary Law School’s Legal Technology Seminar conducts an experimental one day Laboratory Trial. A case is created, often based on a real case, and tried using as much of the Courtroom 21 technology as may be possible. A United States district judge presides, and a community jury hears the case. The trial is used as a vehicle for numerous different experiments, most of which attempt to measure the consequences of given technology uses on participants in the trial process, especially the jury.

The 2000 Laboratory Trial was a civil tort case involving an aircraft crash. We installed a document camera in the jury room with a plasma screen and were surprised to learn that the jurors had used it not only to review at least one important exhibit but also to scrutinize, and argue over, the jury interrogatories. After their verdict, the jurors strongly endorsed the future use of jury deliberation room display technology.

The 2001 Laboratory Trial was a capital criminal terrorism case. We again installed a document camera in the jury room with a plasma screen, and again the jury endorsed the concept.

The 2002 Laboratory Trial was a criminal corporate manslaughter case. This time we equipped the jury room in conformity with Trial Phase II: a document camera, computer with TrialPro software, plasma screen and rear projection Smart Board. Jurors used the equipment successfully and again endorsed its use.

§ 6-10.00 Assistive Technologies

§ 6-11.00 In General

In modern times we have tried to ensure that all members of our nation are available for jury service.⁷⁴ Accordingly, we are increasingly faced with jurors who are in need of special assistance to assure their ability to function properly as jurors. In most circumstances, this means assisting the hard-of-hearing, although it may refer to the visually challenged as well.

In addition to sign language interpretation, there are two general approaches for helping the hard of hearing. Those who can hear to some degree can be assisted through infrared headphones. One or more microphones conveys sound to the infrared emitter which transmits it to individual headphones worn by jurors via infrared. Each headphone-wearing juror then hears a personally amplified version of what is occurring.⁷⁵ This approach has the added advantage that it can be used to convey foreign language interpretation. Indeed, systems capable of multiple frequencies permit transmission of multiple languages.

Those who cannot benefit from these devices but who can read can use the services of a realtime court reporter. Communication Access Realtime Translation (CART) is a service provided by a court reporter to assist persons who are deaf, late-deafened or hard-of-hearing (HOH) in any proceeding. During a trial or deliberations, CART requires a separate reporter other than the reporter taking down the trial to provide CART services to the hard of hearing witness, juror or trial participant. The CART reporter ordinarily will use the CART reporter's own equipment, including, but not limited to, a steno machine with a laptop computer with appropriate software or a voicewriting enabled computer. The CART reporter ordinarily sets up next to the person needing assistance during the trial and/or deliberations. The CART court reporter's output would be displayed on a computer monitor screen in realtime. The screen would face the person so that he or she could read along during the trial or deliberations. The difference between court record realtime and CART reporting is that CART isn't necessarily verbatim. It enables the HOH person to understand the proceedings. Therefore, paraphrasing by the reporter is commonplace in order to get the meaning across to the juror.

Assistance to the visually challenged can also be of importance. Those who can see with assistance may benefit from using computer software that displays substantially enlarged images on the monitor. In the event a blind juror who can read braille is part of a jury panel, documents can be scanned to a computer and then sent to handheld braille devices that will permit the juror to read the document in braille. This was done successfully for a blind witness in the 2001 Courtroom 21 Laboratory Trial, *United States v. Linsor*.

§ 6-12.00 Survey Data

⁷⁴ See, e.g., *Standard 1: Opportunity for Service*, ABA STANDARDS RELATING TO JUROR USE AND MANAGEMENT (1993). "Among the suggested steps for implementation" is:

9. Examine the need for communications technology and services so that persons with hearing and sensory disabilities can serve on juries.

⁷⁵ This same technology can work with hearing aids as well.

§ 6-12.10 State Data

Our survey of state courts obtained the following data with respect to assistive technology:

Question 4 asked: *Please check all types of assistive devices in use in any of your courtrooms.*

Assistive Device	Number Having Device Indicated	Percent of Total
Language interpretation	52	31.9
Special handicap access jury spaces (in jury room and/or jury box)	52	31.9
Infrared hearing assistance devices	50	30.7
Real-time transcription	50	30.7
Radio frequency hearing assistance devices	30	18.4
Other	14	8.6
TDD device	10	6.1
Braille readers	0	0.0

*Note that this figure of real-time transcription does not match the question 1 response rate (39.9% on question 1 versus 30.7% here).

Question 4 Detail of “Other” Category from the above table

Assistive Device	Number Having Device Indicated	Percent of Total
Hearing assistance devices	6	3.7
Human interpreters	5	3.1
Handicap access to court/courtroom	2	1.2
Equipment is borrowed	1	0.6

Roughly one quarter (25.8%) of respondents reported no assistive technology in their courtrooms. A little more than a quarter of respondents (27.6%) reported two assistive devices. About one fifth of respondents (22.7%) reported having only one device, 16.6% of respondents reported having 3 devices, and 7.3% reported having 4 to 5 devices. “Other” category responses were included in this tally as “yes” responses.

Question 5 asked: *If your court provides assistive devices to jurors, who generally owns them?*

Owner of Devices	Number of Responses	Percent of Total
Court	107	65.6
Other	30	18.4
State/local govt	19	11.7
Local agency or group	7	4.3
ADA provider	0	0.0

Question 5 Detail of “Other” Responses in the above chart

Owner of Devices	Number of Responses	Percent of Total
Description field left blank	25	15.3
Other parties	2	1.2
Court; local agency or group	1	0.6
Court; state/local govt	1	0.6
Court; local agency or group; state/local govt	1	0.6

The majority of assistance devices are provided by the court (66.9%). State and local governments provide 11.7% and local agencies or groups provide 4.3%. 17.2% of respondents indicated that the devices were provided by a source not listed on the survey, but 82% of them failed to list the sources.

§ 6-12.20 Federal Data

The preliminary Wiggins & Dunn report from the Federal Judicial Center Survey provides the following federal data:

Table 6
 Number of Districts That Use Devices To Assist People With Hearing, Language or Other Impairments

Courtroom Device(s)	Number of Districts
Infrared hearing assistance devices	27 ^a
Radio frequency hearing assistance devices	9 ^a
Telephone interpreting system	12 ^b
Infrared interpreting system	23 ^a
TDD device	1 ^g
Braille readers	1 ^b
Real-time transcription for providing assistance to the hearing impaired	9 ^b
Special handicap access jury spaces (in jury room and/or jury box)	19 ^c
Other	1

a = 1 missing or can't say response

b = 2 missing or can't say responses

e = 5 missing or can't say responses

g = 7 missing or can't say responses

§ 6-13.00 Future Work To Be Done

It is clear that a substantial number of state and federal courts have access to infrared hearing assistance devices. 30.7 % of reporting state courts indicate the availability of realtime transcription. More of the 31 reporting federal districts indicate the general availability of realtime (20 districts) than do those showing its use for assistive purposes (9 districts).

In our original experimental design it was our intention to conduct an assisted technology experiment. This proved to be impossible. It became clear that we lack at this time sufficient knowledge to be able to formulate a useful experiment. It would have been easy to use infrared hearing assistance devices or to use realtime transcription or CART for a deaf juror or to send text to braille documents to a blind juror, all of which we have done previously in one form or another.⁷⁶

However, our research was insufficient to permit us to properly formulate the issues we wished to investigate. We do not know, for example, if we should be comparing CART to realtime, or dealing with jury deliberation specific human factors of which we are unaware. Determining a research agenda will require substantial assistance from both the courts and members of the affected communities. We have embarked on that course. As currently planned, the 2004 Courtroom 21 Laboratory Trial will

⁷⁶ We used stenographic realtime transcription for a deaf law student in her first two practice trials.

emphasize the use of assistive technologies during trial and deliberations and we will be spending much of the 2002-2003 academic year formulating our experimental agenda.

§ 7-10.00 Conclusions and Recommendations

As we noted at the beginning of this report, our “study sought to determine two things: whether jury deliberations in traditional, non-technology cases, could be assisted through the use of modern technology, and whether jury deliberations in the new technology enhanced cases could be assisted through the use of technology during deliberations.”

The data that we have obtained strongly supports the conclusion that jurors who are given appropriate access to deliberation room display technology generally use the technology, do not use technology perceived as being without case-specific value, and perceive that the technology is highly useful. Interestingly, the highest praise for the technology comes from actual jurors in the United States District Court for the District of Oregon.

What we do not know from our study is how the use of jury room display technology affects the length of deliberations and whether it enhances the quality of the verdict. The unanimous view of the real jurors who responded to the Oregon questionnaires was that the technology shortened their deliberations. However, that is, of course, only a perception. Unfortunately we did not compare deliberation times within the case repetitions using the same technology conditions. Our perception, however, was that the technology at least did not prolong deliberations. In many respects the quality of the verdict is the ultimate issue. Our experiments were not designed to deal with that question. The verdicts rendered in the two controlled studies seem to demonstrate, however, that the technology did not skew results. In a case in which the liability verdict could easily go either way and in which the plaintiff’s damage award, if any, was likely to be small, the verdicts appear to be unrelated to the technology. Further experimental work dealing with these two areas would be helpful.

Our research leads us to offer the following specific recommendations and conclusions for judges and court managers interested in using jury room deliberation technology:

1. It would be helpful to lawyers, court administrators, and technologists if, to the degree compatible with judicial independence and law, the judges of each court or courthouse could determine a consistent policy as to when and what types of exhibits should go to the jury.
2. Deliberations in traditional cases with documentary evidence can be assisted by placing a document camera and a proper display device in the jury room.
3. Given copies of jury instructions or interrogatories some jurors will use display technology in an effort to comply exactly with the court’s instructions.
4. Permanent technology installations are not necessary; portable equipment can be used, permitting its relocation from one room to another.
5. A variety of adequate display devices including plasma screens, rear- and front- projection, and, in appropriate cases, televisions, is available, permitting many courts to use or recycle equipment installed in courtrooms.

6. Display systems that permit visible annotation are desirable.
7. The quality of jury room displays is heavily dependent on the input and display equipment used, and may also be greatly affected by room conditions, including lighting and exposure to natural light.
8. Whether a document camera or computer is used, useful display of exhibits requires the ability to enlarge (zoom in) on portions of the page.
9. Absent individual LCD juror monitors, equipment that will display a large readable image (such as a very large rear-projection unit or a front- projector with enough useful distance for a large picture) is recommended.
10. Since many jurors will ignore written instructions left in the jury room, the use of deliberation technology requires its demonstration by a court officer, preferably following judicial instructions noting the availability of the technology.
11. Jurors should be supplied with an exhibit list, especially when computer input is used.
12. To prevent frustration or distrust of the trial process, jurors in technology-augmented trials should be given the ability to review the exhibits during deliberations.
13. It is feasible and desirable to give jurors in technology-augmented trials the ability in the jury room to review exhibits that were displayed at trial in digital form. The key to doing this successfully appears to be the adoption and minor modification of standard off-the-shelf litigation presentation software. However, giving the jury this capability requires a member of the court staff to load the evidence into the computer before deliberations. Unlike traditional trials with document cameras in the deliberation room for paper exhibits, this would place a burden on the court.
14. Depending upon the number and type, switching among multiple electronic devices in the jury room can be simple or complex. However, to the degree that all evidence is digital and can be loaded into a computer, switching concerns are obviated; the computer would handle that easily.
15. Display capability in the jury deliberation room need have no effect on whether the court will allow jury review of any given type of evidence.

There is much more work to be done in this area, and there are other technologies to be evaluated. Given the data that we have obtained, however, we conclude that jury room deliberation technology will be used by jurors intelligently and be perceived as highly useful by the jurors. In the absence of any apparent negative risk factors, we thus recommend that, with all due respect for financial constraints, courts strongly consider the adoption of and use of jury room deliberation technology.

Appendix A

Grant Advisory Panel

Appendix B
Legal Research Results

Appendix C
State Court Survey Instrument

Appendix D
State Data Analysis

Appendix E
Preliminary Federal Court Report

Appendix F

Selected Controlled Study Deliberation Transcripts From Trial Phase I (Fall, 2001)

The transcripts that follow were prepared by Courtney Kelley, RPR, the Courtroom 21 Project's Court Record Manager, from the videotapes of the deliberation sessions and/or post trial interviews of the Trial Phase I juries. An analysis of the videotapes, including any use of jury room technology is available starting at page 53. References to the "shepherd" refer to the student staff member responsible for conducting the jurors to the deliberation room and ensuring that the jury questionnaires were distributed and completed.

Appendix G

Jury Room Deliberation Technology Manual