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Computer Generated Evidence: The Impact of Computer Technology on the Traditional Rules of Evidence

Honorable Daniel J. Lynch*
and Ian Brenson**

I. INTRODUCTION

Computers¹ profoundly affect today's judicial system.² Much of the evidence presented in the courtroom consists of different types of computer output, whether a printed summary of credit card activity or telephone numbers dialed, a visual reconstruction of a motor accident, or a simulation of anticipated wear and tear on an industrial machine. These new forms of computer generated documents challenge traditional rules of evidence, including the business records exception to the hearsay rule, the best evidence rule, and the rules governing the admissibility of summaries and simulations.

Computers use procedures fundamentally different from those conventionally employed in record keeping and data processing,

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1. Computers, or electronic information processing systems, can be defined as "systems of machines that process information in the form of letters, numbers, and other symbols and that are self-directing within predetermined limits." Freed, *Computer Print-Outs as Evidence*, 16 Proof of Facts § 2, at 276. There are two broad categories of computers: analog computers and digital computers (the subject of this Article).

[A]nalog computers measure continuously changing quantities, such as temperature or the stress on an airplane wing. Digital computers, on the other hand, are designed to handle discrete, discontinuous values. An analog computer ascertains how large or how small a value is; a digital computer ascertains only whether a value has changed, whether a value is present or not present, or whether something is true or not true.

Id.

2. See generally Roberts, *A Practitioner's Primer on Computer-Generated Evidence*, 41 U. CHI. L. REV. 254 (1974); Tapper, *Evidence from Computers*, 8 GA. L. REV. 562 (1974); Comment, *Admitting Computer Generated Records: A Presumption of Reliability*, 18 J. MARSHALL L. REV. 115 (1984) [hereinafter *Admitting Computer Generated Records*]; Note, *Appropriate Foundation Requirements for Admitting Computer Printouts into Evidence*, 1977 WASH. U.L.Q. 59 (1977); Note, *A Reconsideration of the Admissibility of Computer-Generated Evidence*, 126 U. PA. L. REV. 425 (1977).

and permit the production of new types of information output to aid the trier of fact. They do not, however, leave behind a chain of evidence; a court cannot follow a trail from input to printout³ via internal processing, and thereby establish the trustworthiness of the output.⁴ Although businesses or experts depend on a computer system, the courts cannot accept the reliability of the end product of such a system without further inquiry. Consequently, courts are struggling to come up with foundation requirements that will permit the admission of relevant, computer generated evidence and, at the same time, protect the opposing party against human or machine error and unreliability.

In 1977, Justice Clark of the Illinois Supreme Court stated that "[t]he problem we now face is that evidentiary rules must accommodate the automated record-keeping systems of sophisticated technology."⁵ A decade later, computer technology raises evidentiary concerns that extend far beyond the mere admissibility of a printout of business activity. One day, the computer revolution may well lead to simulations and reconstructions capable of deciding ultimate facts, rendering a trier of fact redundant.⁶ Consequently, courts must satisfy themselves as to the reliability of computer generated evidence, which is often both highly probative

3. A computer printout is defined as "a writing which contains in human readable form the contents of a machine readable medium, such as disk, magnetic tape, or drum and is the only permanent, legible form of the results." Elmaleh, *Evidentiary Concepts in a Computerized Society*, 5 *COMPUTER L. SERV.* 1, 6 n.10 (1972).

4. See C. McCORMICK, *EVIDENCE* § 314(b), at 885 (1984).

5. *Grand Liquor Co. v. Department of Revenue*, 67 Ill. 2d 195, 199, 367 N.E.2d 1238, 1240 (1977).

6. See, e.g., Roberts, *A Practitioner's Primer on Computer-Generated Evidence*, 41 *U. CHI. L. REV.* 254 (1974). As Roberts has stated:

The possible uses of the computer for generation of evidence are nearly unlimited. Given the proper statistical base and model, the computer might be used to prove or disprove a claim that a proposed acquisition will substantially lessen competition in some line of commerce in a section of the country so as to violate section 7 of the Clayton Act. 15 U.S.C. § 18 (1970). Computer data bank reports on sentencing might be used to support the contention that a harsh sentence for a crime, albeit within the statutory limits, constitutes "cruel and unusual punishment." *Cf. Furman v. Georgia*, 408 U.S. 238 (1972). In a criminal case built upon circumstantial evidence, computer-maintained statistical evidence might be helpful in deciding whether there is "reasonable doubt" about the defendant's guilt. See generally Fairley & Mosteller, *A Conversation About Collins*, 41 *U. CHI. L. REV.* 242 (1974); Kingston, *Probability and Legal Proceedings*, 57 *J. CRIM. L.C. & P.S.* 93 (1966). The IRS's computerized index system has been used to determine whether a particular case was an isolated case in a non-repetitive setting. *First Nat'l Bank v. United States*, 358 F.2d 625, 631-32 (5th Cir. 1966).

Id. at 255 n.6.

and very seductive, before such evidence should properly be admitted.

This Article will review the effect of computer generated evidence on the traditional rules of evidence and explain the adaptation of those rules caused by the new technology. Because Illinois courts already have recognized the widespread growth in use of the computer in record keeping, and have voiced concerns arising out of this phenomenon, this Article will first discuss the differences between conventional and computerized record keeping procedures that underlie the current evidentiary problems. The Article will then discuss the foundation requirements prescribed by the Illinois Supreme Court in *Grand Liquor Co. v. Department of Revenue*,⁷ and recommend that the focus of inquiry be shifted away from computer hardware and directed towards the reliability of computer software. By way of example, the Article will next address the challenge posed by printouts to the basic concepts underpinning the business records exception to the hearsay rule.⁸ Finally, because computer technology allows for expanded use of second generation analysis, the Article will review the related issues of the best evidence rule,⁹ computer summaries, tabulations, charts, and extracts,¹⁰ and computer models and simulations.¹¹

II. BACKGROUND

A computer system has two main components: hardware and software.¹² Every computer consists of five basic devices: input,¹³ storage or memory,¹⁴ control,¹⁵ arithmetic/logic unit ("ALU"),¹⁶ and output.¹⁷ These five devices are referred to collectively as "hardware," because they are the pure result of the computer's electronic operation and they cannot be altered by programming

7. 67 Ill. 2d 195, 367 N.E.2d 1238 (1977).

8. See *infra* notes 25-50 and accompanying text.

9. See *infra* notes 51-78 and accompanying text.

10. See *infra* notes 79-85 and accompanying text.

11. See *infra* notes 86-88 and accompanying text.

12. See generally R. TOCCI & L. LASKOWSKI, MICRO-PROCESSORS AND MICROCOMPUTERS (2d ed. 1982).

13. Input includes a keyboard, disk, and tape.

14. Switch settings kept internally in the machine, or externally on magnetic tapes or disk drives.

15. The "black box" which moves the electrical current around.

16. The ALU consists of the computation devices.

17. Output includes, but is not limited to, screen displays, printouts, and electrical impulses transmitted to another computer.

instructions.¹⁸ Software or computer programs contain the instructions that control the operation of the hardware.¹⁹ There are thousands of software programs or sets of instructions available ("canned software" or preprogrammed packages), which permit one to use the computer for such activities as word processing, desktop publishing, or creating and manipulating a spreadsheet.

The reliability of a computer's output, whether it be a business record, summary of data, or reproduction, is the most important factor in determining whether data should be admitted into evidence. Despite its undeserved reputation for making errors, the computer is a precise machine, substantially more accurate than its human creator or operator.²⁰ In fact, so-called "machine errors" usually are caused by humans, particularly where the selecting and processing of input data and programming are concerned.²¹ Although infrequent, hardware error may occur, but it generally is detected early through the use of failsafe devices.²²

Traditional record keeping systems, consisting of ledger books, balance sheets, and other manual accounting methods, conceptually differ from computerized systems. They are prepared by different people, sometimes in different geographical locations. Erroneous information recorded in a traditional manual record keeping system, whether accidental or deliberate, is more likely to show itself. An operator intent on altering a final manual record must also change several of the source records, such as ledger books, income statements, and balance sheets. Frequently, those records are inaccessible to the operator. Such an operation is messy, leaves marks, and an audit trail is effective. As a result, a manual record is harder to alter than that generated by a computer.

An integrated computer system, on the other hand, is more susceptible to human error and alteration. If not protected, such a system can contain errors that are almost impossible to detect. A single person familiar with the operation could manipulate the data base or alter the processing program to erase or substitute entries.

18. *Admitting Computer Generated Records*, *supra* note 2, at 119. *See also* 14 AM. JUR. 2D *Proof of Facts* §§ 173, 186 (1977).

19. *Admitting Computer Generated Records*, *supra* note 2, at 120.

20. *See* Sprowl, *Evaluating the Credibility of Computer-Generated Evidence*, 52 CHI-KENT L. REV. 547, 553 (1976). "When evidentiary information is conveyed in part by humans and in part by computers, the errors attributable to the computers will always be negligible compared to those attributable to the humans." *Id.*

21. *Id.* "Whenever a human serves as part of the conduit over which the evidentiary information flows, human errors will occur." *Id.*

22. *See infra* note 24.

All related entries could be amended simultaneously, leaving no trace of any wrongdoing.²³

A computer diminishes the importance of both of the basic elements of a traditional record keeping system: (1) human beings; and (2) maintained writings. First, because a computer can perform a series of separate tasks as a simultaneous operation, the number of persons either performing a record keeping function or familiar with the entire record keeping process has diminished dramatically. Many operations or analyses previously considered too expensive, too time consuming, or too laborious for human beings to perform are now executed efficiently, economically, and at an unbelievable speed by machine. Consequently, there are fewer humans available to provide a check on the operation. Second, because it uses electrical impulse, the computer produces no written evidence of the process by which it achieves its results. In other words, the output is "clean."²⁴ This technological achievement has led to corresponding problems in the traditional concepts of law.

II. THE BUSINESS RECORDS EXCEPTION

Unlike some states²⁵ and the federal system,²⁶ Illinois has not enacted specific statutory provisions to govern the admission of

23. The computer world is not unaware of this danger, and a major effort is underway to provide for increased internal security to detect and prevent such action. Methods being employed include increasing the use of check edits, separating the functions of programming and data input, issuing personal passwords, setting up parity guards, and reducing the human element where possible. For a full discussion of these and other methods of security, see *Admitting Computer Generated Records*, *supra* note 2, at 120-25.

24. Two statements serve to highlight the contrasting views taken towards such output. "The computer can package data in a very enticing manner, and, since it might be difficult to look behind that package, there may be a tendency simply to admit the material 'for what it's worth.'" Roberts, *supra* note 6, at 274. "As one of the many who have received computerized bills and dunning letters for accounts long since paid, I am not prepared to accept the product of a computer as the equivalent of Holy Writ." Perma Research & Dev. v. Singer Co., 542 F.2d 111, 121 (2d Cir.), *cert. denied*, 429 U.S. 987 (1976) (Van Graafeiland, J., dissenting).

25. Iowa and Florida expressly exempt electronically-stored records from the hearsay rule. The Iowa Code provides that:

Any writing or record, whether in the form of an entry in a book, or otherwise, including electronic means and interpretations thereof, offered as memoranda or records of acts, conditions or events to prove the facts stated therein, shall be admissible as evidence if the judge finds that they were made in the regular course of a business at or about the time of the act, condition or event recorded, and that the sources of information from which made and the method and circumstances of their preparation were such as to indicate their trustworthiness, and if the judge finds that they are not excludable as evidence because of any rule of admissibility of evidence other than the hearsay rule.

computer generated records into evidence, but rather relies on the application of the general statutory scheme and common law. Typically, courts encounter computer records and printouts when counsel seek to introduce them into evidence as business records. In Illinois, Supreme Court Rule 236(a)²⁷ controls the admission of business records in civil cases. Section 115-5 of the Code of Criminal Procedure is the source of the business records exception in criminal cases.²⁸ These provisions were intended to liberalize the rules of evidence in the case of regular business entries and records, which would otherwise exclude the document as hearsay.²⁹

The credibility of a business record depends upon both the regular, prompt and systematic nature of the entry and the fact that it is relied upon in the operation of the business.³⁰ Underpinning this exception to the hearsay rule are the two important concepts of trustworthiness and efficiency.³¹

IOWA CODE ANN. § 622.28 (West Supp. 1970). Florida has a similar rule. FLA. STAT. ANN. § 92.36(2) (West Supp. 1969).

26. Rule 803(6) of the Federal Rules of Evidence also recognizes the admissibility of computerized evidence by referring to "data compilations." FED. R. EVID. 803(6). See also Advisory Committee's Note, 56 F.R.D. 183, 307 (1973).

27. A general codification of the Federal Business Records Act, which dates from the mid-1920s, Illinois Supreme Court Rule 236(a) provides:

Any writing or record, whether in the form of an entry in a book or otherwise, made as a memorandum or record of any act, transaction, occurrence, or event, shall be admissible as evidence of the act, transaction, occurrence, or event, if made in the regular course of any business, and if it was the regular course of the business to make such a memorandum or record at the time of such an act, transaction, occurrence, or event or within a reasonable time thereafter

ILL. S. CT. R. 236(a), ILL. REV. STAT. ch. 110A, para. 236(a) (1987).

28. ILL. REV. STAT. ch. 38, para. 115-5 (1987). Paragraph 115-5 provides in pertinent part that:

Any writing or record, whether in the form of an entry in a book or otherwise, made as a memorandum or record of any act, transaction, occurrence, or event, shall be admissible as evidence of such act, transaction, occurrence, or event, if made in regular course of any business, and if it was the regular course of such business to make such memorandum or record at the time of such act, transaction, occurrence, or event or within a reasonable time thereafter

Id.

29. Hearsay evidence is defined as "testimony in court, or written evidence, of a statement made out of court, the statement being offered as an assertion to show the truth of the matters asserted therein, and thus resting for its value upon the credibility of the out-of-court asserter." C. MCCORMICK, *supra* note 4, § 246, at 584.

30. *People v. Mormon*, 97 Ill. App. 3d 556, 564, 422 N.E.2d 1065, 1071 (1st Dist. 1981), *aff'd*, 92 Ill. 2d 268, 442 N.E.2d 250 (1982); *Terminal-Hudson, Inc. v. Goldblatt Bros.*, 51 Ill. App. 3d 199, 205, 366 N.E.2d 486, 490 (1st Dist. 1977); *Ocasio-Morales v. Fulton Mach. Co.*, 10 Ill. App. 3d 719, 725, 295 N.E.2d 329, 334 (1st Dist. 1973).

31. A record used in the "ordinary course of business" is presumptively reliable. Because the regularly kept record is accurate to a high degree and is prepared by record

The common law exception had four elements: (a) the entries must have been original entries made in the routine of the business; (b) the entries must have been made upon the personal knowledge of the recorder or someone reporting to him; (c) the entries must have been made at or near the time the transaction happened; and (d) the records and the informant must have been shown to be unavailable.³² If these requirements were satisfied, the business record was considered reliable, and the court would admit it into evidence.³³ This exception was sound, but some of the requirements were relaxed as technology changed through the years. Eventually, the common law rule could no longer accommodate many of the changes, and it became necessary for almost every jurisdiction to create a statutory business records exception.³⁴

Because a computer record keeping system differs substantially from traditional record keeping methods in that records are translated from "original" human entries to electrical impulse, Illinois courts prescribe additional foundation requirements that must be satisfied before computer generated records can be introduced into evidence. In short, there must be a showing that the output is trustworthy. The Illinois Supreme Court first propounded these foundation requirements in *Grand Liquor Co. v. Department of Revenue*.³⁵

In *Grand Liquor*, the plaintiff-taxpayer disputed a final assessment for an alleged tax deficiency he had received from the Illinois Department of Revenue (the "Department"). At the administrative hearings, the Department's auditor stated that he based the corrected returns on a computer printout that took into account retailers' occupation tax and municipal retailers' occupation tax

keepers trained to be precise and for purposes other than litigation, the record is presumed highly trustworthy and, therefore, admissible. See C. MCCORMICK, *supra* note 4, § 306, at 872.

Once accepted as reliable, the business record is admitted, thus promoting judicial and business efficiency by circumventing a tedious and time-consuming procedure; it would no longer be necessary to produce a long line of business employees at trial to establish through personal knowledge and direct testimony the matter to be proved. See C. MCCORMICK, *supra* note 4, § 311, at 880 ("The reliability of the record could be shown as evidence other than the testimony of participants, as had been done when a participant was unavailable. Accordingly, unavailability as a requirement virtually disappeared.").

32. C. MCCORMICK *supra* note 4, § 306, at 872. See generally 5 J. WIGMORE EVIDENCE §§ 1577-61 (Chadbourn rev. 1974); Laughlin, *Business Entities and the Like*, 46 IOWA L. REV. 282 (1961).

33. See, e.g., *People v. Small*, 319 Ill. 437, 150 N.E. 435 (1926).

34. C. MCCORMICK, *supra* note 4, § 306, at 872. For the relevant Illinois statutes, see *supra* notes 27-28.

35. 67 Ill. 2d 195, 367 N.E.2d 1238 (1977).

records on file with the state in Springfield.³⁶ On cross-examination by the taxpayer's attorney, the auditor conceded that "he did not know what data was fed into the computer or that the end-result answer was controlled by the computer and measured by the conditions of and basic input to the electronic machine."³⁷

On appeal to the Illinois Supreme Court,³⁸ the Department contended that pursuant to the Retailer's Occupation Tax Act (the "Act"),³⁹ an estimated tax correction based upon a computer printout should represent prima facie evidence of the correctness of the amount of tax due, as had been the case with conventional non-automated record keeping methods of correction.⁴⁰ The court, however, acknowledged that by doing so the taxpayer would lose the opportunity to cross-examine a department auditor personally knowledgeable of the source records and accounting method of assessment.⁴¹ The court recognized three potential sources of error in a computer record keeping data-processing system: the input of information by encoding or translating the source documents into machine language; the creation of the program that instructs the computer; and the actual mechanical operation of the machine.⁴² Naturally, the original information had to be accurate to yield an

36. *Id.* at 196, 367 N.E.2d at 1239.

37. *Id.*

38. After the circuit court affirmed the administrative decision, the Illinois appellate court reversed and remanded the cause for a new hearing by the Department. The appellate court held that the Department was to explain its method of reaching the assessment before the Department's correction of the retailers' occupation returns based on the computer printout could be deemed prima facie proof of its correctness. *Grand Liquor Co. v. Department of Revenue*, 36 Ill. App. 3d 277, 343 N.E.2d 555 (1st Dist. 1976). The court stated: "We are aware of the increasing usage of computer and electronic devices to expedite the duties of government, but we must not permit a taxpayer's rights to due process to be programmed out of existence." *Id.* at 282, 343 N.E.2d at 560.

39. Section 4 of the Act provides in part:

As soon as practicable after any return is filed, the Department shall examine such return and shall, if necessary, correct such return according to its best judgment and information, which return so corrected by the Department shall be prima facie correct and shall be prima facie evidence of the correctness of the amount due, as shown therein

Proof of such correction by the Department may be made at any hearing before the Department or in any legal proceeding by a reproduced copy of the Department under the certificate of the Director of Revenue. Such reproduced copy shall without further proof, be admitted into evidence before the Department or in any legal proceeding and shall be prima facie proof of the correctness of the amount of tax due, as shown therein.

ILL. REV. STAT. ch. 120, para. 443 (1987).

40. *Grand Liquor*, 67 Ill. 2d at 198, 367 N.E.2d at 1240.

41. *Id.*

42. *Id.* at 199, 367 N.E.2d at 1240 (citing Tapper, *Evidence from Computers*, 8 GA. L. REV. 562, 566-67 (1974)).

accurate result in the form of a printout.⁴³

To guard against these sources of error, the court adopted the foundation requirements established eight years before by the Mississippi Supreme Court in *King v. State ex rel. Murdock Acceptance Corp.*,⁴⁴ which held that:

[P]rint-out sheets of business records stored on electronic computing equipment are admissible in evidence if relevant and material, without the necessity of identifying, locating and producing as witnesses the individuals who made the entries in the regular course of business if it is shown (1) that the electronic computing equipment is recognized as standard equipment, (2) the entries are made in the regular course of business at or reasonably near the time of the happening of the event recorded, and (3) the foundation testimony satisfies the court that the sources of information, method and time of preparation were such as to indicate its trustworthiness and justify its admission.⁴⁵

The *Grand Liquor* requirements represented a significant first step in meeting the computer revolution, but clearly they did not address some conceptual problems caused by reliance on computer printouts and other forms of output. These cases were decided when the development of much of the computer hardware and software was in its infancy. The computer world, however, has advanced greatly in the intervening years. The courts' application of the *Grand Liquor* foundation requirements to today's cases is akin to the Wright Brothers prescribing the rules for the thickness of fabric necessary to cover the Concorde's wings. The foundation rules laid down in *Grand Liquor* must be re-examined.

First, because it is simple in most cases to alter a computer record or even the system program that produces the record, neither the "business" nor the "regularly kept" requirements guarantee that the data or program will produce a reliable or accurate result. As tests for reliability, these common law rules went to the need of

43. The court stated: "Moreover, 'if the information from which the printout is made has not been accurately compiled the computer's printout will be similarly incorrect.' The latter aspect has been succinctly described in the cybernetics maxim, 'garbage in, garbage out.'" *Id.* (citation omitted).

44. 222 So. 2d 393 (Miss. 1969).

45. *Grand Liquor*, 67 Ill. 2d at 202, 367 N.E.2d at 1242 (quoting *King v. State ex rel. Murdock Acceptance Corp.*, 222 So. 2d 393, 398 (Miss. 1969)). See also *People v. Hendricks*, 145 Ill. App. 3d 71, 109, 495 N.E.2d 85, 111 (4th Dist. 1986); *People v. Bovio*, 118 Ill. App. 3d 836, 841, 455 N.E.2d 829, 833 (2d Dist. 1983); *People v. Mormon*, 97 Ill. App. 3d 556, 557, 422 N.E.2d 1065, 1072 (1st Dist.), *aff'd*, 92 Ill. 2d 268, 442 N.E.2d 250 (1982); *People v. Boyd*, 66 Ill. App. 3d 582, 589, 384 N.E.2d 414, 420 (5th Dist. 1978). See generally North, *Computer Evidence in Illinois*, 71 ILL. B.J. 590 (1983).

business to have precise methods of record keeping.⁴⁶ Unlike a conventional system of record keeping, a computer's reliability stems from the trustworthiness of its software program and input procedures, and not merely whether the method of keeping records serves the business, or whether the record has been kept regularly. Consequently, courts must impose foundation requirements specifically developed to test the reliability of the data.

Moreover, the foundation requirement that the record be kept in the "ordinary course of business" or business routine, will not cause the creation of intermediate records. Further, the particular record itself may not be "ordinarily kept" and may actually be produced for introduction into evidence, but it is produced from base records that are "ordinarily kept" and accurate. In short, although the business records foundation requirement has been devised to test the reliability of traditional record keeping systems, a meaningful analysis of a computer system should separate the input procedures, data base, and processing program and test each for accuracy.

Second, the requirement that the "transaction be recorded at or near the time of occurrence," thus raising a presumption that the transaction was kept honestly and fairly, loses meaning in the context of computers. Although it may be necessary to establish a temporal proximity for the entry of a conventional business record to show trustworthiness, the requirement relates to the transcription of "original entries" and is irrelevant to the determination of the reliability of a printout. The time and manner of recording the transaction differ depending on the type of computer operating system used. The date of the "original entry" becomes less meaningful as long as the more important memory of the transaction remains clear. Generally, input procedures, data bases, and processing programs are unaffected by the passage of time. Stated simply, as long as a data base remains free from tampering, the output remains reliable and the time of entry becomes less important.

Third, in the period since *Grand Liquor*, the computer has become the standard medium for keeping business records. Increased sales of central processing units and peripherals have

46. A business could best serve its own economic self-interest by keeping regular, systematic and accurate memoranda, and there was a presumption that a business would not normally have an incentive to falsify its own records. J. WIGMORE, EVIDENCE § 1522. In the case of computers, courts were asked to accept the operations of a machine product as ultimately reliable.

resulted in new types of machines and a parallel growth in advanced technologies. In contrast to computer technology at the time of *Grand Liquor*, a specific machine can no longer be said to be "standard equipment." Indeed, a commentator has noted that "[r]ecent publications . . . reveal that variety is the only standard in the industry."⁴⁷

In fact, computer science has developed to the extent that courts can and should place less emphasis on the hardware. Whether a machine is "standard" is no longer the issue. Indeed, Illinois courts presently take judicial notice of the reliability of computerized machines.⁴⁸ The trend in Illinois clearly indicates a shift in the burden to show the unreliability of a computer system.⁴⁹ Greater emphasis, however, must be placed not only on the trustworthiness element of business practice, but also on the accuracy of the data input and the software as foundational requirements. The primary focus of the courts in evaluating a computer generated record should be the software programs that produced the record and the input procedures to show the transaction. Errors in programs ("bugs") or in data input can lead to massive error and insurmountable problems that are almost impossible to detect.⁵⁰

Growth in the area of software application programs has been explosive. Software companies and users of internally generated software programs launch new products, and develop and modify data systems constantly. Generally, each software application program undergoes extensive testing and debugging procedures before

47. Comment, *Admitting Computer Generated Records: A Presumption of Reliability*, 18 J. MARSHALL L. REV. 115, 146 (1984).

48. See *People v. Hendricks*, 145 Ill. App. 3d 71, 495 N.E.2d 85 (4th Dist. 1986) (the trial court did not err in taking judicial notice that the IBM/PC is a standard, reliable computer). See also *People v. Holowko*, 109 Ill. 2d 187, 192, 486 N.E.2d 877, 879 (1985) ("There can be no question that computer science has created many devices, the reliability of which can scarcely be questioned. We should therefore apply the rule that its accuracy and reliability is judicially noticeable, requiring only proof of the accuracy and proper operation of the particular device under consideration."); *People v. Gauer*, 7 Ill. App. 3d 512, 514, 288 N.E.2d 24, 25 (2d Dist. 1972) ("In the light of the general use of electronic computing and recording equipment in the business world and the reliance of the business world on them, the scientific reliability of such machines can scarcely be questioned.").

49. See *Peoples Gas Light & Coke Co. v. Barrett by Bortman*, 118 Ill. App. 3d 52, 454 N.E.2d 713 (1st Dist. 1983). In *Peoples Gas Light & Coke*, the court emphasized defendants' failure to question the reliability of plaintiff's computer system or to challenge plaintiff's special account representative on his assertion that the records were compiled in a timely fashion. *Id.* at 59, 454 N.E.2d at 718. See also *People v. Mormon*, 97 Ill. App. 3d 556, 566, 422 N.E.2d 1065, 1073 (1st Dist. 1981) ("In the instant case, there was no evidence of any unreliability of the [computer]."); *Roberts*, *supra* note 6.

50. See *supra* note 2.

being released commercially or for internal use. Until the program performs satisfactorily on the subject data, however, its reliability is still in question. Moreover, each software program requires compliance with a specific operating procedure. An operator of the system becomes responsible for all procedures that relate to data input and output, and the data's interaction with the application software. Adherence to specified procedures becomes of prime importance to ensure accuracy. Therefore, a court must insist that a proper foundation include a complete and thorough test of the reliability of the program software and a positive showing of compliance with the program's operating procedure.

III. THE BEST EVIDENCE RULE

The best evidence rule, more appropriately the original document rule, has a unique application in the scheme of computer evidence. In general, the rule requires the introduction of the original writing into evidence unless it is shown to be unavailable for some reason other than the serious fault of the proponent.⁵¹ If the original cannot be introduced, a copy may be received if deemed trustworthy.⁵² The purpose of the rule is to guard against inaccuracies and fraud by insisting upon production at trial of original documents.⁵³

With respect to computer generated evidence, the question becomes whether a computer printout represents the best evidence available. In theory, the best evidence is the record kept within the electronic heart of the machine. In the final analysis, however, an "original" of a writing or recording is that which was intended by the person executing the document.⁵⁴ If the data stored in a computer was intended to be original, then the printout or other output accurately reflecting the data is for all intents and purposes the original.⁵⁵

51. *Lam v. Northern Ill. Gas Co.*, 114 Ill. App. 3d 325, 330, 449 N.E.2d 1007, 1010 (1st Dist. 1983). See also C. McCORMICK, *supra* note 4, § 230, at 560.

52. C. McCORMICK, *supra* note 4, § 230, at 560.

53. E. CLEARY & M. GRAHAM, *HANDBOOK OF ILLINOIS EVIDENCE* § 1001.1 (4th ed. 1984); C. McCORMICK, *supra* note 4, § 231, at 704.

54. E. CLEARY & M. GRAHAM, *supra* note 53, at § 1001.2.

55. California has codified this result. The California Evidence Code provides:
§ 1500.

Except as otherwise provided by statute, no evidence other than the original of a writing shall be admissible to prove the content of a writing

§ 1500.5.

Notwithstanding the provisions of Section 1500, a printed representation of computer information or a computer program which is being used by or stored

The best evidence rule is tested frequently where hard copy (*i.e.*, paper) is emitted and computer data entered into storage simultaneously. For example, a purchaser of gas at a gas station may receive a printed receipt of the transaction at the same time an entry is made into the vendor's computer data base. If the maker of the document intended that the computer record from which the printed output was produced to be considered the original, both the printed receipt and the computer record are, in fact, "originals."

In *Victory Memorial Hospital v. Rice*,⁵⁶ the court discussed and reviewed the role of computerized records with special attention to memoranda of original entry.⁵⁷ The plaintiff hospital brought an action against defendant to recover payment for medical and hospital services accorded to him.⁵⁸ At trial, the hospital sought admission of computerized bills into evidence as business records.⁵⁹ The trial court, however, refused to admit the bills on the grounds that there was insufficient proof that the items listed on the bills represented services actually rendered to the defendant.⁶⁰

In reversing the trial court, an Illinois appellate court reviewed the hospital procedure and the method of preparing charges against patients' accounts, and discussed the extremely involved and time consuming retrieval process that would be necessary if the court forced the plaintiff to produce documents of original entry.⁶¹ The only documents of original entry were approximately thirty slips indicating laboratory tests performed on the defendant and the results of those tests.⁶² Each of the slips was divided into five parts, the last part of which consisted of numbers and was sent to the data processing department for entry into the computer.⁶³

on a computer or computer readable storage media shall be admissible to prove the existence and content of the computer information or computer program.

Computer recorded information or computer programs, or copies of computer recorded information or computer programs, shall not be rendered inadmissible by the best evidence rule. Printed representations of computer information and computer programs will be presumed to be accurate representations of the computer information or computer programs that they purport to represent

CAL. EVID. CODE §§ 1500, 1500.5 (West 1983).

56. 143 Ill. App. 3d 621, 493 N.E.2d 117 (2d Dist. 1986).

57. *Id.* at 626-27, 493 N.E.2d at 120-21.

58. *Id.* at 622, 493 N.E.2d at 118.

59. *Id.* at 626, 493 N.E.2d at 120.

60. *Id.*

61. *Id.*

62. *Id.*

63. *Id.*

Because the slips produced at trial by the witness were not the actual number-coded slips that had been used by the data processing department to create the bill, the court questioned the verification testimony.⁶⁴ As the five slips contained the same information, and the slips produced could be matched to the corresponding date and charge on the bill, the appellate court found that the defendant had been given the service for which he had been charged.⁶⁵ Moreover, the court held that a proper foundation had been laid for admission into evidence of the entire computerized bill and that no original entries were required.⁶⁶

In *People v. Mormon*,⁶⁷ an Illinois appellate court affirmed the trial court's decision admitting, over objection, a facsimile prepared from a microfilm copy of the original computer record.⁶⁸ The defendant had used the victim's Visa card to rent a car from Avis.⁶⁹ The rental agent had recorded the transaction when the vehicle was rented.⁷⁰ The agent filled out the written agreement, keeping the original and handing the carbon copies to the defendant.⁷¹ At the same time, the agent entered the information into a computer by means of a console typewriter.⁷² The security manager for Avis testified that the computer holds the information for about six months,⁷³ and then the information is converted to microfilm and stored at the New York headquarters.⁷⁴ When the original could not be located, the security manager had obtained a facsimile from the information stored on microfilm.⁷⁵

Defense counsel contended, *inter alia*, that the facsimile did not satisfy the best evidence rule because the original rental agreement was lost and, therefore, not available for inspection.⁷⁶ The court

64. *Id.*

65. *Id.*

66. *Id.*

67. 97 Ill. App. 3d 556, 422 N.E.2d 1065 (1st Dist. 1981).

68. *Id.*

69. *Id.* at 560-61, 422 N.E.2d at 1068-69.

70. *Id.* at 561, 422 N.E.2d at 1069.

71. *Id.*

72. *Id.*

73. This testimony is consistent with customary business practice. For the sake of convenience, companies that employ computers for record-keeping generally keep the original receipts and invoices for only a short period of time after the information contained thereon is fed into the computer. After this time period has lapsed, the original documents are usually destroyed leaving only the record inside the computer as evidence of the transactions. See Comment, *Admissibility of Computer-Kept Business Records*, 55 CORNELL L. REV. 1033, 1042 n.37 (1970).

74. *Mormon*, 97 Ill. App. 3d at 564, 422 N.E.2d at 1069.

75. *Id.*

76. *Id.*

disagreed, stating that two original business records were created at the time of a rental: the original written record and the original computer record.⁷⁷ The microfilm constituted a reproduction of the original computer record and was available for inspection; therefore the facsimile taken from the microfilm was properly admissible.⁷⁸

IV. COMPUTER SUMMARIES, TABULATIONS, CHARTS, AND EXTRACTS

Both the best evidence rule and the prohibition of documentary evidence that has been produced in anticipation of litigation raise the issue of whether computer generated evidence in the form of summaries, tabulations, graphs, pie-charts, and extracts may properly be admitted into evidence. The computer now allows a business to gather, store, retrieve, and analyze a much wider range of information than in the past. The new analytical tools are fast, convenient, economical, and accurate. The output may take the form of an otherwise inadmissible distillation of voluminous and complicated data.⁷⁹ Alternatively, the document sought to be introduced may represent a subjective determination by the programmer of what is important.⁸⁰ The trier of fact may also benefit from the introduction of such evidence. For example, it might

77. *Id.* at 564, 422 N.E.2d at 1071.

78. *Id.* For a more extensive discussion of this area, see Freed, *Computer Print-Outs as Evidence*, 16 AM. JUR. 2D *Proof of Facts* § 273 (1979); Annotation, *Proof of Business Records Kept or Stored on Electronic Computing Equipment*, 11 A.L.R. 3D 1377.

79. The voluminous documents rule allows the admission of secondary evidence of original records where the original records are so numerous and bulky that production in court may be impractical. These summaries may be admitted where a competent person who has examined the originals can testify as to the accuracy of the summary. Generally, this doctrine has been applied to allow admission where the original documents have been made available to the opposing party prior to trial for testing or inspection.

It appears that courts will place added emphasis on the element of impracticality of production, thus providing for the expanded use of computer summaries. This can be shown by the increased use of computerized record systems that provide for computerized data entry at the time of the original transaction. See discussion of *Victory Memorial Hosp.*, *supra* notes 56-66 and accompanying text.

80. As one commentator has stated:

A summary is a condensation. Of necessity, some information is lost when information is reduced to summary form. A summary of evidentiary information can favor either party, depending upon what information is lost and what is retained. Usually the party who prepares a summary will attempt to make it favor his own position if he can do so without arousing the suspicion or hostility of the trier of fact.

Sprowl, *supra* note 20, at 563-64. Professor Sprowl rightly points out the importance of full and fair pre-trial discovery in order to check for bias introduced by the process of summarizing the information.

provide a shortcut through the laborious review of mountains of documents that, although made in the "regular course of business," may be less precise or comprehensive in content than other types of business records.

The introduction of such evidence in a trial setting poses interesting problems. For example, a summary handed across the bench has probably been cleaned up for litigation purposes and may well bear little relation to the actual format of the contents of the computer's memory on which it is ostensibly based. Similar questions arise when the data takes the form of a computer generated chart, graph, or other depiction. At the same time, it may be demonstrative evidence, *i.e.*, a visual aid to the trier of fact to help comprehend verbal testimony of a witness in the form of a photograph or other written evidence, and an alternative method of displaying the actual record in a manner similar to a summary of voluminous records. Demonstrative evidence may or may not be admissible. It must be relevant, explanatory, and useful to the jury. It must not, however, be presented solely for dramatic effect or emotional appeal. Moreover, the judge retains great discretion. If a proponent produces a clean and clear record, opposing counsel may object that such documents have been prepared solely in anticipation of litigation with the consequence that the business records exception to the hearsay rule will no longer apply.

In *Transport Indemnity v. Seib*,⁸¹ the Nebraska Supreme Court discussed the admission of a printout containing a computer summary of data based upon information stored in the plaintiff's computer data base.⁸² The defendant opposed the admission of printouts, contending that they were prepared in anticipation of litigation and, therefore, were not made in the regular course of business.⁸³ The court rejected this argument, reasoning that although the retrieval from the taped record was made for the purposes of the trial, the taped record and the information and calculations to be found on it were made in the usual course of business and for the purpose of the business alone.⁸⁴ The general rule remains that the document is an accurate representation of that which was kept by business. Recent Illinois case law similarly treats these documents as records kept in the regular course of business.⁸⁵

81. 178 Neb. 253, 132 N.W.2d 871 (1965).

82. *Id.* at 253, 132 N.W.2d at 871.

83. *Id.* at 260, 132 N.W.2d at 875.

84. *Id.*

85. See *People v. Mormon*, 97 Ill. App. 3d 556, 565, 422 N.E.2d 1065, 1071-72 (1st

V. COMPUTER MODELS AND SIMULATIONS

Today, Illinois courts encounter an increased use of computer models or simulations. Naturally, the use of models and simulations by no means breaks new ground in the law. Most trial judges have had experience at one time or another with such expert testimony concerning hypothetical cases. What has changed is the growth and sophistication in this area as a result of the computer's ability to perform operations on vast quantities of data in a fast and efficient manner. Analytical tools available throughout the business community test current or future effects of processes, systems, or events, and subject them to otherwise impracticable simulations. Such studies are often used for accident reconstructions, demographic data, and economic projections.⁸⁶ The simulations are clearly not business records, and their admissibility is not sought as such. Instead, these computer generated simulations constitute a type of expert opinion in that they form the basis of expert testimony provided that they reliably represent the facts and the means by which they reach their conclusions.

Both courts and commentators have stressed the necessity of fair and thorough discovery when faced with computer models and simulations.⁸⁷ As with computer generated evidence admitted under the business records exception, the crucial factors are the reliability of the software and compliance with the operating procedures. Further, a court must examine the assumptions underlying the operation of a computer model to determine whether they truly reflect the real-world system or entity that is the subject of the model or simulation.⁸⁸

VI. CONCLUSION

Illinois courts are experiencing problems accommodating computer generated evidence within the system of rules intended to provide for the admissibility of more traditional forms of evidence.

Dist. 1981). In *Mormon*, the court stated that: "Reproductions or facsimiles prepared incident to or in anticipation of litigation but which are based upon an original record made and kept in the regular course of business are not subject to [the litigation exception to the business records rule] because their trustworthiness is based upon the original record." *Id.* (citing *Transport Indemnity v. Seib*, 178 Neb. 253, 132 N.W.2d 871 (1965)).

86. For an indication of the range of simulations and other models available for use at trial, see *Jenkins, Computer-Generated Evidence Specially Prepared for Trial*, 52 CHICAGO L. REV. 600, 601-05 (1976).

87. See *Perma Research & Dev. v. Singer Co.*, 542 F.2d 111 (2d Cir.), *cert. denied*, 429 U.S. 987 (1976); *Pearl Brewing Co. v. Schlitz Brewing Co.*, 415 F. Supp. 1122 (S.D. Tex. 1976).

88. See *Sprowl, supra* note 20, at 565-66.

Today, the majority of computer printouts reach the courtroom under the business records exception; tomorrow, courts will face different evidentiary challenges engendered by the computer's astonishing growth in sophistication and popularity. Illinois courts should focus on the reliability of the software and the input procedures, and encourage extensive and thorough discovery. The different nature of the computer and its output may well render obsolete the conventional presumptions underlying the traditional evidentiary rules.