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COMMENTS

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ELECTRONIC COMPUTERS AND THE PRACTICAL LAWYER *

F. Reed Dickerson †

The surest sign that information retrieval has come of age is found in a recent article in the magazine American Documentation, in which the authors propose a system of classification and machine retrieval dealing not with the literature of phosphates or cardiovascular disorders, but with the literature of information retrieval itself.¹ It is ironical that the literature dealing with the problem of managing otherwise unmanageable literature is itself becoming unmanageable. But perhaps the ultimate was reached recently in Dallas, where, according to the New York Times,² the Nieman-Marcus department store proudly announced that the services of an electronic computer would be available to any shopper who, for example, wanted suggestions in the $10 to $20 price range on what to give his twelve-year-old sister for Christmas.

The main picture has been painted for us in a recent issue of Fortune.³ With upwards of 100,000 technical journals in more than sixty languages carrying more than a million articles a year; with more than 500 abstracting and indexing services in the United States alone, one of whose abstracts for a single subject for a single year will match the bulk of the Encyclopaedia Britannica; with 240,000 reports a year, for example, flowing to just one institution, the Cancer Chemotherapy National Service; we can readily see why modern civilization is floundering in its own information. Like gout, this condition is an affliction of the rich.

Unfortunately, the costs of living in intellectual luxury are high. The same issue of Fortune tells that some American mathematicians took several

* Revision of talk given to the Harvard Student Bar Ass'n, Nov. 2, 1961.
† Professor of Law, Indiana University.
¹ Atherton & Clark, A Suggested Classification for the Literature of Documentation, 12 American Documentation 38 (1961).
years to solve an electronic switching problem whose solution had already been published by the Russians; that the Air Force lost four valuable months by submitting to outside experts a problem on flow-control valves, important to the missile program, whose solution was already known to one of its own researchers; that the nation has been losing ten per cent of its multibillion research and development budget through needless duplication. Little wonder, then, that much time and money have been spent to improve present methods of storing and finding scientific and other information.

But we are lawyers, not scientists. What message is there here for us? Here are some plain, hard facts.

From 1658 to 1879, a period of 221 years, the reported American cases numbered about 407,000. From 1879 to 1932, a period of fifty-three years, they numbered about 1,121,000. Approximately equal to this latter figure, it has taken only the twenty-nine years since 1932. In quantity alone, therefore, the volume of reported case law has increased at a strongly accelerating rate. Although this is hardly surprising in view of the increases in population, it shows how greatly the aggregate fund of case law available for legal research has increased.

Consider several other facts. For some time, new law has been more likely to come from the legislature or an administrative agency than from the court. And so we must also cope with the problem of searching the rapidly growing fund of statutes and administrative regulations. Consider, too, the fact that this greatly increasing volume of materials reflects a vastly more complicated system of controls, which, in turn, is addressed to a vastly more complicated society. The “stuff” of the law, as Llewellyn would say, has become far richer and more voluminous. It is not surprising that its individual elements are correspondingly harder to pigeonhole and harder later to find.

Not only is society more complicated, but its members have been conditioned to expect something different from the kind of legal services it has been getting. At the 1960 Lake Arrowhead conference, Felix F. Stumpf, of the University of California, offered a provocative explanation of why the incomes of lawyers have failed to keep abreast of those of doctors and comparable professional groups. In his opinion, the lawyer has adhered too long to procedures that made good sense only when he was preoccupied with litigation, instead of the counseling that constitutes, the predominantly preventive nature of legal work today. While the lawyer has been trained to do custom-tailored piecework, clients have as consumers been conditioned by modern merchandising to expect the quicker and more efficient rendering of a number of increasingly standardized services. There is some evidence that by failing to adjust to social changes, the lawyer may even be pricing himself out of the market.

4 For these figures, I am indebted to Vincent E. Fiordalisi, of Rutgers University. See also Fiordalisi, Panel Discussion, in ABA Electronic Data Retrieval Committee, Applications of Electronic Data Processing Systems to Legal Research 22 (1960); Kelso, Does the Law Need a Technological Revolution?, 18 Rocky Mt.L.Rev. 373, 379 (1946).
There is evidence, too, that lawyers have been reluctant to adopt new and even proved mechanical aids. It was 1860 before they allowed steel pens to replace quills. Rubber bands were not used even as late as 1870. Telephones caught on slowly. There was even some reluctance to adopt typewriters.

That legal specialization has been a partial answer to the resulting economic pressures is witnessed by the much greater remuneration received by lawyers in law firms as against that received by lawyers who practice solo. The inability of the individual lawyer to lay his hands readily on needed legal materials, on the one hand, and a partly compensating tendency toward over-specialization, on the other, have both contributed, according to Stumpf, to the “deprofessionalization” of the lawyer.

Despite these trends, he offers hope that lawyers may again pull professionally and economically abreast of the doctors by making available to more people legal advice at moderate fees geared to the time spent in finishing a legal job instead of to the economic interest at stake. To do this, they must develop simplified and standardized techniques for handling the kinds of research and other operations that recur in day-to-day legal work. Techniques for making the vast body of legal materials more accessible to the general practitioner, for example, should enable him to provide better and faster legal advice without resorting to the intensive specialization found in today's largest law offices. Most important, the reduction of routine drudgery would allow more time for making the significant legal judgments that constitute the lawyer's main contribution.

Traditional systems of storing information are becoming increasingly inadequate to handle the relentless flow of cases and statutes and the great proliferation of legal doctrine that they reflect. You may be able to remember that your wife wants you to pick up some bananas and a loaf of bread on your way home, but if she adds a head of lettuce, three cans of minestrone, celery salt, and two boxes of zwieback, you had better “mechanize” by reaching for a pencil. Today in the law we are well beyond that point.

Against this background, electronic computers and other mechanical devices for searching legal materials offer a welcome fund of hope, particularly if they are carefully exploited with eyes fixed coldly on what they are needed to accomplish. The possibility of using computers to search the law has, of course, excited those who like to be in the vanguard of developments like color TV, backyard swimming pools, and the modern outboard cruiser. In extreme contrast, there is the even larger number of reluctant lawyers for whom these forms of mechanization echo such similarly radical innovations as the steel pen, the rubber band, the telephone, and the typewriter.

Computers and other machine devices for the storage and retrieval of information may interest lawyers in at least five different areas. First, they may be used in the client's business or industry to unlock and store all kinds of legally relevant facts such as the size and breakdown of inventories.
This includes the use of machines to create and preserve records in compliance with statutes, regulations, and contracts.

Second, computers will interest many lawyers because of the legal consequences of using them, or of not using them, in the conduct of their clients’ affairs. To illustrate, I will merely repeat a couple of examples recently mentioned by Roy N. Freed as reasonable possibilities. Suppose persons are injured and property is damaged by an explosion in a chemical plant controlled by an electronic data processing system. What is the responsibility of the plant owner? The manufacturer of the electronic hardware? The outside programmer? The service company? Or suppose an aircraft manufacturer fails to use a well-known electronic data processing system to determine the structural characteristics of a new plane that later cracks up because of latent structural flaws. Would such a failure constitute negligence?

Third, small computers or simpler machine devices may offer significant advantages, for firms of more than a dozen lawyers, in performing internal housekeeping chores. At least one Los Angeles firm, for example, is now using machine devices for keeping its time records.

Fourth, computers may help the lawyer in searching the factual materials relevant to current litigation. The need is well illustrated by United States v. United Shoe Machinery Corp., in which the transcript and supporting records ran into the hundreds of thousands of pages and cards. Needless to say, a classification, indexing, and machine retrieval system would have greatly reduced the paper shuffling by lawyers and other professional personnel. It would have made available very quickly the successively relevant parts of the transcript, as well as reduced the risk of overlooking some of these materials. Speed is especially important, as Freed has pointed out, during preparation for cross examination. Another potential professional use of computers is to develop alternative approaches to the mathematics of estate planning.

For lawyers, however, the most challenging use of electronic data computers lies in a fifth area—that of searching case law and statutes, and ultimately regulations, journals, and treatises. It is here that the lawyer faces his most baffling problem of research. How, he wants to know, can the vast resources of the law be made more readily available?

Unfortunately, computers do not, for the most part, by-pass the intellectual problems inherent in present-day methods of research. They simply offer the possibility of faster, more thoroughgoing, and more efficient methods of coping with them. This should comfort those lawyers who fear that they may soon be consigned to the breadlines.

7 Id. at 79.
8 Carl G. Paffendorf, of Cincinnati, is experimenting in this area.
Unquestionably, the central and most difficult problem in any system of storage and retrieval is to develop a comprehensive list of categories, adequate for the purposes of searching, in which the significant aspects of each case or statute can be pigeonholed or catalogued. This is the classification problem that has long haunted publishers, librarians, and lawyers. One of the chronically baffling problems in the use of indices and tables of contents, even after we have analyzed our legal problem, is to match the categories and terminology of our analysis with those respectively used in such search tools as the West Key Number System, the United States Code, or *Scott on Trusts*.

The capabilities of electronic computers and other machine devices in this field are best understood in terms of the limitations of traditional tables of contents and indices. The main weakness of a table of contents is that, because it must parallel the physical arrangement of the text to which it relates, it necessarily takes the form of a specific hierarchy of classes and subclasses, thus reflecting a legal point of view in which some particular bases of classification are more fundamental than others. So long as the legal point of view of the searcher is that of the text and table of contents, the particular scheme of classification helps to guide him to the area that he wishes to investigate. On the other hand, for one searching from another legal point of view, the existing compartmentalization may even be a hindrance. This is why a table of contents with a substantive breakdown is hard to use in procedural problems that cut across substantive lines. Moreover, depth of classification is limited by the increasing practical difficulties involved in reading and comprehending elaborate hierarchies of categories.

The traditional index, on the other hand, partly alleviates these difficulties. So far as it remains coordinate—that is, remains an index in which hierarchical arrangement is avoided and each item is given equal dignity in the list—the indexer can classify in far greater depth, even to the point of indexing every significant word. Equally important, the searcher can more freely search from differing points of view. Unfortunately, the indexer will find it futile to press the former advantage very far. An index suitable for searching in detail requires a correspondingly greater number of search terms and a correspondingly greater number of page entries after each term. This, in turn, either makes it harder for the searcher to match the respective page entries for the various search terms descriptive of what he is looking for or requires him to examine a much larger volume of irrelevant materials. This practical dilemma severely limits the depth to which the indexer can practically go in any but a small legal work.

The indexer also faces the problems of designation, or “semantics,” to use a fancier name. He must not only anticipate the words that the typical searcher would be most likely to have in mind, but take adequate account of synonyms, homonyms, implied equivalences, and ambiguities. Homonyms, for example, which are clusters of words that sound alike and may even be spelled alike (“If you can bear the sight, look at that bear”), create one kind of prob-
<table>
<thead>
<tr>
<th>Name of Case</th>
<th>Plaintiff:</th>
<th>Citation</th>
<th>Defendant:</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>Retailer</td>
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<td>Wholesaler</td>
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<td>Sale</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>No sale</td>
<td></td>
</tr>
</tbody>
</table>

| Defect:      | Latent Ascertainable foreign substance | |
| Injuries incurred: | Indiv. wkness | |
| Injuries compensated: | | |
| Other data: | Sealed container Buyer's selection | |
| Theory of suit: | Warranty Warranty Contract Tort | |
| Privity involved | Fatal Not fatal | Impleader used Ignored | Public policy | Warranty "runs" | Warranty "inures" | 3rd party beneficiary |
| Plaintiff proved: | Causation Injury by D's food | Circumstantial facts: | |
| | Food defective | C. facts: | |
| | Defective when left D | C. facts: | |
| Negligence | C. facts: Causation Breach of stat. | |
| On basis of this, P established: | Nothing | Inference | |
| | Res ipso loquitur | Presumption | |
| | Absolute liability | | |

FIGURE 1
lem. Synonyms create another. How many times have we looked for the word “fault” only to find that the indexer had used the word “culpability,” or looked for the word “oral” only to find that he had used the words “not in writing”?

A severe limitation in most current systems for classifying and storing legal materials is that they depend on a physical allocation of the stored materials. This inheres, of course, in printed treatises and encyclopedias. But what about library card catalogs and filing systems? Those who have filed any large body of materials under the old Ph.D. system, in which the fragmented units of information are carded and filed in physical locations paralleling an elaborate outline or table of contents, know the horrors of misfiling and the deadening drag of physical inertia that inhibits any attempt to rearrange the materials. No wonder a scholar tends to become a slave to his first comprehensive system of arrangement.

The cumulative effect of the lawyer’s failure to solve these problems adequately has taken a heavy toll in both time and overlooked materials. Before the Patent Office began to adopt modern computer techniques, even the most expert patent examiners were missing, in the field of steroids, an average of half the relevant patents. Indeed, 100 of the 2400 patents in this area were being overlooked altogether. And whereas in 1930 the expert examiner could average at least 200 examinations a year, in recent years his average has fallen to less than 90.9

How can the modern computer help? Before considering complicated pieces of electronic hardware, let us examine several less pretentious devices that are now available.

Figure one shows a form for storing case law that I have been using for some years in the field of food-products liability. The idea was suggested by a kind of humorous postcard that used to be available at drug stores in some vacation areas. Instead of writing a message, the sender simply checked the pertinent items in a series of lists: “Dear Mother Father Uncle Sweetheart, etc. I am fine happy sick drunk, etc. The weather is beautiful so-so terrible, etc.”

As the indexer and user of the system in a narrow substantive area, I did not face a serious problem of varying viewpoints. Even so, it was necessary to identify the concepts relevant to the substantive law of food-products liability, arrange them in a satisfactory hierarchy of ideas, and attach appropriate name tags. This was quite a trick, and the form went through three or four revisions before it was good enough to use. Even then, it needed later tinkering. With spaces in which concrete facts or quotations from the court’s opinion could be inserted, it became for most purposes a substitute for the case itself, and not merely a road sign pointing to its location in the reports. Thus, it combined substantive legal content with the accoutrements of classification

and indexing. By current standards, this kind of form is considered conventional in that the basic unit that is stored is a document representing a single case on which all the relevant legal aspects (that is, concepts or topics) are abstracted and recorded.

The value of a general system such as this lies in the fact that the findability of a specific case abstract does not depend on its physical location. In manual operation, all the searcher has to do to find the contributory negligence cases, for example, is to fix his eyes on the lower right hand corner of the case form, where specific space is dedicated to that topic, and flip all the pages. So long as the volume of cases stored is not too great, he does not need edge-notched cards and a steel rod or other mechanical equipment beyond the case forms themselves.

In a limited and self-contained field of the law, this system works beautifully. And the searcher does not need a short course in electronics to understand and operate it. In developing the case form, however, he does have to do the kind of careful conceptual and semantic analysis that is a prerequisite to all searching. But the system has serious limitations. Mainly, it tends to break down if the volume of case law becomes great or if classification is attempted in great depth, which is likely whenever the legal doctrines involved are highly complicated or heterogeneous.

The problem of volume can be handled by the simple expedient of dropping the manual feature of the system and coding the information on punched cards, which can be manipulated by machine analogously to the manual search that I have just described. In fact, if volume and speed continue to pose serious problems, the operation can be further transferred to magnetic tape, disc, or drum and conducted with a digital computer.

The problem of classifying in depth, which inheres in many complicated areas of legal doctrine, can be alleviated in the same way. In the transfer to punched cards, fact summaries, quotations, and everything other than the necessary aspect terms can be jettisoned and the card used only for the purposes of classification and to show where the case itself can be found. The additional card space makes it possible to classify the relevant materials in greater depth. Unfortunately, however, even this approach is limited ultimately by the available space on the card. And another limitation is that each inquiry requires us to search all the cards. This may take an undesirable amount of time.

These problems have been met in several ways. One approach is to use what is called “inverted arrangement.” Here, instead of using a separate card for each case and posting on it all the legally relevant aspects, we do just the opposite. We use a separate card for each relevant aspect and post on it each case that involves that aspect. With this system, it is unnecessary to search the entire card file for each search. Searching only the aspect cards that relate to the particular legal problem saves valuable time. Here is how it works.

Suppose we want all the cases that deal with punitive damages in an antitrust case involving price fixing. We pull the cards respectively relating to
"antitrust," "price fixing," and "punitive damages." Then we compare the three sets, looking for every number that appears on all three. These will be the coded references to the court cases we are looking for. Now, depending on the volume of cases stored and the depth of our classification, we can do this manually, by the machine handling of punched cards, or electronically by digital computer.

One of the inverted systems is the "peek-a-boo" system, developed in England. Here, each case that has been posted on an aspect card is represented by a hole located at a spot that has been dedicated to that case on all cards in the set. When we stack the relevant aspect cards and hold them up to the light, only those cases that are represented by a hole in each aspect card will let the light through. Thus, wherever light comes through, we know there is a relevant case represented by that location.

An American counterpart is the "uniterm" system. Although it has some significant differences, it, too, uses an inverted arrangement. But the differences between these systems are not as important as the fact that any system that is based on coordinate, detailed indexing and is used with devices that facilitate the comparisons necessary to locating the corresponding entries for any selected cluster of search words frees the searcher from limitations otherwise imposed by others' points of view and enables him to search in greater depth and thus with greater precision.

All the traditional research systems and all those previously described have one thing in common. Interposed between the searcher and his basic materials is the work of a classifier. In many respects, this can be a great advantage to the searcher; in others, it can be a formidable barrier. For the searcher of limited intelligence or sophistication (which covers many of us), the availability of prefabricated, prepackaged legal concepts is very helpful. It is helpful, that is, so far as the classifier had in mind the same legal viewpoint and the same general system of concepts, and so far as he has provided names and cross references that enable the searcher to bridge the gap between the searcher’s verbalized analysis of the problem and the classifier's verbalized analysis of the broad legal area.

Unfortunately, however, not all abstracters, classifiers, and indexers are equally adept. Nor do they use the same system. Besides, the difficulties of classification are so great that it is not surprising to find even the best classifiers stubbing their toes. When they err, they often interpose a screen between the searcher and his materials. The 100 lost steroid patents remained hidden not because the searchers limited themselves to conventional methods of research, but because the original classifiers had put them in an unlikely pigeonhole. Even apart from error, broad classification systems tend to lack sufficient depth, especially for persons who approach a legal area from a novel point of view.

10 Costello, Uniterm Indexing Principles, Problems and Solutions, 12 American Documentation 20, 21 (1960).
The ideal system of classification and designation is one sufficiently comprehensive and detailed to permit the systematic searching of the entire body of law from every practicable legal viewpoint and at every level of generality or specificity. If operable, such a system would be of inestimable value, because it would make more accessible the rich store of analogous materials that lie in related or comparable areas of the law. Unfortunately, as the architects of the West Key Number System or of Corpus Juris Secundum know, such a system is not easy to come by, and the fact that they have not succeeded in these respects is no occasion for our wholesale condescension. In fact, we can confidently say that no comprehensive and detailed classification system for a large mass of materials is feasible today if it must be arranged in the hierarchical form required by today's printed treatises and digests. Even if it could be built, which is doubtful, it would be almost impossible to keep up to date.

At present, the most satisfactory general plan of attack is to develop deeper and more detailed classification systems in particular areas of the law and then try to integrate the results in coordinate—that is nonhierarchical—form. This will take many years. In the meantime, we can do our best to work with the existing comprehensive systems, possibly delegating to mechanical devices the more onerous routine operations.

Now let us consider one very ingenious approach to this baffling problem. It is ingenious because it makes no attempt to improve the existing classification systems, upon which we have been so dependent. Instead, it by-passes much of the problem by making the basic legal materials directly accessible to the searcher.

The system I am going to describe was developed by John F. Horty and others at the University of Pittsburgh. The gist of this approach is to record on punched cards and then on magnetic tape not an abstract of the basic legal materials, but full, unedited text. This gets the materials into the machine without the intervention of an abstracter, classifier, or indexer. There is no possible barrier, therefore, between the searcher and his materials.

So far so good. The big problem is to retrieve from this great mass of information the specific provisions we want. This, if I may indulge in understatement, is a little harder. To accomplish this, the programmers at the University of Pittsburgh worked out a computer program for sorting all the words on the text tape into a vocabulary list that omits only words (like "of," "for," "and") that have no significant search value. It is a long printed list of individual words arranged in alphabetical order. After each word appears a series of numbers, each representing a specific paragraph, line, sentence, and place in the sentence of the original document in which the word appears. For example, after the word "parts" appear the numbers "128.3.12.7.4" and "362.1.1.3.9," showing two places where that word can be found.

The system is more fully described in Dickerson, The Electronic Searching of Law, 47 A.B.A.J. 902 (1961).
A copy of this list is the searcher's basic working tool. From it, he selects the particular words of the text most suggestive of what he is looking for. In the demonstrations held during the 1960 American Bar Association meeting in Washington, D. C., Mr. Horty searched all the state statutes dealing with hospitals, which had been recorded on a text tape. His specific objective in one such search was to locate all the statutes dealing with the problem of tax exemptions for charitable institutions that use part of their otherwise exempt property for commercial purposes. From the vocabulary list, he framed an inquiry for the machine that requested all the statutes that contained the word "tax," the word "exempt," and the word "partly." In each instance, he included the several equivalent alternative expressions that also appeared on the list. The inquiry then had to be stated in machine language using appropriate "commands."

When the inquiry was inserted in the machine by means of punched cards, the machine first searched the text tape and made, in its internal memory, a "list" of the document numbers of the text provisions that used any one of the first group of expressions. It made a similar list for the second group, and one for the third. Next, the machine compared the three lists and made a fourth list showing each document number that appeared on all three of the other lists. These represented the particular provisions of the hospital statutes that satisfied all three requirements of the inquiry. In response to a specific request in the inquiry, the machine then counted the items in this common list and printed a sheet, called a "print-out," showing that there were nineteen statutes that fitted the requested description. In response to a second request, the machine next printed the citations for those statutes. Finally, in response to a third, it printed their full text.

This approach does not avoid the fundamental problems of classification and designation. It simply passes the buck to the individual searcher. While this may put a correspondingly heavier burden on him, it gives him a flexibility in searching that is limited only by the limitations of his own imagination and resourcefulness. In an age of do-it-yourself, such an approach seems quite appropriate. Its advantages are obvious, and it has proved quite successful in the searching of statutes at the University of Pittsburgh. There it is being used to search the entire body of Pennsylvania statutes, which have been stored on five reels of magnetic tape and 611,000 punched cards. Best of all, this approach can be used now, without undergoing the agonies and delays of developing a satisfactory general classification system to replace the categories expressly reflected in the original text.

Even so, there are some disadvantages. For one thing, the searcher is confined to the words used in the text of the source materials. So far as he phrases an inquiry in other terms, he will recover nothing. This might be some handicap for a jurisprude who aspired to search at a high level of abstraction. Mr. Horty believes, however, that the handicap will be slight.

So far, this approach has been used only to search the text of statutes and abstracts of case law. Why is this not the answer also to the problem of
searching the text of case law? Perhaps it is. Mr. HORTY is now experiment-
ing with attorney general opinions and will later include cases. Others re-
main skeptical. In the meantime, systems such as those developed respectively
by the Patent Office and Robert T. Morgan at Oklahoma State University
attempt to store only the text of case abstracts.

One problem is that the volume of case law is overwhelmingly greater than
that of statute law. Secondly, judicial opinions are written much more loose-
ly and in a far more heterogeneous language. A vocabulary list for a large
body of case law comparable to that developed for the hospital statutes
would approach the dimensions of a good-sized dictionary. Would this be
too unwieldy for the average researcher? Only experience can tell. Some
of the difficulties here can be lessened by carefully converting the vocabulary
list into a more selective general thesaurus, with helpful cross references to
synonymus or equivalent expressions and to higher levels and lower levels of
abstraction. In the meantime, Mr. Horty's approach offers immediate re-
wards in the field of statutes.

Perhaps the most fruitful prospect offered by these developments is the
opportunity they may provide to search the full text of legal opinions, not so
much for relevant legal principles as for similar kinds of fact situations. If
we have an automobile case involving a bee sting, use of the traditional index
or table of contents in a field so rich with case law is likely to produce more
judicial text than we can conveniently sift. Instead, by using the fact categor-
ies referred to in the text and thus reflected in the working thesaurus, we
should be able to locate very quickly the automobile bee-sting cases, limited by
whatever other factors we please. This opens up broad new possibilities of
research.

Because these mechanical and electronic devices free classification from the
hierarchical and physical limitations that conventional indices and tables of
contents now impose, they make it possible to abstract and classify in much
greater depth than is now feasible with conventional methods. Project Law-
search, for example, which is now using the peek-a-boo system to abstract
and index 4,000 cases relating to motor carriers, appears to be classifying in
greater depth (as many as forty search terms per case) than has heretofore
been feasible. Even so, the searching of original text offers far more depth
and flexibility. For this reason, Mr. Horty and the programmers at the Uni-
versity of Pittsburgh are studying the structure of judicial opinions to perfect
methods by which significant word juxtapositions, combinations, and proxim-
ities can be identified and used for searching purposes.

Unfortunately, the costs of putting the text of any large body of case law
on tape would be prohibitive at the present time, because of the expense of

12 Efforts in this direction are now being made under Mr. Horty's direction at the
University of Pittsburgh and under Mr. Robert A. Wilson at the Southwestern
Legal Foundation.

13 Sponsored by the Council on Library Resources, Inc., assisted by three large
law publishers and the American Association of Law Libraries. William H. B.
Thomas is directing the indexing phase.
key punching the necessary punched cards. However, input costs may greatly lessen when modern electric typewriters equipped with paper tape punches are more widely used for this purpose. Electronic devices for scanning printed materials may also help.

It is important for anyone interested in using electronic computers for searching purposes to know their basic utilities. While very stupid and incapable of inductive reasoning, they can count, add, subtract, arrange, recognize and compare, and, most important, remember. In these respects, they are almost infallible. Of course, they can do nothing that they are not specifically instructed to do and how to do. The giving of these instructions is called "programming."

In general, each computer system has five elements: 14

1. Program elements, which are either built into the machine or added as later instructions. These establish the routines to be followed in different kinds of operations.

2. Input elements, such as punched cards or tape, by which information is fed into the machine.

3. Storage elements, such as cards, tapes, discs, or drums, on which the input information is retained.

4. Processing elements, by which input information is manipulated in conformity with the programming. In an electronic computer, these are the constituent parts of the computer itself.

5. Output elements, such as cards or printed lists or text, on which the results of the operations are recorded.

All this is very fine, but what about cost? What lawyers or law firms can afford to own these electronic luxuries? The answer is, very few. But we must remember that in some fields the simpler, manually operated systems may suit our particular needs just as well. We are not faced with choosing between a large computer and nothing. Furthermore, it will not be necessary for us to own an electronic computer, even if our problem calls for one. Most computers will probably be owned by service companies, universities, foundations, or bar associations. They will be put in central locations and made available on a time-rental basis. The real problem is to determine what kinds of legal questions it will be economically feasible to answer by electronic computer. This will depend, for the most part, on unit operating costs. These, in turn, will depend on what is done to utilize machine time most efficiently. Much depends on keeping the machine continuously busy.

In meeting today's legal needs, we will do well to re-evaluate the research tools that we are now using. If we can eliminate much of the drudgery of research in the office and library, we will not only make the practice of law more satisfying, but do a better job for our ultimate client, the public. As a by-product, we may even make a little more money!