

chines—were such valuable individuals that IBM allowed them to sit at the computer control consoles as long as necessary to figure out flaws in the translation process. Since then, the speed of the machines has risen, the size of components has shrunk, and computer sophistication has grown to such a state that a machine can do a number of different things at a time, not necessarily in sequence.

As a result, the computer's time is worth upward of \$300 an hour—too valuable to be wasted by a programmer's headscratching; and each programmer now must figure out unexpected problems in a separate place while the computer goes on with other people's problems. In other words, it is now possible for wrongly instructed computers to make more disastrous and far-reaching mistakes in a shorter time than ever.

Paul Baran, of the Rand Corp. in Santa Monica, has studied this dilemma more searchingly than most observers of the phenomenon.

"As we pass through life," he reminds us, "we leave a trail of records, widely dispersed and generally inaccessible—except with a great deal of effort and diligence. Beginning with a birth certificate, we accumulate hospital and medical records. We become deductions on our parents' income tax. In school, we generate records of our grades, attendance, IQ tests, personality profiles, etc. (Automated teaching will add to this recordkeeping. The volume of data recorded per child may be expected to increase even more markedly.) After school we start accumulating employment, social security, and selective service records. We may get a driver's license. Most of us will apply for marriage licenses, and some of us will collect divorce decrees which will end in voluminous court records. If we are lucky, we will be able to avoid having arrest and jail records.

We move from job to job in a mobile economy creating moving-company inventory records of our goods. Even as we move from place to place we leave behind short records of our airplane reservations and, for some reason, every hotel makes a ritual of acquiring and preserving the alleged names and addresses of its guests for posterity. This is only a partial list. Think of all the records you leave as you go through life.

"Behind all this creating of records is the implicit assumption that they will some day be of use. In order to be of use, there must be some means of interrogating the files to resurrect the information sought.

"An Internal Revenue Department investigator might wish to have immediate access to the tax returns of each of the associates of a man who is being audited, in order to check on consistency of financial relationships.

"A company may wish to have rapid access to its personnel files to know whether to give a good reference to a former employee.

"A doctor may wish to trace the entire medical history of a patient to provide better input into a diagnostic computer.

"The Veterans' Administration may wish to examine a man's complete military record and possible other previous medical records to see whether the ailment claimed as being service connected really is service connected.

"A lawyer for the defense of a man will wish to search for jail and arrest records, and possibly credit records of all witnesses for the plaintiff.

"Professional licensing boards may want to delve into any records to determine if an applicant has an unblemished character.

"The military in filling extremely sensitive positions may even wish a record of all books borrowed by a prospective applicant to insure that his interests are wholesome and he possesses the proper political bias desired.

"Today it is difficult to gather such information about a prospective examinee. If one went through direct channels and asked most sources for their records about a person, he would most likely be rejected, if for no other reason than that the information is not available—cheaply. Even if the records were publicly available, the investigator would have to spend a great deal of time and effort delving through to discover pertinent data. Today, as a practical matter, if one wishes to obtain certain information about a person, he hires a private detective who charges a great deal of money and expends a great amount of time obtaining a little information available from a portion of these potential records. The price for a fishing expedition for information is high and most of the fish are inaccessible."

Having thus summed up the "the pleasant past," Rand Analyst Baran looks into the future through a three-step review of established processes of computer storage of information. Step 1: Manual records are kept by human clerks. Step 2: Some of the clerks are eliminated by putting all the records into a central