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## Prospects for a Cashless and Checkless Society

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The object of a document examiner's professional attention is typically some sort of paper instrument representing something of value. Of particular importance to most working examiners are the basic noncash elements of our current money payments system: checks and credit cards. Checks and credit cards on the scale they are used today would not be possible without modern computers, but even modern techniques will be inadequate to cope with continued expansion of the current payment system. The development of a money system without checks, credit cards, or even cash has already begun and should be completed by the end of this century. This presentation will review some of the evidence which suggests we are on the brink of a cashless and checkless society. We will look briefly into the history of checks and credit cards, and then review some recent and incipient developments regarding these aspects of our current money system. On a more speculative level, we will inquire about the realistic prospects for a cashless and checkless society, look at the form such a future money system might take, and briefly consider the impact of such developments on the forensic sciences.

### Checking Accounts

Checking accounts are fairly recent developments, having been introduced about 100 years ago. Their growth has been steady and continues even today. Recent surveys indicate that approximately 22 billion checks were negotiated in 1970 and that this figure should about double by 1980 [1], which will mean about 200 checks yearly for each person in the country. At first glance, such continued and substantial growth seems good evidence *against* the advent of any society without checks. However, a more persuasive argument can be made that even modern equipment and techniques cannot expand indefinitely simply to handle the ever-increasing volume of paper through the many separate steps required to move a check from the issuer, through intermediate bank accounts and clearing houses, and then back to the issuer in his monthly statement. Additionally, such physical transfer is expensive; the present handling costs for each check is 16¢ and over 30¢ each is predicted by 1980 [1], which will give an annual total of approximately \$13 billion for the volume expected at that time. With this in mind, the banking industry has undertaken steps to modify the present system; for example, there are two recent and somewhat related developments which give insight into the future of the check.

First, there was the recent experiment in electronic banking conducted under the trademark In Touch® [2-4], by Telephone Computing Services, Inc., of Seattle, in

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conjunction with the Seattle First National Bank. Actually, In Touch<sup>®</sup> is more than a banking service; it connects its subscribers, each of whom must have a Touchtone<sup>®</sup> phone, with a central computer and provides each with computer time which can be used for a variety of purposes, such as mathematical computations or information storage. However, the aspect of most interest to us here, and to In Touch<sup>®</sup>'s prospective customers, is the bill-paying feature. To use this feature, the customer must have an account at Seattle First National and there must be some advance arrangement between In Touch<sup>®</sup> and the creditor (department stores, oil companies, dairies, and utility companies). The customer can then, by telephone, direct the computer to debit his account and transfer funds to his creditors.

In Touch<sup>®</sup> was in actual commercial operation for six months but shut down on 29 Dec. 1973, due to insufficient public response. The major stumbling block appears to be the lack of sufficient Touchtone<sup>®</sup> phones in the Seattle area, but the company intends to persevere and may reinstate service in 1974.

Another, and more broadly based, move in the direction of automated banking was provided by the automated clearing houses (ACH) [5] established in San Francisco and Los Angeles in the fall of 1972. The ACH system allows paperless (electronic) transfers which have been prearranged between creditors and debtors banking in member banks. The system was devised by the Special Committee on Paperless Entries (SCOPE) [6], authorized by the San Francisco and Los Angeles Clearing House associations in 1968. SCOPE members included representatives of California banks, advisers from Federal Reserve, and observers from other interested agencies and organizations. The ACH is actually operated by the Federal Reserve Bank and over 95% of California banks are participating in the system.

The system works in the following way. An employer banking at, say, Wells Fargo, can have his employee's wages debited from the company account at Wells Fargo and credited to the employee's account at Bank of America. The employee can then in turn arrange to have his Bank of America account debited periodically and credits applied to utility companies, mortgage companies, etc., who bank at Crocker Bank, United California Bank, Union Bank, or any other participating bank. All transfers in the SCOPE system must be *preauthorized*. For example, the depositor simply authorizes the bank to pay his monthly utility bill, whatever the amount.

The depositor is protected from the obvious risks in this arrangement by two other features of the system. First, the creditor must provide the debtor with at least seven days' prior written notification if the amount of the current bill differs from the one immediately preceding. For example, the utility companies would likely be in touch every month since such bills are rarely exactly the same two months running, whereas the mortgage company may only communicate once a year or so when adjustments are necessary to accommodate changing tax or insurance payments. Second, within a period of time after receiving his monthly bank statement, a depositor can rescind any debit from his account by filing a written representation that the debit was in error. For example, if the amount of a utility bill is in dispute and it has already been debited from the customer and credited to the company, the credit and debit will both be rescinded and both parties will be in the same position they occupied before the transaction took place. The customer and the company can then resolve their dispute without the bank of either being involved.

SCOPE has modest goals. It aims for about 35% of the payroll checks and 15% of the routine household payments by 1977. This represents approximately 8% of the total check volume in California, out of the 30% which SCOPE estimates is amenable to

prearranged paperless transfer. Even with such modest goals, the ACH is an important development. It is a practical, working system with a very broad base of bank and government participation and support. It has been designed with interconnection to other such systems in mind, and has in fact provided technical information and material to a like system being developed in Atlanta.

### **Credit Cards**

The history, present status, and legal implications of credit card use have been discussed in detail elsewhere [7-9]. A brief summary will suffice for present purposes.

The first credit cards were those issued by hotels, oil companies, and some department stores beginning in 1920. These were all two-party accounts with the card simply identifying the customer who had established credit with the issuing company, and the cards were honored only by the issuing company. These credit card systems grew steadily until the Depression, remained relatively static for some time, and then nearly disappeared during World War II due to government credit restrictions.

After the Second World War, the oil and store charge cards resumed their growth and were soon joined (1950) by the first travel and entertainment (T&E) card, Diners Club. Other T&E cards followed shortly with the present giant American Express entering the field in 1958. Also during the early fifties, the bank cards began to emerge, and during the early sixties, BankAmericard and Master Charge rapidly overshadowed other systems and dominated the field. Both T&E cards and bank cards are three-party arrangements involving the cardholder, the merchant, and the creditor (bank or T&E company). The cardholder establishes credit with the creditor; the merchant then permits the cardholder to purchase goods and services and collects from the creditor, less a discount; the creditor in turn collects from the cardholder. In addition to the discount charged to the merchant, the creditor generates income in one of two ways; either the cardholder is charged a yearly fee and pays all charges monthly as accumulated (typical plan for the T&E cards), or the cardholder carries a revolving charge balance with the creditor and pays a monthly service charge on the unpaid balance (typical plan for bank charge cards).

Over the years the once sharp distinctions between the various types of credit cards have somewhat blurred. The oil company cards can now be used to purchase a wide variety of services, particularly hotel and motel accommodations; the T&E cards, particularly American Express, can now be used in retail outlets, once the exclusive province of bank cards; and the bank cards are readily accepted in gas stations and for the travel and entertainment previously available only through the T&E cards. While some distinctions remain, notably the general lack of extended credit in the T&E field which relies primarily on member dues for income, the general drift is toward functional interchangeability of the different card systems.

The level of credit card use has increased steadily and in many cases spectacularly. For example, during the five-year period from 1965 to 1970, bank cards increased from 5 to 50 million, and purchases went to over \$6 billion a year. Today most retail establishments display the familiar decal emblem of at least one of the common cards, and frequently accept several. There is very little indeed that we cannot buy now and pay for later.

In the immediate future of the credit card system is the widespread use of electronic card readers located at the point of a transaction and hooked up to a central, on-line computer [10]. The newer credit cards will have account numbers and other information recorded in a magnetic stripe on the card itself—some such cards are already in

customers' hands. The card is inserted in a slot on the reader and the amount of the purchase is keyed in. The on-line computer either gives or denies an authorization immediately (real time). With such hookups established, it is relatively easy to implement more sophisticated computer programs which could, for instance, spot unusual activity on a credit card which might indicate fraudulent use, or could make appropriate debits and credits instantaneously.

### **Future Payments System**

The next logical steps in the development of our system of payments are somewhat speculative. The checking account and the credit card will clearly be with us for some time—the society is too heavily committed to these devices to abandon them readily. We are, however, evolving toward a system without cash and without checks, or at least with greatly reduced use of cash and checks. We have already seen, in the discussion of the automated clearing house, that automatic, paperless deposit of payroll checks and payment of recurring expenses are services available right now. The next step will be some sort of paperless payment system which can handle the day-to-day purchases at widely scattered points. Such a system might well be based on a card which will look like a credit card but which more accurately will be called a “debit card.”

The debit card may replace both the checking account and the credit card, the two systems merging into one. The card will be presented to one of the electronic card readers we discussed above in connection with credit cards, perhaps together with some other personal identifying information. Information from the card and information about the transaction will be transmitted on an on-line, real-time computer system which will interconnect the cardholder's bank account and the merchant's bank account through an electronic clearing house. The cardholder's account will be debited and the merchant's account credited instantaneously; in essence, this is simply the old check transaction done electronically. In addition, the debit card may have a credit feature along the lines of the line-of-credit option currently available with most checking accounts. While everyone would have a debit card, not everyone would qualify for the credit feature; this is as it is today where anyone can have a checking account but not all qualify for credit cards.

Since possession of the debit card will provide access to the cardholder's assets, undoubtedly some additional form of personal identification will be required. Several systems which would blend well with the debit card system have been proposed. One simple system gaining early favor in banking circles is based on some sort of secret code known only to the cardholder. The card is presented to the electronic card reader and at the same time the cardholder keys in the secret code, which is then checked against a stored value. Identification systems based on secret codes are commercially available today, and are already in use in, for example, cash-dispensing machines. The secret code system is attractive in that it is fairly simple and easily adapted to present and foreseeable technology. It also has the important advantage of ready acceptance by the public.

Even secret codes, however, are impersonal, since anyone who does know the secret code can utilize the account. To combat this problem, several systems involving personal characteristics of the cardholder have been devised. Each system is based on an advance reading and encoding of some personal characteristic, probably in digital form, and then storing this digital code in a computer file. Some sort of scanning or reading device must then be available at the point of the sales transaction which can make the same encoding of the personal characteristic and transmit the code to the central file for comparison

with the stored value. For example, a system based on fingerprint identification [11] would work this way. The cardholder would come into the bank and give one or more impressions of, say, the right thumb. These impressions would then be electronically classified and reduced to a digital code which is then stored in the computer along with the account number, credit information, or any other pertinent information. When the cardholder wishes to buy something, he presents his debit card and puts his right thumb in a scanning device at the point of sale. The on-site scanner could transmit the data it reads to an on-line computer which would classify the fingerprint and reduce it to a digital code, which would then be checked against the stored digital code. If the codes match within predetermined limits, the transaction can then be consummated. The entire process would be essentially instantaneous. While systems based on fingerprint identification should prove quite reliable, they have two drawbacks which make their application in the near future unlikely: the technology is not completely developed and will probably be quite expensive initially, and there is substantial resistance on the public's part to fingerprint systems.

Other personal identification systems have been suggested. There is at least one system currently available based on hand geometry [12], that is, the physical dimensions of the user's hand and not the friction ridge characteristics used in fingerprint systems. Voiceprints have been suggested, and might prove invaluable in accessing accounts by telephone.

Signatures may still have a future as a personal identification device, but not as used today where typically a store clerk or a bank teller compares a signature to a standard which is either on the back of a credit card or stored in a signature card file. The present system has proved basically unreliable and is readily defeated every day. Two variations on the signature problem are under consideration. First, there have been suggestions to reduce signatures to holographic form which could be scanned and digitalized by automatic equipment. Second, systems based on signature dynamics [13, 14] have been demonstrated to be feasible. Signature dynamics devices analyze signatures while they are being written and plot the pen pressure and pen speed as a function of time, reducing the signature to a digital code. This code can then be compared against a stored code and access granted if there is agreement within allowable limits. Such systems are probably quite secure, since duplication of signature dynamics seems a far more difficult problem than duplication of forms. Systems based on signatures have the advantage of being familiar to users, and not likely to generate much opposition.

When all this might happen remains to be discussed. While there is general agreement among the experts that some version of the checkless and cashless society is inevitable, they are far from unanimous in their estimates of when. The consensus seems to be that little can be expected in the next five years, and we can expect radical developments in the next 20 years. If this seems a short time, remember that the three-party credit cards—bank and T&E—developed to their present eminence from essentially nothing in about 15 years.

## Conclusion

There are three things to note about the future money system just discussed. First, all of the technological pieces already exist. The electronic card readers, the on-line computers, the electronic clearing houses all exist right now. In other words, the new system is feasible; it will come with little technical difficulty when the present system becomes too cumbersome and too expensive.

Second, there are, in my judgment, serious threats to personal privacy implicit in such a system. Examination of personal checks and credit card invoices can create a sur-

prisingly vivid picture of an individual's activities. Add to that records of even small expenditures and make the information available in real time and it would be possible to create an accurate picture of what an individual is doing right this minute. It is by no means suggested that such electronic surveillance is an inescapable result of a cashless and checkless society, but the capability is clearly inherent in the system. Possibility of abuse, even if remote, must be carefully weighed and guarded against.

Third, and the main reason for discussing the system here at all, is the impact on the forensic sciences in general and questioned document examiners in particular. It does seem clear that the questioned document examiner will play a greatly reduced role in the money payments system of the future, because the paperless system will generate no documents to be questioned. On the other hand, the paperless system will undoubtedly not be immune to criminal manipulation and new techniques must be developed to contend with the electronic criminal of the future. Responsibility for development of such techniques will surely fall on at least some members of the American Academy of Forensic Sciences; perhaps the time has come to begin consideration of the problem.

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