
Clicking with Dollars: How Consumers Can Pay for Purchases from E-tailers

By Stacey L. Schreft

The Internet is often referred to as the world's largest mall. Consumers can shop at stores from around the globe simply by pointing and clicking on their computers. About half of all adults in the United States have made a purchase online. That's at least 75 percent of Americans with web access. These cybershoppers spent \$44.8 billion online in 2000—148 percent more than they spent the previous year. Worldwide, online shopping is considerably greater since the United States contributes only about a third of all Internet users.¹ And cybershopping is expected to continue to grow as more households become connected to the Internet and as improvements in mobile telecommunication technology allow wireless Internet access anywhere and anytime.

A byproduct of the dramatic increase in online shopping has been a heightened demand for convenient and secure online payment methods. If consumers had access to a Star Trek-like transporter, paying for goods and services in cyberspace would be easy. The transporter could convert their dollar bills to energy and send them through space to the appropriate e-tailer, where the bills would rematerialize upon arrival. Lacking such a device, consumers are making almost all their online purchases with credit cards. But the dominance of credit cards at the online check-out counter does not mean consumers perceive credit cards as the ideal

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way to pay on the Internet. Study after study continues to identify concerns about the safety of providing credit-card numbers and personal information online as the biggest barrier to cybershopping.² Without further improvements in consumers' online payment options, e-tailing might not realize its full potential.

Many firms have stepped in to meet the demand for payment services by cybershoppers. Some have been established providers of payment services in the bricks-and-mortar world. Most have been technology start-ups, though increasingly these tech firms are forming alliances with more established financial service providers. Regardless of their industry experience, today's payment service providers (PSPs) are generally offering new ways of using the same means of payment that predominate in the physical world. Only a few provide truly new means of payment.

This article surveys and assesses what is new about the options consumers have to make payments at Internet retailers. Section I considers as background the two objects that are available for transferring value to make payments in the physical world—cash and deposits—and describes their use at bricks-and-mortar retail outlets today. Section II first discusses how making payments in cyberspace differs from making payments in the bricks-and-mortar world. It goes on to describe the use of traditional payment methods for cybershopping. Section III focuses on new means of payment designed especially for use online.

I. MAKING PAYMENTS IN THE PHYSICAL WORLD

As background for considering how consumers can pay for purchases on the Internet, it is useful to understand first what objects in the physical world allow a buyer to transfer monetary value to a seller, and second how payments are made. The distinction between these is significant because monetary value must ultimately be exchanged to make payment, even though it often cannot be exchanged directly by consumers.

How monetary value is exchanged

In most economies today, consumers can transfer monetary value with either cash or deposits. The term “cash” refers to paper currency and metallic coins that are used in exchange. The term “deposits” refers to claims to monetary value (that is, claims to cash) on the books of financial institutions (FIs), such as the funds individuals hold in their accounts with banks. They are merely bookkeeping entries on FIs’ balance sheets with no physical representation.

Because deposits take no physical form, buyers cannot pay for purchases by handing them directly to sellers, the way they would cash. They must rely instead on what are known as payment instruments. Payment instruments are tools to enable the use of deposits, with no monetary value of their own. Checks, credit cards, and debit cards are the leading payment instruments in use today. Since they do not embody monetary value themselves, consumers cannot, for example, pay for purchases by giving sellers their credit card. The plastic card itself would have no value to the seller because it has few alternative uses and the seller cannot legally make purchases with it. What payment instruments are useful for is generating instructions that direct the movement of deposits. Consumers authorize the transfer of deposits based on such instructions by providing a signature or some form of identification.

The use of a payment instrument in exchange initiates a transfer of deposits within the banking system to complete the payment process. The instructions generated direct the payer’s FI to transfer deposits from its account to the payee’s account. If the payer and payee have accounts with the same FI, this involves the FI simply debiting the buyer’s account and crediting the seller’s account on its own books. If they instead have accounts at different FIs, then a back-office transfer must occur to move monetary value off the books of the payer’s FI and onto the books of the payee’s FI so the payee’s account can be credited. In either case, at least one third party is involved in an exchange of deposits. Additional entities also might play a role in passing information among the parties to the transaction and their FIs. Some time is required for the payer’s instructions to be communicated to all involved

(that is, for the payment to *clear*) and for the appropriate funds to be debited from the payer's account and credited to the payee's (that is, for monetary value to transfer and the payment to be *settled*).

How many intermediaries are involved and how much time is required to complete a transfer of deposits depend on the payment instrument used. As will be discussed in more detail below, funds are typically debited from a buyer's bank account later if the buyer pays with a check than with a debit card, and there can be fewer parties to the transaction. With a credit card, funds are debited from the buyer's account even later, and relatively more parties are usually involved. In all cases though, deposits are what consumers ultimately transfer indirectly to complete the transaction. This means that in the physical world of a modern economy, consumers have only two objects for transferring monetary value to complete a purchase: cash and deposits.³

How payments are made

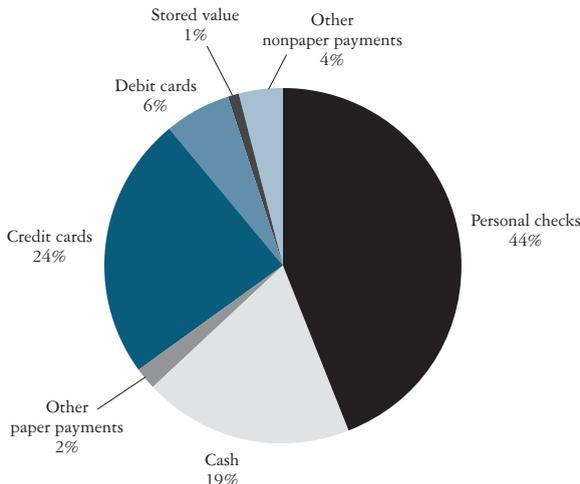
As the preceding discussion has suggested, cash and deposits can be exchanged to transfer monetary value between people, but cash and payment instruments that transfer deposits are used to make payments in the physical world. The remainder of this section addresses the payment instruments used in the physical world today: what they are, how they are used, and how widespread their use is.

Cash. These days cash worldwide consists almost entirely of coins and paper currency issued by governments.⁴ In a cash transaction, coins and currency are transferred by hand in exchange for goods and services. The transaction is final when it is executed. Legally, payers have no basis for reclaiming their cash once the transaction is completed. And the transfer of cash is equivalent to a transfer of monetary value, so a recipient of cash is free to spend it immediately. As a result, a unique feature of cash is that it allows anonymous trading. No instructions are needed to direct its transfer so there is no paper trail.

In the United States, cash was used as payment for 19.5 percent of all nonbusiness expenditures in 2000 (Chart 1).⁵ Checks and credit cards were used for a greater share of expenditures largely because they offer greater convenience, especially for large purchases. Cash remained,

Chart 1

DOLLAR VALUE OF PAYMENTS BY TYPE AS A SHARE OF TOTAL PURCHASES, 2000



Note: The data include purchases of at least \$30.3 billion made at e-tailers. The check number reflects only direct purchases by check, not checks used to prepay or repay via another form of payment (for example, to pay a credit-card bill).

Source: *The Nilson Report*, December 2001

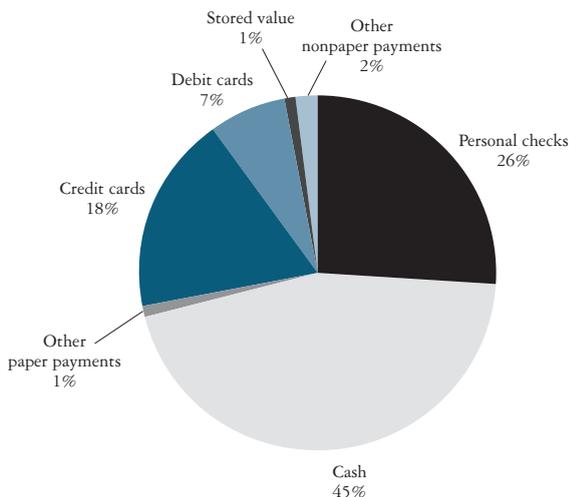
however, the most frequently used means of payment in terms of the number of transactions made (Chart 2). In 2000, U.S. consumers made 45 percent of their transactions with cash.⁶

Checks. When consumers write paper checks, they are writing instructions that direct their bank or FI to transfer on demand deposits of a certain value from their account to the payee of the check.⁷ A merchant is willing to accept checks because it can exchange them for currency or deposits at its own bank. A merchant’s bank, in turn, is willing to exchange checks for currency or deposits upon request because it can be reimbursed by submitting the check to the consumer’s FI through the check clearing process and awaiting settlement.⁸

Checks came into use in paper form in the mid-1800s and gradually became the dominant means of payment. Over time, as a result of competition from debit and credit cards, check use has decreased. Today, consumers use paper checks in about a quarter of all transactions (Chart 2).⁹

Chart 2

NUMBER OF PAYMENTS BY TYPE AS A SHARE OF TOTAL TRANSACTIONS, 2000



Note: The data include purchases of at least \$30.3 billion made at e-tailers. The check number reflects only direct purchases by check, not checks used to prepay or repay via another form of payment (for example, to pay a credit-card bill).

Source: *The Nilson Report*, December 2001

Debit cards. A debit card is a bank-issued plastic card that works much like a check in that it allows the holder to direct the transfer of deposits to make payments. Debit cards usually come with a magnetic stripe on the back that holds information about the cardholder and can be read by an electronic device (a card reader) at the point of sale. Increasingly, though, they are coming with an embedded microchip instead of or along with a magnetic stripe. Such cards are known as chip cards or smart cards because the microchip can hold much more information than the magnetic stripe. In fact, today's smart cards are capable of holding about seven different applications, of which the debit-card function might be just one.¹⁰

There are two types of debit cards, regardless of whether the cards come with a magnetic stripe or microchip. The first type, the PIN-only debit card, requires the cardholder to enter a personal identification number (PIN) into the card reader after swiping the card. The card

reader encrypts the information on the card along with the PIN and sends them over telephone lines to the issuer for confirmation that the PIN is accurate and that the cardholder's bank account has sufficient funds to cover the transaction. The second type of debit card, the signature-based card, does not require a PIN.¹¹ The cardholder simply swipes the card through the card reader, and encrypted information about the account and transaction are sent for authorization. If the purchase is approved, the cardholder signs a sales receipt. A match between the signature on the receipt and the signature on the back of the card takes the place of a PIN in verifying that the purchase is being made by the true owner of the bank account associated with the card.

The two types of debit cards differ in the benefits they offer consumers. PIN-only cards provide somewhat greater security for the cardholder by reducing the risk of fraudulent use, but purchases made with them are immediately deducted from the cardholder's bank account once the purchase is authorized. The merchant's account is credited at the end of the day, when the FIs involved settle their payments. PIN-only cards are used in 36.4 percent of all debit-card transactions and for 39.7 percent of the dollar value of transactions made with debit cards.¹² In contrast, signature-based cards provide greater functionality because they can be used with or without a PIN. Since they do not require a PIN, they can be used at any retail outlets that accept credit cards of the same brand. This means that the cards also can be used for mail-order or catalog purchases, which is not possible with PIN-only cards. The major disadvantage of this type of card is its ability to be used without a PIN and thus by thieves.¹³

Debit cards have been available since the mid-1970s but only became popular in the mid-1990s. At that time, issuers started referring to them as cash cards or check cards, labels without the negative association with "debt" that the term "debit" seems to have. Despite the relatively recent growth in debit-card usage, consumers still opt to use debit cards in only about 7 percent of transactions.

Credit cards. Credit cards are unique in that they are both a payment instrument and a credit instrument. As a credit instrument, they typically offer consumers a line of credit that requires no collateral. The credit line is very flexible. Consumers can draw on their credit lines whenever they choose and can carry most of their outstanding balance

from month to month. Consumers pay for this payment flexibility through the interest rates on their cards. Those interest rates are high relative to interest rates on other loans because credit-card loans are unsecured and can be rolled over, which makes issuers' expected cost of defaults relatively high.

As was true of debit cards, credit cards are plastic cards with either a magnetic stripe or an embedded microchip (almost solely the former today). Consumers use them exactly as they would signature-based debit cards. Behind the scenes, the issuer's database, not the shopper's bank account, must be accessed to verify that the the shopper's credit limit has not been exceeded. By signing the credit-card sales receipt, customers indicate their intention that the card issuer pays the merchant on their behalf. The signed receipt also constitutes a promise to repay the loan from the card issuer in accordance with the terms governing the credit card. The issuer pays the merchant within a couple of days through the settlement process and bills the shopper monthly. The shopper pays the bill with deposits—usually by issuing a check. Thus, when a shopper makes a credit-card purchase, he or she is making a promise to pay at a later date with deposits.

Credit cards have been available since about 1950.¹⁴ In recent years, they have been displacing checks in the payment process. They now account for 18 percent of all transactions and 24 percent of the dollar volume of transactions in the United States.¹⁵

Stored value. Stored value is perhaps best described as a hybrid of cash and deposits, much like a traveler's check or electronic gift certificate. Simply put, stored value is monetary value stored in digital form. It resembles deposits in that it is just a record of monetary value, like a bookkeeping entry reflecting the value of deposits at a bank. From the perspective of consumers, stored value is similar to a traveler's check in that it is a payment instrument that requires people to prepay for purchases. Monetary value is transferred to the seller of stored value in exchange for a claim to future goods and services. From the perspective of consumers, stored value is also more like cash. It typically offers anonymity, requires no PIN or credit authorization, provides finality at the time of payment, and is unrecoverable if lost or stolen. Stored

value's major advantage over cash is that it allows users to avoid carrying small change. Its major disadvantage relative to cash is that it is much less widely accepted.

In the United States today, stored value is in almost all cases associated with a plastic card with a magnetic stripe. Because consumers have to pay in advance for purchases with stored value, the cards are also called "prepaid cards." Prepaid phone cards, copy-machines cards, and mass-transit cards are the leading examples of stored-value cards. Consumers buy the cards from merchants using traditional means of payment—cash, checks, or credit or debit cards. A record of the monetary value is either stored on the card or in a database maintained by the merchant or a third party operating the database for the merchant. Some cards are rechargeable, so consumers can add value to them; the rest are disposable with a fixed denomination. At the point of sale, consumers insert the card into an electronic device that can read the card. If the value is stored on the card, the card reader updates the card to reflect the value on the card after a purchase is made, assuming there is enough value on the card to cover the purchase. If the card does not have enough value on it to cover the purchase, the card and purchase are rejected. Cards used at copy machines or mass-transit systems are good examples of this type of stored-value card. If the record of monetary value is stored in a database maintained by the merchant or a third-party processor, the consumer swipes the card in the merchant's card-reading device, and the card is processed through the credit-card processing system or through the merchant's internal network. The account number is accessed and the monetary value associated with the account is checked to verify that it is sufficient to cover the purchase. The record of value is updated to reflect the value remaining after deducting for the value spent. Gift cards from retailers are an example of this second type of card.

Some stored-value cards are designed to be used even without physically presenting the card at a card-reading device. In this case, the record of monetary value is always stored on the books of the merchant or with a third party that processes the card program for the merchant. Each card has an account number and PIN associated with it. The consumer provides the account number directly to the merchant, usually

with the customer's PIN. With this information, the purchase proceeds as if the card were present. The best example of this type of stored-value card is the prepaid phone card.

Smart cards with a stored-value feature can do even more. They can directly transfer value to and from the holder's bank account. When value is spent, it is deducted from the card and stored in the card-reading device. The merchant can download it to its bank for deposit into its account. In the United States smart stored-value cards are used almost solely by government agencies to provide benefits (for example, food stamps) electronically to designated recipients. The only use of smart stored-value cards more generally has been limited to some trials in which the cards have been issued to consumers for use at certain participating merchants (for example, at the Atlanta summer Olympic games).

The technology to enable stored value has been around since the mid-1970s, but stored-value cards are still used in the United States for only 1 percent of transactions (Chart 2).¹⁶ It was thought that when smart cards took off, stored value would too, but for now the smart cards being issued in the United States lack a stored-value application.

II. MAKING PAYMENTS IN CYBERSPACE USING TRADITIONAL PAYMENT INSTRUMENTS

The payment instruments traditionally used to pay for purchases in the physical world—checks, credit cards, debit cards, and stored value—can also be used to make purchases online. But shopping in cyberspace is fundamentally different from shopping in the physical world, and there are a number of significant hurdles to the use of existing payments instruments in cyberspace. As a result, traditional payment instruments have had to be modified to work on the Internet.¹⁷

What's different about making payments in cyberspace?

Shopping in cyberspace differs from shopping in physical space in one key respect: purchases in cyberspace are all made remotely. This makes them much like catalog purchases in the physical world. Consumers pay for the vast majority of catalog purchases using credit cards.¹⁸ Merchants accept the cards following the existing protocol

established for transactions where the card is not physically present. The remainder of catalog purchases is paid for with checks mailed to the merchant since cash cannot safely be transferred remotely. Only a small share of catalog purchases is made in this manner because receipt of an order is delayed while the check is moving through the postal system. Since all Internet purchases are made remotely, it is not surprising that the payment instrument used most often by consumers when cybershopping is the same one used for catalog purchases. Credit cards are estimated to be used by consumers for at least 90 percent of their purchases at e-tailers. That makes credit-card transactions five times more common in cyberspace than in the physical world.

When the need for payment instruments for use in cybershopping arose, credit-card transactions had two features that made them well suited for the task. First, they were processed electronically after the point where the customer physically presents the card to the merchant. Second, procedures already existed to enable credit-card transactions when the card was not present. The other traditional payment instruments—debit cards, stored value, and, in some limited cases, checks—shared the first feature, but not the second.¹⁹ To function in cyberspace, these payment instruments needed modifications so they could be used electronically from beginning to end, without a card or paper check ever present. Today, there are ways of using each of the traditional payment instruments in cyberspace.

One might think, then, that traditional payment instruments are fulfilling consumers' need for a safe and easy way to make payments while cybershopping. But there are three additional hurdles to using these payment instruments online. The first and biggest barrier to online shopping is consumer reluctance to use credit and debit cards in cyberspace. One recent survey found, as is typical, that 43 percent of consumers fear cybershopping will result in the theft of their credit-card numbers (PR Newswire 2001). Another survey found that 29 percent of online shoppers think they are responsible for fraudulent Internet purchases made with their debit cards (*ATM & Debit News*, July 2001).

The second hurdle is the costliness of using credit and debit cards for very small purchases (that is, micropayments) such as the one-time use of digital content, like an individual song, photograph, or magazine article. The fees merchants must pay on purchases made with these

cards are so high that sellers of digital content and other very inexpensive goods cannot afford to accept the cards. Yet the demand for such purchases is potentially very large. About 38 percent of all Internet users report having downloaded music files at some point.

The third hurdle is that many potential cybershoppers do not have access to the traditional payment instruments. One study found that lower income consumers—the consumers more likely to be constrained in their ability to make credit-card purchases—are the fastest growing group of Internet users. Teenagers are also likely to lack credit cards, debit cards, and checking accounts; yet they are thought to constitute the largest market of cybershoppers who look but do not buy.

PSPs and e-tailers have been somewhat successful in addressing these hurdles. The rest of this section will discuss how the traditional payment instruments can be used online and what approaches have been taken to overcoming these hurdles.

Credit cards

From the shopper's perspective, credit cards are used online exactly as they are for catalog purchases. A shopper provides his or her card number and expiration date—the latter serving to help prove that the card is in the hands of the account holder. In most cases, the information goes into what is known as a Secure Sockets Layer (SSL), where it is encrypted and sent over telephone lines via modem to the credit-card issuer for authorization. If authorization is received, the transaction is complete and a screen appears that can serve as a receipt when printed.

Some experts say that using credit cards on the Internet is no more risky than using them in the physical world, either in person or over the phone. In either realm, credit-card information is often stored along with purchase information on computers from which it can be stolen by hackers. Sales associates or website operators can record credit-card numbers and expiration dates and use them illegally to make purchases. And paper receipts, including printed verification of Internet purchases, can be stolen from the trash and used to generate fake credit cards.²⁰

To combat consumer fears, e-tailers and PSPs have been taking additional steps to ensure that credit cards can be used more securely in cyberspace. One step card issuers in the United States have taken is to

offer cybershoppers zero liability for fraudulent purchases made with either type of card. This voluntarily extends to cyberspace and enhances a U.S. consumer protection that applies to credit-card transactions made in the physical realm. A second and similar approach is for card issuers to provide separate lines of credit exclusively for Internet purchases. This approach is very common in Europe. In the United States, where cards are fairly easy to obtain, consumers can achieve the same end by holding multiple cards and dedicating one for cybershopping. A third and newer solution relies on software that generates a one-time-use credit-card number for each purchase made with the same credit-card account. With this technology, shoppers avoid having to disclose their credit-card numbers online. This approach requires no effort by e-tailers since they need no additional software to accept the one-time-use card numbers. In fact, e-tailers cannot distinguish a one-time-use account number from a real account number. When an e-tailer seeks authorization for a transaction, the card issuer recognizes the number as linked to the customer's credit-card account and authorizes the purchase (assuming the purchase is within the credit limit on the account). This third approach is gaining popularity. Finally, an even newer solution to the security problem allows cardholders to protect their credit cards with a password. When shopping online, cardholders provide their password along with their card number, just as they would provide a PIN with some debit cards. The password is sent directly to the credit-card company and never visible to the merchant.

For large-value transactions, such as the sale of a car online, buyers and sellers may be especially wary of transacting with credit cards, or checks for that matter, because of the risk of fraud. Virtual escrow services are the solution here. When a buyer and seller use escrow services in cyberspace, they rely on a third party to handle the transfer of funds and goods between them, just as they would if they used an escrow service to facilitate a transaction in the physical world. The escrow service receives and verifies the transfer of funds by the buyer. It then notifies the seller, who delivers the merchandise to the buyer. When the goods have been received and deemed acceptable to the buyer, the escrow service forwards payment to the seller. To use such a service, both parties to a transaction must agree in advance to use it and must register with

the service. Charges for such services are about 4 percent of the transaction value. Most online escrow companies today promise to refund the customer's money if the merchandise is not satisfactory.

Solutions are also available for the problem of how to sell very low-priced goods on the Internet. For digital content at least, one approach is for merchants to sell subscriptions to their digital offerings. This, however, can require a bigger expenditure than a customer is interested in making. Someone who just wants to download and read one news article might not want to buy a yearly subscription to an online magazine. A newer and more promising approach is for merchants to use the services of a PSP for handling "pay-per-view" credit-card sales. The merchant obtains the PSP's software and pays a competitive fee for set up and maintenance. Independently, consumers register with the PSP, providing their credit-card number and personal information and selecting a personal security code. When a registered consumer shopping at a participating e-tailer is ready to check out, a window pops up that allows the consumer to communicate with the PSP to authorize the purchase. The PSP combines multiple small transactions by the consumer and submits them to the credit-card issuer as a single charge against the consumer's account. Consumers benefit because they can use their credit cards to make low-value purchases, they incur no cost for using the PSP's services, and they are better protected against fraud since they reveal no financial information to the e-tailer. E-tailers benefit because they can collect payment for purchases of as little as 10¢ and they receive payment as they would from any credit-card sale.

Cardless charge accounts

Some PSPs are offering a novel way for consumers who lack credit cards or who seek greater security and privacy to shop online. They allow consumers to have their purchases included on their monthly bills for telephone service or Internet access. Since phone companies and Internet service providers bill customers monthly, an individual account with these service providers is essentially a charge account, but without an associated charge card. These charge accounts differ from credit-card accounts because the credit they offer cannot revolve. The account

holder is expected to pay the bill in full each month, and a late fee is imposed if the bill is not paid on time. If several months pass without payment being made in full, the service is discontinued.

There are many advantages of this type of payment service and few disadvantages. It is available to almost everyone with Internet access at home since both telephone service and an Internet service provider are generally required to access the Internet. It is easy for merchants and for the PSP to offer because it piggybacks on the existing systems for sending bills for phone and Internet service. Consumers are afforded additional privacy and protection against fraud when using credit cards since their account information is not transmitted to the merchant and the billing process is discreet. The expenses they incur while cybershopping appear on their phone bills, for example, as associated with a phone number or with the name of the PSP. The main disadvantage is that not many e-tailers are accepting payments in this manner.

Debit cards

Signature-based debit cards, which are used just like credit cards in the physical world, are also used just like credit cards in online shopping. And like credit cards, these debit cards when used online can bring with them a heightened exposure to fraudulent use and a lack of cost effectiveness for low-value transactions. Fortunately, the solutions to these problems for credit cards, described above, also work for signature-based debit cards.

PIN-only debit cards, in contrast, cannot easily be used online for the same reason they cannot be used in the physical world for catalog purchases. Without access to a card-reading device that can accept input of the PIN and verify its accuracy, there is no way for the transaction to proceed. There are two factors behind this problem. First, the banking industry long ago adopted the standard of requiring the PIN to be entered into a secure device that encrypts it before it reaches any computers. Consumers would need access to a card reader that can accept a PIN in order to go cybershopping with their debit cards. So far, very few consumers have the necessary card readers. Second, the

method the banking industry uses to encrypt debit-card information does not work well on the Internet, where anyone anywhere might want to send payment information for processing.²¹

PSPs have been developing better ways for consumers to use their PIN-only debit cards at e-tailers. The most common solution is to provide consumers with card readers with numeric keypads that plug into their computers, say between the computer and keyboard, so no additional computer ports are needed. Consumers can then use their PIN-only debit cards just as they would at an ATM machine or at the grocery store.²² Of course, for this solution to be viable, potential cyber-shoppers need card readers with PIN pads attached to their own computers. Some banks and e-tailers affiliated with the PSPs providing this solution are giving card readers to their customers to encourage cyber-shopping with PIN-only debit cards. Otherwise, consumers have to purchase them from a PSP. As this article went to press, one PSP was offering them for \$50 each.

Checks

Some PSPs have begun to offer services that allow customers to pay for purchases online with deposits by essentially writing an electronic check. In some cases, banks themselves offer these services to their customers using software provided by a PSP. In others, customers go through a PSP, who deals directly with the banks involved. This approach is just like going through a telephone operator to place a phone call. The only requirement for using a check online is that both the sender and the recipient of funds have email addresses and bank accounts that can be electronically debited or credited through the automated clearinghouse (as described in endnote 7). To use a check to pay for Internet purchases, customers simply register with the PSP offering the service by providing their checking-account information and email address, by choosing a user ID and password, and by specifying the amount of the check and the recipient's name and email address. PSPs may require additional personal information such as the sender's mailing address and social security number and the recipient's mailing address as part of their fraud-prevention efforts. The request to send funds triggers a banking system transaction that takes a few days

to settle, just as would be the case with a paper check. This means that no funds change hands immediately, which can be good for consumers but bad for merchants.

An advantage of using electronic checks is that they work for funds transfers between any two individuals, not just between individuals and e-tailers. Thus, a parent could use them to send funds to a child at college instead of writing and mailing paper checks. In some cases, electronic checking services also allow people to request money from others, to essentially send them a bill by email that can be paid online by check. This feature is especially useful for online auctions since it enables any individual to auction goods and receive payment.

As with any payment instrument, the use of electronic checks has advantages and disadvantages in terms of security. Some PSPs operating in this area provide insurance against losses resulting from security breaches of their systems—say, if someone manages to gain access to a customer's bank-account information, user ID, or password. Another advantage of using checks is that the consumer's account information is not sent to the recipient of the payment.²³

Of course, PSPs must charge for the electronic checking services they offer if their businesses are to remain viable. They generally impose fees on the merchants using their services, not on their consumer users.²⁴ Consumers could potentially face charges from their banks for processing the ACH transfers that underlie the check transaction. If these charges are high enough, consumers might not find electronic checks to be a cost-effective way to pay for online purchases.

Cybershoppers also might find using checks online to be inconvenient. To limit losses from fraud, PSPs often limit the size of each electronic check and the amount a single consumer can spend daily and monthly. This makes it impractical for consumers to use electronic checks to make large or frequent purchases.

Stored value

Stored value is used to pay for purchases at e-tailers just as it is in the bricks-and-mortar world in cases when a card is not physically presented to the merchant. It is used exactly like a prepaid phone card. The customer simply provides the card number and card access number or

PIN. The transaction is processed through the credit-card processing system or through the merchant's internal network and approved if there is sufficient value remaining on account to cover the purchase.

In some cases, shoppers can get stored value without ever acquiring a stored-value card in the physical world. They can instead buy a virtual card entirely online. A virtual stored-value card is just a card number associated with a charge account, without an actual plastic card to go with it. Shoppers can use a credit card to add value to their stored-value account. They can also use their stored value as they would the underlying credit card by providing the account number to the merchant. At least one PSP enables shoppers to provide their account number as if it were their credit-card number without revealing any personal information at online checkout counters. E-tailers' websites normally require shoppers to give their name and billing address to make what appear to be credit-card purchases. This PSP provides a name and billing address other than the shopper's own for use at this stage in the transaction. But this approach provides anonymity only when used to buy online content, like a photo, song, or a subscription to an Internet magazine, items that do not require personal information for delivery in the bricks-and-mortar realm.

III. MAKING PAYMENTS IN CYBERSPACE USING NEW MEANS OF PAYMENT

Despite the many ways that traditional payment instruments can be used on the Internet, there are some payment needs they are not fulfilling. None of them offers all the features or accessibility to a broad consumer population that cash offers. Many businesses, especially small businesses, and most individuals still do not accept credit, debit, and stored value cards. And the use of paper checks takes too much time to be suitable for online shopping and exposes all parties to a transaction to the risk of loss. Two new means of payment have arisen to fill the gaps left by the traditional means of payment—alternative currencies and brokered monetary value.

Alternative currencies

The fact that cash is used for a larger share of transactions in the physical world than any other means of payment by itself suggests a potentially sizable demand for a cash alternative for use on the Internet. The ideal electronic-cash or digital-cash products would have the same defining characteristics as cash in the physical world. So far, governments have avoided issuing Internet-friendly cash products. Private firms have been trying to develop them for several years, but have had little success.

Digital cash. The first generation of electronic-cash products has come and gone. They were truly electronic analogs for paper coins and currency. Consumers and merchants needed to be affiliated with the issuer and to install and use special software to trade with the cash substitutes. For the consumer, the software would access their bank deposits, create digital coins and currency, and then send the money electronically to the merchant. The digital coins and currency were bits and bytes in cyberspace representing their unique serial numbers. The software verified the authenticity of the money for the merchant and deposited its value into the merchant's bank account.

In the end, both merchants and consumers judged the software too difficult to use given the reward, since initially few others were using it. And since the digital-cash products had negligible networks of users, there was little reason for anyone to try them. The attempts to introduce digital cash failed as a result, and the companies behind them either went bankrupt or moved into other lines of business.²⁵

Reward currencies. The industry is now witnessing the second generation of electronic-cash products. These are mostly known as reward, or loyalty, currencies because private firms issue them as a reward for some action taken by a consumer. They are sold to merchants as a marketing tool: the issuers' websites bring attention to the e-tailers' products and provide handy links to their sites. The currencies also may help build brand loyalty by giving consumers an incentive to make repeat purchases. Consumers conceivably benefit because they can earn monetary value online, often from shopping and doing what they might have done anyway on the Internet.

The typical reward currency works as follows. A consumer who registers with the issuer of a currency will earn units of that currency for visiting particular websites, completing specified online surveys, or making purchases at affiliated e-tailers. The currency is deposited into an account with the issuer on behalf of the consumer. It is generally not denominated in dollars, though the issuer declares an exchange rate between the dollar and the currency. The consumer can use the currency toward the purchase of goods from Internet merchants that accept it. Some issuers allow people to use the currency very broadly, including to make charitable donations or to save for a child's education. In some cases, issuers have even joined with providers of traditional stored-value cards to allow consumers to download units of the reward currency onto their cards and spend the currency at bricks-and-mortar establishments. Most reward currencies are not so flexible, however.²⁶

Reward currencies did not get their start online. The first reward currency dates back to 1896, when Sperry & Hutchinson, known as S&H, introduced the S&H Green Stamp.²⁷ Green Stamps are now available as digital Green Points. As an electronic reward currency, they join what is probably the most well known reward currency—the frequent-flyer mile, also first introduced in the physical realm. There are now PSPs that allow people to earn frequent-flyer miles for shopping at associated e-tailers' sites. At least one PSP lets people convert frequent-flyer miles from all of their frequent-flyer accounts to an online currency that can be spent online.²⁸ Both Green Points and frequent-flyer miles have the benefit of considerable consumer recognition because of their existence in the physical world before spreading into cyberspace. Frequent-flyer miles have the additional advantage of having had an extensive network of consumers and merchants when PSPs began issuing them online.

Most reward currencies, however, are best for use by children, who lack credit and debit cards. Merchants catering to children seem to be the ones who have found that accepting such a reward currency has helped them reach their desired customer base. But most of these reward currencies have failed to attract enough participants of all ages to be successful. Reasons include the difficulty involved in earning enough units of a reward currency to buy something online and the relatively few e-tailers that accept any one currency. In most cases, the currency cannot be

redeemed for dollars, so it becomes worthless to the consumer who cannot find anything online on which to spend it. Today's reward currencies also fail to offer the anonymity desired for a digital cash substitute. The issuer of a reward currency has users' personal information and collects data on users' spending behavior and web use.

Brokered monetary value

The most successful innovation in payment services for online shopping has been the creation of what might best be called *brokered monetary value* (BMV). BMV refers to monetary value that is transferred between the parties to a transaction via a broker, hence its name. It allows individuals and organizations to pay for and receive funds with traditional payment instruments without dealing directly with each other. This means that only the PSP serving as the broker to a transaction needs the ability to accept and make payments with checks or credit, debit, or stored-value cards. As an added benefit, the financial information of all parties to a transaction remains with the PSP at all times, providing an extra measure of protection.

How BMV works differs a little across the PSPs that offer it, but it can generally be described as follows. A consumer wanting to use BMV to make a payment first opens an account with an appropriate PSP and deposits funds into the account using a credit card or check. When ready to spend the value in the account, the consumer sends an email to the PSP, indicating the amount to be sent and the email address of the recipient. The PSP then notifies the recipient by email that the customer has sent funds. A link in the email readily connects the recipient to the PSP. The recipient must open an account with the PSP if one does not already exist. The PSP deposits the funds in the account, and the recipient can withdraw them at any time. In some cases, the recipient must have a bank account to receive funds since the PSP will transfer funds via ACH to the bank account. Likewise, a seller with a BMV account can request funds from buyers (that is, bill them) by notifying the PSP and having an email sent to the buyer indicating the recipient and the amount and providing a link so the buyer can arrange payment. In many cases, the dollar value of funds transferred can be small, well

under \$1, allowing micropayments to be made. Most providers of BMV now impose a fee per transaction to receivers of funds as a way of defraying the costs of processing credit-card purchases.²⁹

A big advantage of BMV is that it allows payments to occur between any two individuals regardless of the physical distance between them. Most PSPs offering BMV even allow for its use in international transactions, although they generally do not offer their services to residents of all countries. For this reason, BMV payments are popularly known as person-to-person (or P2P) payments, and are the major type of payment at online auction sites. The P2P label is a misnomer, though, because it obscures the fact that payments can flow between businesses. In fact, some PSPs allow funds to be sent to multiple recipients, which can be a convenient way for an e-tailer to pay its employees.³⁰

The benefits of BMV transcend cyberspace, enabling payments in the physical world that were not previously possible. The BMV offered by some PSPs can be used to make payments via handheld electronic devices with Internet access, like personal digital assistants. This allows, for example, the exchange of funds among friends when dining out together, without the hand-to-hand exchange of cash or checks. People can essentially beam cash to each other—a close approximation to using a Star Trek transporter.

The main drawback of BMV stems from the fact that BMV allows considerable anonymity in trading because it lets people exchange funds through a third party. This makes BMV systems susceptible to fraud. That fraud can be costly for people using BMV. Either a credit-card or a check transaction underlies a BMV transaction, and only the PSP and the relevant credit-card companies or banks are involved in the underlying transaction. Consequently, the consumer protections associated with those underlying payment instruments might not extend to the use of BMV. And PSPs might not be legally required to offer those protections to their customers. However, since they bear a large share of the costs of fraud, they are using sophisticated surveillance methods to identify and stop suspicious transactions.

The security measures implemented by the providers of BMV themselves limit the usefulness of these payment services. Most PSPs restrict the amount that can be sent and received daily. Some also limit

the amount sent and received over longer time intervals, such as a week or a month. Most limit the size of a transaction, which makes BMV inappropriate for large purchases.

Despite these limitations, providers of BMV have succeeded where providers of other new online payment methods have not for three reasons. First, providers piggybacked on the settlement system used for credit cards and traditional interbank transfers. This allowed buyers and sellers to use BMV without acquiring and setting up additional hardware or software. Second, almost everyone who shops on the Internet is a potential user of BMV since an online shopper most likely has Internet access and an email account—the two conditions for usage. And third, recipients of BMV have to open accounts with the issuer, ensuring that the network of people capable of sending and accepting a provider's BMV grows rapidly.

IV. CONCLUSION

In the physical world people transfer monetary value to pay for purchases using either cash (currency and coins) or deposits. For online shopping, they usually rely on deposits accessed with traditional payment instruments—credit cards, debit cards, checks, or stored value. When they do use a new means of payment online, they currently rely primarily on brokered monetary value. BMV, though, is just a new way of using traditional payment instruments to access deposits. Thus, despite the remote nature of purchases from e-tailers, consumers for now are making payments online much as they do in the physical world.

Further advances in how consumers can make payments at e-tailers will likely be in two areas. Traditional payment instruments will be adapted to better overcome the hurdles that remain to using them. And there will be continued efforts to develop an electronic-cash product that can be used on the Internet. Although past efforts in this area have failed, the demand for an electronic substitute for cash is so great that future efforts are highly likely.

ENDNOTES

¹ See Forrester Research and assorted reports on Internet activity at <http://cyberatlas.internet.com>.

² It is not clear whether these perceptions are accurate. Little solid data exist regarding security breaches affecting consumers shopping online. There have been some well publicized incidents of hackers stealing credit-card numbers from e-tailer websites. But data on other thefts of credit-card numbers during cybershopping episodes (for example, card numbers stolen from phony websites that exist solely for the purpose of collecting card numbers) are hard to collect. Complicating the collection of good data is the need to distinguish between credit-card numbers stolen online and those stolen in the physical world simply by running a card through a handheld card reader. In either case, the card number is stolen although the card itself is not.

³ A useful reference on payment instruments in the physical world is the Federal Reserve's *Traditional Payments Primer*, available through the Federal Reserve Bank of St. Louis.

⁴ In the United States private firms can issue their own brands of coins and currency in denominations exceeding \$1, subject to some restrictions that ensure the currency is distinguishable from government-issued currency. Traveler's checks are the most prevalent of the privately issued currencies in use in the physical world today. Current law, however, prohibits the private issuance of coins or currency in denominations of less than \$1 if those coins are meant to circulate as money (18 U.S.C. Sec. 336). According to Vartanian, Ledig, and Demianczuk, this law stems from The Stamp Payments Act of 1862.

⁵ According to *The Nilson Report* (December 2001), the source of these findings, the data used as a measure of purchases capture purchases by U.S. residents for new and used goods and services by individuals and nonprofit organizations while within or outside the United States. They include business-related purchases made by individuals.

Data from the Federal Reserve Financial Services' Retail Payments Research Project (2002) are not used in the article because that study omitted cash transactions.

⁶ The prevalence of cash use is truly amazing given that government-issued currency is not convertible into any monetary or nonmonetary object other than itself. The intrinsic value of a piece of U.S. paper currency, regardless of its denomination, is the value of the paper and ink that constitute it and the labor and equipment usage embodied in it. In 2000, that came to 2.265 cents, according to the Department of the Treasury. Yet people are willing to exchange \$1 for 100 cents. That is, they are willing to trade a dollar at exchange rates far beyond what is consistent with its intrinsic worth because they trust it will retain its value and continue to be accepted in exchange.

⁷ Consumers can also make ACH (automated clearinghouse) payments. These payments are cleared and settled through the network of banks that participate in the ACH process. ACH payments usually involve the direct debiting or crediting of depository accounts to effect payment, as when paychecks are directly deposited or when payments are made directly to a utility company. They are not very useful in cybershopping because consumers do not have a way to communicate with FIs to initiate them in real time.

⁸ Electronic checks are an alternative to paper checks. They are discussed in the next section. To issue electronic checks while shopping in the physical world, consumers must be able to access their electronic banking services at checkout counters. Terminals at the point of sale or personal wireless devices like palm-sized computers can enable this.

⁹ Another source of data on check use is the Federal Reserve's recent payments study (Federal Reserve Financial Services 2001).

¹⁰ Today's smart cards usually come with only one application loaded, even though they can hold more.

¹¹ PIN-only cards and signature-based cards are also referred to, respectively, as online and offline debit cards.

¹² Data are from the author's calculations based on statistics provided in both *ATM & Debit News* (November 2001, page 2) and Table 6 of Federal Reserve Financial Services (2002).

¹³ Merchants might like the cards because the cards reduce their need to hold, safeguard, and process cash and because they generally incur lower transaction fees on debit-card sales than credit-card sales. FIs prefer debit-card transactions to paper check transactions because the former are cheaper to process.

¹⁴ Initially, credit-card transactions generated paper payment instruments. Now, they are almost entirely electronic since most merchants have card readers. Increasingly, even the signature is captured and stored electronically.

¹⁵ Credit-card transactions are especially popular with U.S. consumers because they offer benefits not available elsewhere. U.S. government regulations limit cardholders' losses to \$50 if their cards are lost or stolen. Regulations also require issuers to assist cardholders in disputes with merchants regarding goods and services purchased with the cards.

¹⁶ Stored-value cards are catching on outside the United States because of the greater need for a payment instrument that can be used without accessing the telecommunication system. Greater merchant acceptance there has in turn encouraged consumer acceptance of the cards. In contrast, stored-value cards are rarely used in the United States outside of mass-transit systems. U.S. merchants have been reluctant to purchase and install the necessary card readers in addition to the devices they already have to read magnetic-stripe cards. Merchants have complained that they do not have enough space for the machines at their checkout counters and that there are not enough smart cards in the hands of consumers to justify the expense of the machines.

¹⁷ The discussion of payments in cyberspace here and in Section III is based on payment technologies available when this article was written.

¹⁸ Consumers also could use signature-based debit cards for catalog purchases and in the same manner as credit cards.

¹⁹ Recently, some retailers have started running paper checks through electronic devices that capture the information on the check and then immediately returning the checks to customers.

²⁰ Merchants may face a greater risk of fraud from Internet payments than consumers. Consumers dispute charges made to their credit cards over the Internet with alarming frequency. They claim the goods were never received or arrived defective. In the latter case, they fail to return the goods. According to First Data Corp, consumers get refunds on 1.25 percent of all online transactions. This refund rate is

almost four times higher than that for catalog purchases and almost nine times higher than that for purchases at bricks-and-mortar stores. Standard practice in the credit-card industry is for the merchant to be relieved of liability for a fraudulent sale if a customer signature was obtained on the sales receipt. Since signatures cannot be obtained in cyberspace, this practice leaves the merchant liable for all fraudulent sales and forced to repay the credit-card issuer for refunds given to customers (Angwin). When other types of payment methods are considered, the incidence of fraud by consumers shopping online is even greater. A 2000 survey conducted by the Gartner Group found 12 times more fraud on Internet transactions (*Card News*).

²¹ The banking industry uses the Data Encryption Standard (DES) to encrypt debit-card information. DES requires both the sender and recipient of information to use the same password to encrypt and decrypt the information. The sender and recipient both must know the password before starting the encryption process. This makes the DES system more suitable for anticipated communication among parties that know each other, as is the case within the banking industry. It also makes the DES system cumbersome for encrypting transaction information sent over the Internet, especially compared to the SSL system, the one used in most Internet credit-card transactions. SSL requires each recipient of information to have a public password that senders of information can use to encrypt information destined for the recipient. The recipient, meanwhile, also has a private password that it uses to decrypt information it receives. The private and public passwords are related so that only they work together to encode and decode information. Consequently, SSL is more suitable for use on the Internet. It just doesn't work for transactions requiring a PIN.

²² The shopper might also benefit from yet a third level of protection if the PIN and card information pass from the card reader to the PSP first and then directly onto the customer's bank for processing, without ever going to the e-tailer. This way the information is protected against hackers getting into the e-tailer's website.

²³ E-tailers can enjoy a security advantage from accepting checks online as well. They can wait until the check has cleared and the transaction is complete before shipping the purchased goods. This protects them against checks that might bounce.

²⁴ PSPs offering electronic checking services monitor the transaction pattern of the individuals using their services. If an individual is receiving too many deposits in a month, the PSP concludes that the individual is using the service to operate a business and imposes additional fees, more like those charged merchants.

²⁵ Schreft discusses these early electronic-cash products and their implications for government regulatory agencies.

²⁶ A variant of the reward currency is the barter-exchange currency. A barter exchange is an organization that allows its members to exchange goods directly for each other or indirectly for the organization's currency. Barter exchanges issue their own currencies because they are an easy way of setting up an accounting system of debits and credits and allowing a greater volume of trades. Holdings of the currency would represent net credits in the trading system.

In the physical world, there are a whole host of alternative currencies for this purpose. The Ithaca Hour, the currency of the Ithaca, New York, barter exchange, was the first and probably remains the best known. Now barter exchanges are online, too, where they are flourishing because the Internet significantly reduces

transaction costs—the major obstacle to barter organizations. The Internet makes it easier and faster for members to find others with whom to trade, and it lowers the cost of issuing and accounting for barter-exchange currencies.

²⁷ Merchants, often grocery stores, issued the stamps based on the total amount customers spent with the merchants. Consumers could redeem the stamps at special redemption centers for everything from waffle makers to hair dryers to outdoor play sets. Green stamps were very popular in the 1960s and 1970s, making the S&H catalog one of the most widely distributed catalogs in the United States. By 1980, Green Stamps had lost popularity because of changes in merchant marketing practices and in consumer shopping habits. In March 2000, however, they were resurrected online as digital Green Points.

²⁸ Unlike most frequent-flyer miles, Green Stamps never expired. In fact, there are still a couple of redemption centers in existence in the United States.

²⁹ Kuttner and McAndrews discuss BMV at length.

³⁰ While BMV enables shopping at small, entrepreneurial websites, it is often not advantageous for operators of larger e-tailers. To accept BMV, an e-tailer must employ staff to communicate by email with the provider of BMV and to visit the PSP's website to finalize the transaction. The expense and time required to accept BMV often outweigh the benefits for larger e-tailers.

REFERENCES

- Angwin, Julia, 2000. "Credit-Card Scams Bedevil E-Stores," *Wall Street Journal*, September 19.
- ATM & Debit News*. November 22, 2001. "Check Study Helps to Clarify Debit's Growth Potential."
- _____. July 19, 2001. "Web Shoppers Not Afraid to Use Debit Despite High Internet-Fraud Experience."
- Card News*, December 27, 2000. "Card Industry Looks to Technology to Stamp Out Fraud."
- Federal Reserve Financial Services. *Traditional Payments Primer*. Available through the Federal Reserve Bank of St. Louis.
- Federal Reserve Financial Services. 2002. Retail Payments Research Project. Information available at <http://www.frb-service.org/>.
- Forrester Research. 2001. "Forrester Online Retail Index," available from <http://www.forrester.com/NRF/1,2873,0,00.html>.
- Kuttner, Kenneth and Jamie McAndrews. 2001. "Personal Online Payments," Federal Reserve Bank of New York *Economic Policy Review*, December, pp. 35-50.
- McAndrews, Jamie. 1997. "Network Issues and Payment Systems," Federal Reserve Bank of Philadelphia *Business Review*, December.
- PR Newswire. 2001. "National Consumers League Launches New Tips for Safe Shopping Online," Press Release, October 3.
- The Nilson Report*. 2001. Number 753, December.
- Schreft, Stacey. 1997. "Looking Forward: The Role for Government in Regulating Electronic Cash," Federal Reserve Bank of Kansas City *Economic Review*, Third Quarter, pp. 59-84.
- U.S. Department of Treasury, Bureau of Engraving. 2000. *Chief Financial Officer Annual Report*, p. 17.
- Vartanian, Thomas P., Robert H. Ledig, and Yolanda Demianczuk. 1996. "Echoes of the Past with Implications for the Future: The Stamp Payments Act of 1862 and Electronic Commerce," *BNA's Banking Report*, vol. 67, pp. 465-70. Also available online at <http://www.ffhsj.com/bancmail/bmarts/stampart.htm>.