# Why has stored-value not caught on?

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## Abstract

Why have general-purpose stored-value cards been unsuccessful in penetrating the U.S. market? Three necessary conditions for a payment instrument to be successful are discussed: consumers and merchants need to be convinced of its advantages over existing payment alternatives for at least some types of transactions; payment providers must convince consumers and merchants simultaneously of its benefits to achieve critical mass; and assure them that adequate safety and security measures have been implemented. This article discusses the credit card industry's success in meeting these necessary conditions and general-purpose stored-value issuers' failure to meet them to date.

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## Why has stored-value not caught on?

Advances in computing power, electronics, and telecommunications have improved the way we live. Now such advances have started to change the way we pay. Technological advancements now make it possible for consumers to purchase goods with electronic bits of information representing money, commonly referred to as stored value. The value may be stored on microchips embedded in plastic cards that look similar to credit cards. This type of stored value device is called a smart card. According to an article seven years ago, 'Smart cards are set to revolutionize payment systems and provide a plethora of new opportunities' [Talmor and Timewell (1997)]. Another article in the popular press stated that 'Cash is dirty, inefficient, and obsolete. Smart cards, digital cash and a host of electronic currencies will soon replace pocket money' [Gleick (1996)]. This article asks the question: Why have general-purpose stored-value cards not been widely adopted as some analysts had expected?[2] I will compare the credit card industry's success in meeting three conditions necessary for widespread adoption with the stored value issuers' failure in meeting these conditions to date in the United States.

Financial analysts have predicted the death of cash and other paper-based payment instruments for many years. Cash usage has started to decline. According to an American Bankers Association/Dove Consulting Study, cash usage has declined from 39 percent to 32 percent for in-store payments [Sapsford (2004)]. Part of this decline results from greater acceptance of payment cards, such as credit and debit cards, at merchant locations that traditionally had not accepted them. In the United States and most parts of the world, limited-use stored-value cards have been successful as cash substitutes for some niche markets, such as transportation systems, university campuses, and military bases.

Smart card issuers along with producers of the technology have made sizeable investments to establish smart cards as a viable payment instrument. The migration to chip cards from magnetic stripe ones have been aided by the reduction in the cost of producing smart cards. Payment card organizations, such as MasterCard and Visa, along with banking and non-financial institutions have invested significant amounts of money into stored-value technology in an effort to provide electronic substitutes for government-issued physical cash. MasterCard reportedly had invested over U.S.$150 million to purchase 51 percent of Mondex International, an electronic cash system developed in the United Kingdom by National Westminster Bank [Hansell (1998)]. National Westminster spent more than U.S.$100 million developing Mondex [Stouffer (1996)].

Stored-value issuers hope to earn interest from outstanding stored-value balances, earn fees from merchants, and possibly revenues from advertising on the physical card. However, issuers will have to convince consumers and merchants why they should use stored value. Issuers argue that their product would be more convenient for consumers and reduce costs of processing payment for merchants.

Most analysts agree that the two largest U.S. stored-value trials, the Atlanta Olympic Games and the Upper West Side of Manhattan, failed in convincing consumers and merchants of the benefits of using stored value over existing payment alternatives. The Economist (1998, 73) concluded that, 'Electronic money has thus turned out to be a solution in search of a problem.' While general-purpose stored-value has not been successful in the United States, many European countries have implemented such payment instruments with varying degrees of success. This article will address some factors that have lead to adoption of stored-value payment instruments in some countries but not others.

### The necessary conditions

Consumers and merchants are reluctant to change their preferences towards payment instruments. In the context of the issuance of new coinage, Jevons (1875) wrote, 'No one can possibly understand many social phenomena unless he constantly bears in mind the force of habit and social conventions. This is strikingly true in our subject of money.' Furthermore, Evans and Schmalensee (1999) observe that in the last 4000 years there have been only four major innovations in the way

2 General-purpose stored-value payment cards are defined as those that are widely adopted by merchants and consumers where the value resides on the card and is transferred to the merchant's terminal at the time of purchase. Unless otherwise stated, stored-value cards will be short for widely-accepted stored-value cards in this article.

## Why has stored-value not caught on?

we pay. These four major innovations are: coins (4,000 years ago), checks (800 years ago), paper money (more than 100 years ago), and the payment card (over 50 years ago).

Three important conditions must be met before stored value is widely used. Firstly, consumers and merchants need to be convinced that stored value is superior to existing payment instruments for certain types of payments. Generally, stored value payments substitute for cash payments. Stored value has been a successful alternative to cash in closed loop systems, such as transportation service purchases, coffee purchases at certain popular coffee chains, and for purchases on university campuses and military bases. Nilson (2003) estimates that prepaid cards, which include stored-value cards for limited use and phone cards, accounted for U.S.$55 billion in 2003 and predicts that this figure will grow to U.S.$146 billion in 2007.

Secondly, as with the introduction of any new payment instrument, to achieve critical mass, consumers and merchants need to be convinced simultaneously. That is, consumers will not use stored value unless a sufficient number of merchants accept it and merchants will not accept it until a sufficient number of consumers use it. An example of the inability of a payment instrument to overcome the chicken-and-egg problem is the Susan B. Anthony dollar coin. Because coins remain in circulation much longer than bills, they are less expensive for currency issuers to provide in the long run. Unlike most countries, the United States has been unsuccessful in replacing lower denomination bills with coins. McAndrews (1997) argues that Canada, like other countries, was eventually successful with its dollar coin because the central bank started to withdraw notes from circulation.

Thirdly, with any payment instrument, consumers, merchants, and financial institutions are concerned with credit and fraud risk. For our purposes, credit risk is the risk that the payee is unable to convert a payment into good funds. The inability to acquire good funds may result from the payer, a payment intermediary, or the issuer's inability to process or make good on its obligation to deliver. Fraud risk is the risk that an unauthorized user is able to use the payment system for financial gains or a participant in the payment process presenting a monetary claim that is not backed by the value stated.

An important issue with credit and fraud risk is the allocation of monetary losses when it occurs. Consumers and merchants prefer that the liability lies with the payment service provider. Payment instruments with this characteristic may also penetrate the market quicker. In the case of credit cards, government regulations determine the maximum liability to the consumer if the card is used by an unauthorized user. Today, the card networks have further reduced the consumer's liability for unauthorized use to zero.

### Is it better?

For new payment products to succeed, they need to provide benefits to both consumers and merchants, while at the same time being profitable for payment providers in the long run.[3] Issuers of new payment instruments usually target a segment of the payment services market where their product is superior to existing alternatives. A recent example of a payment product that has benefited both consumers and merchants is the payment product provided by PayPal.com to buyers and sellers for transactions on online auctions sites such as eBay. Because many relatively small merchants were not usually equipped to process credit and debit card transactions and checks were associated with high settlement risk, a payment enabler like PayPal.com was able to intermediate these transactions resulting in both parties being better off.

### Credit cards

In the early 1970s, some financial observers predicted that credit cards were not viable in the long run. One such observer argued that credit cards were 'a temporary but probably unavoidable retreat in the campaign to develop an efficient domestic payments mechanism' [Hester (1972)]. Today, credit card transactions rank second behind checks in terms of the number of non-cash transactions in the United States.[4] There were 17.86 billion general-purpose charge and credit card transactions accounting for U.S.$1.608 trillion in the United

3 Chakravorti and Kobor (2003) argue that payment products may not have to be profitable as a stand-alone product, but sufficiently add value to a bundle of banking and payment services.

4 In certain payment segments, such as in-store purchases, credit cards have surpassed checks. In other market segments, such as Internet payments, credit cards continue to be the preferred payment instrument although signature-based debit cards have started to catch up. However, for recurring bill payment and business-to-business payments checks continue to make up the lion's share of payments [Chakravorti and McHugh (2002) and Chakravorti and Davis (2004)].

## Why has stored-value not caught on?

States in 2002 [Nilson (2003)].

General-purpose charge and credit cards have existed for over 40 years. Unlike charge cards, credit cards allowed consumers to pay their monthly charges in installments. Today, credit cards benefit consumers and merchants and are profitable to payment providers.[5] Credit cards serve two primary functions for consumers, they allow consumers to purchase goods and services (serves as a payment instrument) and they extend credit to consumers lacking sufficient funds even if they choose to pay their balances in full (serves as a credit instrument). Consumers may also prefer to use their credit cards because of frequent-use awards or dispute-resolution services. Furthermore, consumers can use them almost anywhere in the world. As a result, credit cards may be preferred to cash or travelers' checks as a secure, widely accepted payment instrument for foreign travelers.[6]

Although the credit card is the most expensive payment instrument to accept, merchants benefit from credit card acceptance, justifying their relatively high cost.[7] For charge and credit card purchases, most merchants enjoy payment guarantees from card issuers if they take the proper authorization steps. Merchants also benefit from greater sales and profits. In a survey of retailers, 83 percent thought accepting credit cards increased sales and 58 percent thought their profits increased from accepting them [Ernst and Young (1996)]. These greater sales are generated in part because consumers may not have sufficient cash on hand.

Financial institutions earn revenue from the merchant discount, interest income from consumers who borrow beyond the payment cycle, and other fees from additional services provided. However, there are risks that financial institutions take when issuing credit cards. Investment in new payment products may not immediately generate a positive return. In the case of Bank of America, fifteen months after launching its BankAmericard, it officially lost U.S.$8.8 million dollars. If hidden costs, such as advertising and overhead, were included the loss was closer to U.S.$20 million [Nocera (1994)].

### Stored-value

Limited-use stored value systems have been successfully adopted for transportation systems, such as the Bay Area Rapid Transit system in the San Francisco Bay Area and the Metro in the Washington D.C. area. Some transit authorities have introduced smart cards that can be used as proximity payment devices. In Hong Kong, the transit authorities have introduced smart cards as the sole payment device and have found that more passengers can be processed in a given time span resulting in reduced queues [Poon and Chau (2001)].

Two notable U.S. general-purpose smart card trials were conducted during the last 8 years, Upper Westside of Manhattan and the Atlanta Olympic Games. By most accounts, these trials were not successful based on the usage rates and the lack of long-term adoption in the United States. However, some lessons can be learned. In both trials, consumers and merchants were given incentives to use the product. In the Manhattan trial, converted laundry machines accounted for 30 percent of all transactions conducted with the stored-value cards [Van Hove (2001)]. In Atlanta, stored-value cards were more successful when merchants did not previously accept payment cards, such as fast-food restaurants and convenience stores [Bank Systems & Technology (1996)]. Therefore, stored value cards are popular with consumers and merchants at merchant locations that had traditionally accepted only cash.

Similar to credit cards, for stored value to be successful, consumers and merchants along with financial institution must all perceive a benefit from its use. A lucrative niche market segment for stored-value cards are unmanned point of sale purchases, such as vending machines, parking meters, and fares for transportation services. A key issue for consumers in such purchases is the availability of exact change. Coca-Cola estimates that a significant portion of their potential sales never took place because customers did not have the exact change [Clemons, Croson, and Weber (1997)]. In other cases, consumers may overpay for services, such as parking and tolls.

5 Chakravorti and Emmons (2003), Chakravorti and Shah (2003), and Chakravorti and To (1999) discuss the incentives for consumers to use credit cards and merchants to accept them.

6 In addition to security concerns, foreign travelers may need to convert their cash into local currency prior to making purchases and convert the remaining foreign currency back to home currency at the end of their trips. However, some types of transactions, especially small ones, may require cash for payment.

7 For a discussion of payment instrument cost, see Food Marketing Institute (2000).

## Why has stored-value not caught on?

Consumers are unlikely to use stored value for purchases where they use checks, credit or debit cards because they risk losing monetary value if the stored value is lost or stolen and forgo the opportunity to earn interest on their funds before they spend them.[8] Evidence from Scandinavian countries suggests that greater penetration of debit cards especially for low-value transactions has resulted in greater reluctance to use stored value products [Van Hove (2004)]. Thus, stored value may only replace a shrinking number of cash transactions.

Often successful adoption of a stored-value card is associated with eliminating alternative payment methods completely. In the Dutch cities of Prumerend, Nijmegen, and Rotterdam, the use of Chipknip, a general-purpose stored value payment system, became the only way to pay for street parking. As a result, parking accounted for 31 percent of the total number of Chipknip payments [Van Hove (2004)]. Stored-value cards may also become the only payment option for some French parking lots.

Merchants may benefit from a lower volume of cash transactions because they are more prone to safekeeping concerns and on average take longer to perform than stored-value ones. Lucas (1994) states that employee theft can account for up to 4 percent of cash sales for primarily cash-based transit systems. In addition, some merchants would benefit from quicker transactions because the transfer between the merchant's stored-value machine and the consumer's smart card would be faster than alternative payment forms [Poon and Chau (2001)].

However, merchants may be the most reluctant to use stored-value technology. Merchants may face large transition costs in acquiring the necessary hardware to accept stored value and training their staff. Some analysts argue that the initial investment may be relatively small compared to the potential cash savings, especially since acceptance terminals for other payment cards would need to be replaced over time. When these terminals are replaced, they could be fitted for acceptance of stored value at relatively low cost.

Financial institutions should also benefit from the shift to stored-value from cash. The migration to electronic substitutes for cash may provide greater profit opportunities for financial institutions in terms of cost reductions associated with security and transportation. In addition, financial institutions may benefit from income generated from issuing and distributing the stored value and the interest income from outstanding stored value.

### Can it achieve critical mass?

Payment instruments have two distinct sets of users, consumers and merchants, that simultaneously demand payment services. Consumers benefit more from an increase in the number of merchants that accept the payment instrument than from an increase in the number of consumers that use it. Similarly, merchants benefit more from an increase in the number of consumers that are willing to use it than the number of merchants that accept it. In other words, the consumer's and the merchant's demand for the payment service are interrelated.[9] These types of services are often called two-sided because usage of these services is dependent on both sides being on board.

Payment services can be viewed as network goods. A good is defined as a network good if a user benefits from an increase in the number of users of that good [Farrell and Saloner (1985), and Katz and Shapiro (1985)]. For example, telephones and fax machines are network goods because existing users benefit from an increase in the number of people that they can communicate with. Furthermore, a sufficient number of users is required for the network good to survive. Economists define this sufficient number as a critical mass.[10] Both credit cards and stored value exhibit characteristics of network goods.

The problem of a network good achieving critical mass can be described as a chicken-and-egg one. An example of a good that required a long time to overcome the chicken-and-egg problem is the debit card. Although the first debit card pilot was conducted in 1966, only many years later did debit card

8 For a general discussion about the preferred payment instrument by consumers and merchants, see Chakravorti (1997) and Humphrey, Pulley, and Vesala (1996).

9 For a discussion about the interrelated demand for payment services see Baxter (1983).

10 See Economides and Himmelberg (1995) for a discussion of critical mass in the context of network goods.

## Why has stored-value not caught on?

transactions start to gain popularity.[11] One type of debit card, commonly referred to as PIN-based, uses ATM networks to process transactions at the point of sale and is also an ATM card. Issuers were initially unsuccessful at convincing a sufficient number of merchants to participate primarily because of the additional cost of installing card readers and the lack of interoperability among the different ATM networks. Today, one in three merchants has point-of-sale terminals needed to process PIN-based debit cards [Nilson (2003)]. Furthermore, consolidation of ATM networks and the introduction of shared networks also increased the appeal of PIN-based debit cards to merchants.

Another debit card innovation that allowed greater market penetration was the introduction of the signature-based debit cards issued by the credit card associations. These debit cards use the existing credit card network infrastructure to process and settle transactions. Because credit card networks were already extensive and merchants faced no new setup costs, these cards were able to penetrate the market much quicker. In addition, to promote acceptance of the signature-based debit cards, the card associations required all merchants accepting their credit cards to accept their debit cards.[12]

To overcome the chicken-and-egg problem, debit card providers used existing technologies that were familiar to both merchants and consumers. To increase consumer usage many financial institutions started to issue ATM cards that were both PIN-based and signature-based debit cards. Thus, with the ATM customer base and the use of the existing credit card network by signature-based debit cards, debit cards were able to overcome the chicken-and-egg problem.

### Credit cards

Charge and credit card issuers used various techniques to overcome the chicken-and-egg problem. To achieve a critical mass of consumers, Bank of America mailed active cards to their existing customers. Not having a customer base to solicit, Diners Club initially handed out leaflets door to door and issued cards to applicants if they had a job. Because cardholders initially did not incur any of the costs associated with credit card transactions, they were easily convinced to use the cards.

Card issuers had more difficulty bringing merchants on board because the merchants were charged a fraction of the purchase price. Diners Club managed to convince twelve restaurant owners to accept their card at the time of launch. Bank of America started with 300 merchants. Larger merchants were unwilling to pay the merchant discount. The first large department store chain to accept third-party credit cards was J.C. Penney in 1979 and widespread acceptance by grocery stores has only occurred recently. On the other hand, smaller merchants that granted their customers credit were willing to pay the fee to reduce their accounting, collection, and billing costs.

To expand the geographic coverage of its cards, Bank of America began to license the BankAmericard through Bank America Service Corporation to out-of-state banks. Banks would pay a U.S.$25,000 entry fee to Bank of America and a small royalty to support a national advertising campaign to become members of the network. Each bank would enlist its own merchants and customers. The main goal of these licensing agreements was to increase the number of consumers using the card and the number of merchants accepting the card. Bank of America benefited from BankAmericard holders from other states making purchases from their merchants and from their customers making purchases from merchants of their licensees.

Card issuers used innovative ways to simultaneously convince consumer and merchants of the cards' benefits. The more consumers that card issuers convinced, the more merchants were willing to accept it. Although credit cards were eventually successful in overcoming the chicken-and-egg problem, Osterberg and Thomson (1998) argue that critical mass was only achieved in the late eighties when its growth exploded.

11 For an excellent discussion on why the debit card has been slow to penetrate the marketplace see Caskey and Sellon (1994).

12 Recently, around 5 million U.S. retailers settled a case against MasterCard and Visa over the tying of association credit and debit card products. As part of the settlement, the card associations can no longer tie their credit and debit card products. For more about this case see Chakravorti (2003).

## Why has stored-value not caught on?

### Stored-value

To promote usage, payment instrument providers entice both consumers and merchants with incentives. In the two largest U.S. general-purpose stored-value trials, issuers gave consumers monetary value to promote its use. At the Atlanta Olympic Games, some stored-value cards were given away with five dollars of purchasing power, but cardholders preferred to keep them as souvenirs. In New York, Citibank employees handed out cards with U.S.$5 of value to passersby. Merchants also received the necessary equipment at subsidized rates and may not have paid the full merchant discount.

To increase awareness of smart card technology, some financial institutions in other countries have started to use existing payment instruments, such as ATM and credit cards, to piggyback stored value by placing microchips on these cards. For example, financial institutions in Belgium and Finland have started to put microchips on ATM cards. In these countries, consumers must use stored value to pay for parking meters, calls from public phones, and bus tickets [The Economist (1998)]. These uses of stored value may increase consumers' awareness and comfort level.

### Is it safe and secure?

The sustainability of a new payment instrument is critically dependent on the containment of credit and fraud risk. The success of any payment system is related to the faith and confidence that participants have in it. Payment providers should convince consumers and merchants that they can convert their claims into good funds with minimal risk. If the payment provider becomes bankrupt and has payment obligations outstanding, consumers and merchants may face significant losses. To limit credit risk, some European regulators have argued that stored value should be only provided by regulated financial institutions.

Along with credit risk, payment providers are concerned with containing fraud risk. Roberds (1998) describes two major forms of fraud. In the first case, the buyer presents a monetary claim that is not backed by the value stated. For example, in a check transaction, the consumer may write checks with insufficient funds in his account. The other type of fraud involves the buyer using a monetary claim belonging to someone else.

While credit and fraud risks are difficult, if not impossible, to eliminate, adequate disclosure of which participant bears the loss is critical to the sustainability of any payment instrument. If payment providers cannot adequately guard against unauthorized use, resulting losses may lead them to leave the industry and lead consumers and merchants to lose confidence in using that type of payment instrument. Furthermore, if consumers and merchants perceive that they are more liable for payments made with a new instrument, they may be less willing to use it.

### Credit cards

Historically, credit and fraud risks have been challenging for credit card issuers to contain and have led to a number of issuers leaving the business. Technological advancements along with government regulations significantly reduced these risks. However, credit card networks continue to improve and introduce new measures to mitigate these risks.

Credit risks are contained by guidelines and rules at various levels in the credit card network. The risk that a financial institution is unable to meet its payment obligation is controlled primarily by the card associations. Because the cost of losing their reputation is so high, the associations impose guidelines governing the distribution of losses if a member institution is unable to meet its obligations. Credit risk at the consumer and merchant level is primarily contained by policies of the financial institutions involved. Today, financial institutions use more rigorous methods to determine creditworthy consumers. In addition, part of the interchange fees charged by card-issuers to merchant banks covers the credit risk the issuer faces from consumers unable to pay their obligations.

Fraud was a major factor in the early years of charge and credit cards. Evans and Schmalensee (1993) report that in

## Why has stored-value not caught on?

1960, Bank of America's losses from fraud and defaults were nearly U.S.$9 million or 15 percent of their volume. Fraud was committed in various ways, including consumers using cards to make purchases that they did not intend to pay for, cards being stolen from the mail and used to make purchases, and merchants sending in credit slips for nonexistent purchases.

Banks implemented several policies to limit fraudulent uses. Banks required that merchants call their financial institution's credit centers when purchases were above a certain amount, known as floor limits. Many banks provided merchants with hot lists that identified delinquent accounts. Eventually, Congress outlawed the mailing of unsolicited credit cards by financial institutions in an effort to limit fraudulent use. However, these measures were not sufficient.

The use of computers and telecommunications in the authorization process allowed credit card organizations and their members to contain fraud. In 1972, National BankAmericard, Inc. (NBI), the credit card organization spun off by Bank of America, introduced a nationwide network linking computers via telephone lines to authorize credit card transactions at the point of sale.[13] Although the system cost U.S$3 million to build and implement, it saved members of NBI at least U.S.$30 million in the first year [Nocera (1994)]. The initial authorization system still involved humans checking computer screens for the status of the customer's account. Today, the process is completely automated and most transactions are authorized prior to purchase. Further improvements to the physical card, the network, and the monitoring of charges have led to significant reduction in losses from fraud.

Although credit and fraud risk have not been eliminated, sufficient steps have been taken to assure consumers and merchants that they face minimal liability when using and accepting credit cards. The adoption of system wide guidelines along with the aid of real-time online processing has greatly reduced these risks in the credit card network.

### Stored-value

The most powerful deterrent against fraud in stored-value systems is the technology. Smart card technology may be more secure than cash for merchants and offer issuers greater protection from counterfeiters than magnetic stripe technology. To prevent theft of coins from public phones in France, callers were required to use smart cards. The major credit card companies are considering smart card technology as a replacement for magnetic stripes to reduce credit card fraud.

Stored-value issuers want to limit or perhaps eliminate the possibility that outsiders can replicate the underlying value and inject it into the system. One of the largest known cases where a stored-value system was compromised occurred in Japan involving Pachinko parlors, where the less secure magnetic stripe technology was used. Criminal organizations were able to create stored value that they did not purchase. As a result stored-value issuers are said to have lost at least U.S.$600 million [Pollack (1996)].

Realizing that the most sophisticated technology to prevent fraud may not be impenetrable, stored-value issuers are considering other preventive measures. While online real-time verification would defeat the purpose of stored value, most issuers require redemption of the underlying value after each use.[14] In these systems, fraud could be detected sooner than in systems where stored value is redeemed less frequently. However, given the relatively small amount of monetary value transacted with stored value, there may be little incentive to commit fraud.

### Will stored-value succeed?

Given the comfort and convenience that consumers have with existing payment instruments and ongoing improvements to reduce the cost of accepting them, consumers and merchants in the United States may perceive little benefit from stored value as a stand alone payment instrument. Thus, unless consumers are forced to use it by merchants, the widespread use of stored value as a stand alone point-of-sale payment instrument is unlikely in the United States. However, microchips are

13 Today, NBI is known as Visa.

14 A notable exception is the Mondex system which allows consumers to exchange value among themselves without third-party intervention. For more details about Mondex see Clemons, Croson, and Weber (1997).

being added to identification cards or existing payment instruments where value can be stored and used to make purchases. Such types of cards exist in closed settings, such as university campuses where students may use the stored-value feature to make photocopies where other alternatives are not as convenient. Alternatively, merchants using stored value in closed systems, such as transportation systems, could enter into agreements with other merchants to broaden the acceptance of the payment instrument.

To achieve a critical number of consumers for stored value, financial institutions may offer a stored-value enhancement to their existing debit and credit cards. Similar to the debit card, where issuers used the existing ATM and credit card networks, by piggybacking on existing payment cards, stored value could benefit from economies of scope. While in many European countries, financial institutions replaced existing debit cards with ones with stored value capabilities, Van Hove (2004) states that many of these unsolicited stored value enhancements remain largely unused. Therefore, while such a strategy may be helpful in achieving a critical mass of potential users, it is clearly not a sufficient condition for widespread adoption.

Experiences in Europe suggest that government mandates may increase the acceptance of smart cards. However, even with such intervention, usage rates of the stored-value component remain small as a percentage of total transactions. As with the introduction of other payment instruments, stored value cards will require some time before they achieve critical mass. While Van Hove (2004) argues that stored value has not to date achieved the desired market penetration, he identifies certain types of merchants as ideal candidates for stored value. These types of merchants have at least one of the following characteristics: payments are time-critical (public transport), there are high cash handling costs (vending machines), or there are vandalism problems (parking meters and payphones).

## Conclusion

This article explored three necessary conditions for the viability of a new payment instrument. A new payment instrument may take longer for consumers to accept because of the complex set of interactions that occur among participants. It must provide benefits not provided by existing ones for at least certain types of transactions. Consumers and merchants must be convinced simultaneously of its benefits and may require incentives to change their behavior. Finally, the payment instrument should be relatively safe and adequate measures against credit and fraud risk should be adopted.

While credit cards were successful in meeting these three necessary conditions, stored-value cards have yet to meet them. However, in markets where limited-use stored-value cards have been successful, they are generally a substitute for cash. They are popular with consumers when exact change is required. In some cases, as with the dollar coin, significant market penetration may not occur unless consumers are forced to adopt stored value, such as payment of transportation services and parking fees. They are popular with merchants when cash handling costs are high and other alternatives are not available for payment. Today, the most successful limited-use stored value operators have started to leverage their expertise to expand acceptance of their product beyond its initial use. The Octopus stored-value system in Hong Kong was expanded from payment for transportation services to include purchases at non-transit related merchants. The introduction of a new payment instrument requires sufficient time to educate consumers and merchants of the benefits of migrating from existing payment options. If stored value is to succeed, both consumers and merchants must be convinced of its benefits.

## Why has stored-value not caught on?

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