Interoperability in Electronic Payments: Lessons and Opportunities

This report was commissioned to Glenbrook

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Public Version

Background

About CGAP

The Consultative Group to Assist the Poor works toward a world in which everyone has access to the financial services they need to improve their lives.

CGAP develops innovative solutions for financial inclusion through practical research and active engagement with financial service providers, policy makers, and funders. Established in 1995 and housed at the World Bank, CGAP combines a pragmatic approach to market development with an evidence-based advocacy platform to advance poor people's access to finance. Our global network of members includes over 35 development agencies, private foundations, and national governments that share a common vision of improving the lives of poor people with better access to finance.

About the Project

CGAP is exploring the issue of interoperability in developing financial systems that serve the poor and under banked in developing countries. CGAP believes that interoperability of these systems, both domestically and internationally, may be necessary to best serve the needs of customers, businesses and governments.

Report Approach and Methodology

This report looks at the question of interoperability in payments systems in general, and attempts to derive reasons for the successes and failures of interoperability in the past. This report presents a series of hypotheses about the drivers of interoperability, and then tests these hypotheses against experience in various countries.

Payments System Interoperability

A robust environment of interoperability in payments systems benefits all participants in the payments ecosystem. End users, including consumers, merchants, governments, and other types of enterprises, find it easier to make and accept payments. Providers to these end users, including banks, networks, processors and other service providers, gain revenue from payments in interoperable systems that they may not be able to achieve with closed loop (or non-interoperable) systems. Interoperability in payments systems can also produce cost efficiencies and enable superior risk management. Interoperability of multi-party systems, however, rarely happens on its own. Independent development efforts may produce processes or use technologies that are not compatible, and, often, market competitors have reasons to hope that interoperability will not occur, and that their proprietary solutions will "win."

This paper identifies three ways interoperability in payments systems can be achieved: (i) through simple *scheme interoperability, (ii)* by connecting networks through *network interoperability*, or (iii) by creating a business environment that enables *parallel system interoperability* to occur.

Scheme interoperability is a feature of open-loop payments systems, or "schemes," which consumers and businesses access through their relationships with their banks. Banks join a scheme and agree to be bound by the rules set by that scheme. Payments can flow from an end user that is the customer of one bank to an end user that is a customer of another bank; both banks are "in the scheme." Checks, ACH or Electronic Funds Transfer (EFT) systems (including "direct debit" and "credit transfer"), and open-loop debit and credit card systems are all examples of this type of interoperability.

Network interoperability exists when one payment scheme negotiates an exchange agreement with another scheme. This is most typically used for cross-border or cross-regional payments acceptance - allowing the holder of a domestic credit card, for example, to use that card in another country. Network interoperability is rarely used when bank network members are competing for business within a single market. This is because network interoperability would facilitate out-of-network banks competing for business with local banks.

Parallel system interoperability allows the merchant or agent accepting payment from a consumer to participate in multiple schemes. A commercial service provider acts as an intermediary between the various schemes and the merchant. Although the merchant is technically separately accepting payments in the various schemes, doing so is made simple and achieves some of the effects of interoperability. In many markets around the world, for example, merchants accept multiple card brands (Visa, MasterCard, American Express, etc.). These brands do not interoperate, but the experience for the merchant is essentially the same

with each brand: this is made possible by products and systems provided to the merchants by card acquirers and processors.

Hypotheses About Payments Systems Interoperability

To facilitate exploring the additional factors that have played an important role in payments systems interoperability, this paper presents the following hypotheses:

1. **Economic framework**: payments systems participants agree to voluntary interoperability for economic gains, however, the financial drivers in any specific scenario often relate to larger business objectives of the participants, and not just the costs and revenues related to the payments transactions.
2. **Effective regulatory bodies:** Industry associations or councils can foster rapid voluntary interoperability, particularly when encouraged by regulatory bodies
3. **Use of government payments to grow systems**: Government commitments to make payments on a new system can foster interoperability.
4. **Early dominance**: Early dominance by one provider can slow or stop interoperability.

These hypotheses will be tested against the real experiences of payments systems interoperability in selected countries.

Hypothesis # 1: Economic Framework

> **Economic framework**: payments systems participants agree to voluntary interoperability for economic gains, however, the financial drivers in any specific scenario often relate to larger business objectives of the participants, and not just the costs and revenues related to the payments transactions.

Around the world, banks participate in interoperable payments networks. But why do competitors agree to collaborate in an interoperable network given that the lack of interoperability would appear to commercially benefit individual providers? At one level, it seems obvious that economic benefits would be the driver of such decisions, given that banks are commercial enterprises.

The hypothesis here is that it is necessary to look very broadly at the economic framework banks (and other financial services providers) are using to make these decisions. Only by seeing the larger perspective can one understand why banks make decisions that may appear, from a narrower perspective, to be contrary to their interests. Similarly, the economic *disincentives* of interoperability need to be understood as well.

As background, it should be noted that across the world, *national bank transfer systems* interoperate. These systems, which include checking and ACH-like direct debit and credit transfer systems, enable the customers of one bank to pay to and be paid by customers of another bank. These systems are examples of *scheme interoperability*, in which all banks in the relevant community participate directly. These networks typically are formed by banks, often using not-for-profit association structures, and are still, in most cases, governed and controlled by banks.

Central banks, or groups to which central banks have delegated regulatory authority for payments systems, require interoperability of these systems as the price of holding a bank charter. In other words, interoperability is not voluntary in these systems. In that context, banks manage these systems as utilities: the economic objective is to be as cost-efficient as possible. Costs are kept low, network-defined features and capabilities are minimized, and participation in the network is rarely regarded as a strategic advantage – or disadvantage. Interoperability in these systems "levels the playing field" – it is extremely difficult, for example, for one bank to develop meaningful product features that competitively differentiate a check, or a direct debit, when the instrument needs to interoperate with offerings from other banks.

However, open loop credit and debit card schemes, while mechanically similar to the bank transfer systems, are viewed very differently by bank participants. Interoperability in these schemes is voluntary, and depends on the bank joining the particular scheme. It is the question of when, and why, a bank would choose to participate in a given scheme that we investigate in this hypothesis.

Citibank and the Evolution of Bank ATM Networks

FROM NON-INTEROPERABLE TO INTEROPERABLE

The evolution of bank ATM networks, and in particular the example of Citibank in New York City, is an illustration of this hypothesis. Unlike national bank transfer schemes, the ATM schemes began as proprietary, single-bank offerings. The initial appeal of ATMs to banks was to reduce the expense of check cashing at branches.

In developed countries, in the 1970's, banks had only recently moved away from keeping customer accounts, sometimes manually, at the branch level. Banks were beginning their heavy investments in mainframe computing and automated record keeping at central or regional data centers. Branches were still the primary location for the deposit of checks and withdrawal of cash. The critical decision of whether or not to allow a particular customer to withdraw a particular amount of cash depended usually on an account balance that was only as current as the night before.

In this environment, banks competed for customer account business primarily on the basis of branch location and secondly on customer service within the bank. Branch location was key because customers needed to deposit paychecks, or government benefit checks, at a convenient location: they also needed to get cash for purchases. A customer known to branch employees as a "good customer" might be allowed to withdraw cash based on a deposited check, whereas an unknown customer might need to wait for several days before being able to draw on that check.

In 1975, Citibank was one of a dozen major banks competing for consumer checking accounts in the New York marketplace. With fewer branches than some other banks, Citibank had no particular competitive advantage. Walter Wriston, the bank's chairman, asked rising star John Reed to conduct a comprehensive review of the bank's operational processes. The review resulted in a series of recommendations for centralization and automation of manual processes. One of these was the process of cash disbursement by adopting the then-nascent ATM technology. In 1977, Citibank announced that it would "blanket the city" in ATM's. The eventual investment was reportedly $160 million (approximately $630 million in 2012 dollars).

Why did the bank choose to invest such a large amount of money?

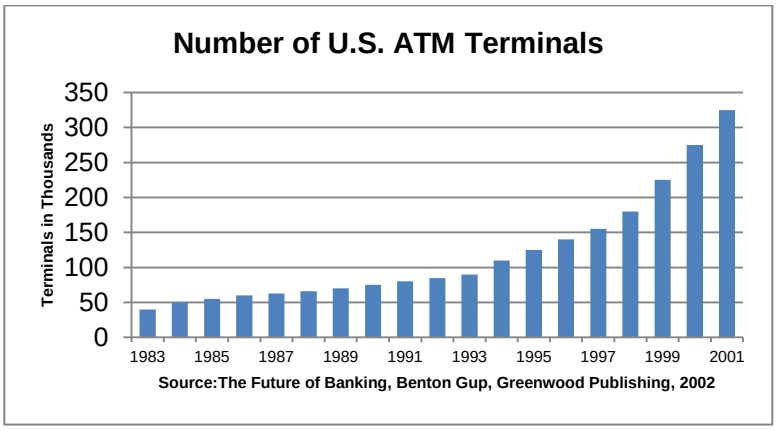
Even in the earliest of days, Citibank did not imagine it could charge the customers for the use of the ATMs, so there was no direct revenue associated with the investment. Lowering the cost of manual cash disbursement (teller's salaries and related expenses) was an important component of the business case. But a broader economic view reveals the real motivation of the bank: to gain new customers and significantly increase market share.

As the first ATM's rolled out, there were many problems, and skeptics abounded. The machines themselves were awkward to use and at times would crash or disburse the wrong amounts of money. People, including both customers and bankers, initially resisted the machines. Bankers

were afraid of losing their jobs, or their customer relationships, while many customers were simply afraid of the machines. To counteract customer resistance, Citibank trained tellers to walk with customers over to the machines, and help them through their first transactions. Slowly, consumer adoption increased.

In 1978, a watershed event occurred which has become famous in the stories of New York banking. A huge snowstorm closed the city down. No bank was able to open to provide customers with cash necessary to buy groceries and other necessities, but Citibank's ATMs remained open.

Immediately, Citibank released television advertisements showing customers trudging through the snow, and simultaneously introduced their new slogan: "The Citi Never Sleeps." Customer ATM usage increased by 20% during the snowstorm, and market share went from 4.5% to 13% from 1978 to 1987, attributed largely to the ATM. Walter Wriston, and John Reed's, bet on the ATM had succeeded. John Reed succeeded Walter Wriston as Citibank's Chairman and CEO.



Citibank could have chosen to develop and introduce ATM's in consortia with its competitors. This would have significantly reduced the investment cost and helped with customer education and familiarization with the machines. One could argue that faster customer familiarization would have brought cash-disbursement teller costs down more rapidly. There was even a logical body that could have provided the locus for such a joint effort. The New York Clearing House, originally a check clearing house only, was already supporting the newly formed Automated Clearing House (ACH) network, and could easily have formed a "committee for ATM interoperability."

But the broader economic view shows why Citibank chose to go it alone, and why the eventual result, increased market share, supported that view. But the story does not end there.

Competing with a Dominant Player

Citibank's competitors, of course, had also been following the developing ATM technologies and watching nervously as Citibank's market position strengthened. It appeared unlikely that the followers in the market could duplicate the market share increase that Citibank had achieved. Instead, these banks chose interoperability as a way of quickly matching Citibank's position with ATMs. In 1985, six major banks (excluding Citibank) formed the New York Cash Exchange (NYCE). NYCE was a network (and an example of scheme interoperability) that allowed one bank's customers to use another bank's ATM. A system of interchange was developed by which the customer's bank compensated the bank providing ATM access, following the methodology which had already been adopted by credit card networks. At introduction, the total of 800 ATMs owned by NYCE participating banks compared to approximately 500 ATMs owned by Citibank.

The NYCE banks ran their ATM network very much in the manner of the other utility-style bank transfer networks: network costs were minimized and ATM features (color screens, etc.) remained proprietary. Customers liked being able to get money out of other bank ATM's, and Citibank soon began to feel pressure from its own customers to have access other bank ATMs. But Citibank resolutely refused to join NYCE, believing that its superior ATMs continued to bring it new customers, and preserved existing customer relationships.

During these same years, units of Visa and MasterCard were forming ATM networks that "bridged" the regional ATM networks such as NYCE, and provided bank customers with ATM access when they were travelling outside of their region or country. In 1990, Citibank was rumored to have attempted to join Cirrus (MasterCard's network) on a non-reciprocal basis: their customers could access ATMs of other Cirrus banks, but Cirrus bank customers could not access Citibank ATMs. This effort apparently failed, and in 1991 Citibank joined Cirrus on a reciprocal basis, and, in 1994, finally joined NYCE.

The second half of this story does not mean that Citibank's earlier strategy was wrong – it simply means that the economic situation, broadly seen, had shifted. What made sense economically in the 1970's (staying proprietary to gain market share) no longer made sense in the 1990's, when failure to interoperate was threatening their ability to maintain customer relationships. The evolution of interoperability of ATMs in the United States demonstrates how a dominant actor can spur smaller competitors to adopt interoperability as a competitive strategy, but such is not always the case (see Hypothesis Four).

BankAmericard to Visa Evolution

TRADING PROPRIETARY ADVANTAGE FOR GROWTH

Bank of America (BofA) launched its BankAmericard credit card in the late 1950s in California. In 1966, Bank of America formed a company, BankAmerica Service Corporation, to franchise its BankAmericard to banks in states outside of California. By franchising, Bank of America believed

it could monetize its investment in states outside of California. At the time, U.S. banking regulation prohibited BofA (or any bank) from operating outside its home state.

> By the mid 1960s the BankAmericard system had overcome its initial difficulties and was generating increasing profits, but it was still restricted to the state of California. BofA realized that both consumers and commerce were increasingly traveling across state lines, and for their card to be truly useful, it had to be accepted nationwide. American banking regulations at the time prohibited BofA from opening branches in other states, so they decided the best way to expand the system was to license the program to banks in other states. BofA created a subsidiary organization known as BankAmericard Service Corporation (BASC) that was tasked with signing up licensees and administering the entire system.
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> *David Stearns, History of Visa, 2007*

Their efforts were successful, and banks, seeing the success of Bank of America in its own market, signed on as franchisees. By 1970, however, as a result primarily of operational difficulties, the franchisee banks began pressing for a new organizational structure for the product, This lead to the formation of National BankAmericard Inc. (NBI) to manage the U.S. card program with Bank of America and the franchisee banks becoming members of NBI.

Bank of America had also licensed its program to banks in countries outside the US. In 1974, an organization similar to NBI named IBANCO was formed which contracted with NBI to manage the international card program. Shortly thereafter, the two organizations came together under a

new company, named Visa. The international organization (IBANCO) became Visa International and NBI became Visa U.S.A., a group member of Visa International.

Separately, and in competition with Bank of America's card program, another group of banks formed a competing organization called the Interbank Card Association. The IBA created Master Charge: The Interbank Card and, in 1979, renamed itself and its products to MasterCard.

The formation of IBA was in reaction to the clear success of the Bank of America program – particularly the potential for generating credit card lending profits on the issuing side. It was clear to the banks involved, with both IBA and the newly renamed Visa organization that

delivering a product into a commercial market as large as the United States required cooperative action. In particular, the need to sign up merchants was too large a task for any one card-issuing bank to undertake.

The work done by these new companies, structured as associations of member financial institutions, was remarkable for the establishment of principles of open financial institution membership—the open loop exchange of transactions, interchange fees, and brand control through association bylaws and operating rules that would, over time, grow to define the card payments systems. Significantly, these rules set the groundwork for interoperability that quickly grew global, as card systems were developed in other countries and linked into the Visa and MasterCard systems.

Interoperability was primarily technical, of course, establishing protocols and timelines for all aspects of issuance, acceptance, and transaction management, but also defined the system economics, brand management, and requirements for transaction interchange. The associations also established arbitration processes for the resolution of disputes between members—ensuring that any such disputes would be resolved "within the family," with association staff acting as court and jury.

In joining the card associations, member banks surrendered considerable individual control over how these products worked—but gained the significant benefits of common product definitions and a global acceptance framework that no one bank could develop on its own.

Economics Driving Voluntary Bank Participation

The open loop card networks, in their early credit-card days, enabled a very profitable consumer lending business for card-issuing banks. Originally, it was a means of enabling banks to efficiently and profitably lend to their own customers. This quickly opened up, for imaginative banks, as a channel to extend lending to consumers outside of an existing geographic footprint. New and profitable customer relationships could be established—on the basis not of a consumer opening a checking account but, rather, applying for a credit card from the bank.

Why did this system evolve independently from the other payments systems in the country – most of which were run, directly or indirectly, by the Federal Reserve Bank?

It was the credit-issuing aspect of the systems that made them so different from other payments systems. Credit also defined the profitability of the systems for the participating banks. Later, as debit cards were introduced, they "inherited" the same association structure, particularly when, as in the case of Visa and MasterCard, the debit cards were run over the same "rails" as credit card transactions. In other countries, where debit cards preceded credit cards, there was more involvement by regulatory bodies and bank associations and councils: France and Canada are both examples.

Did Bank of America make the right decision in opening up its proprietary system to other banks? One can only imagine the debate, internally, during the early days of the formation of

Visa, when the bank agreed to give up control and ownership of the system. Clearly, this enabled significant growth in the card system overall. Today, Bank of America is one of the country's top three card issuers and card acquirers, and card services represented 16% of the bank's overall revenue in 2011. It seems the answer is yes: there are times when giving up a seemingly valuable economic advantage, in owning a proprietary system, can produce a greater return as a participant in a larger interoperable system.

WHEN ECONOMICS COUNTER INTEROPERABILITY

There are many situations where the economic filter works counter to interoperability. In the United States, for example, online bill payment products offered by banks do not interoperate. Each bank allows customers to create and store biller (payee) information that is proprietary to that bank (or, in some cases, shared among banks which use a common solution provider). Each bank then contracts with solution providers to deliver bill payments to billers. This system is patently awkward, expensive and inefficient. In markets such as Australia, for example, a simple biller numbering scheme (BPay) makes this infrastructure unnecessary - consumers simply make payment to a number the biller puts on their bill. Why would U.S. banks tolerate such an expensive and inefficient system? Because the difficulty of entering biller data in the bank system creates an effective barrier to exit for consumers, who do not want to go through the hassle of re-entering data. In fact, banks enthusiastically acclaim the "sticky" characteristic of online banking bill payment in preserving the checking account relationship. Having an Australian-style interoperable bill payment system would be less costly and more efficient to operate, but it would also make it easier for a customer to switch from one bank to another.

PayPal, Square, and the Master Merchant Model

BROADENING A SCHEME FOR GREATER INTEROPERABILITY

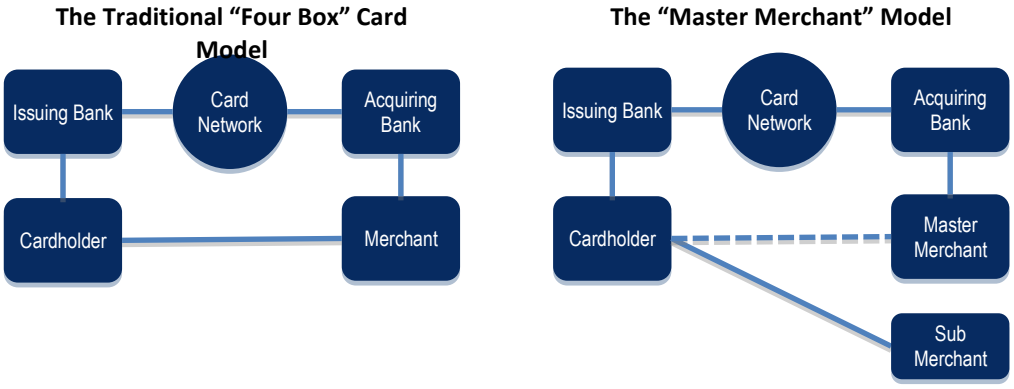
A more recent story illustrates how economics drive decisions that foster interoperability.

Visa and MasterCard, as operators of very large *scheme interoperability* networks, are the owners and sole controllers of a powerful set of rules which bind network participants. Historically, a very important rule prohibited what the industry called “factoring.” What this meant was that one merchant could not stand in front of another merchant, and accept payments on its behalf. Imagine, for example, this scenario, from in the early days of the card networks. A small store, which did not have a card network account, makes a private deal with a larger store that is located next door. When a customer of the small store wanted to pay by credit card, the merchant would run the paper sales draft (the so-called “zip-zap” machine), and later walk the draft over to the larger store. The larger store would submit the draft and collect payment, giving its smaller partner the funds, less some fee.

The card networks prohibited this practice for several reasons. They believed this limited the ability of the card acquirer (servicing the large merchant) to manage merchant risk – since the acquirer would not even know that the small merchant was involved. (In a “Four Box” card network, the acquiring bank is responsible financially if the merchant is unable to fulfill its obligations – on, for example, a return of goods or, in some situations, a successful claim of fraud.) Secondly, the ability of the card issuer to put accurate information on the cardholder’s statement was similarly impaired. Finally, the card network’s overall control – and knowledge of who was participating in the network – was reduced. (Not coincidentally, this also supported the business of the network’s acquiring banks – by ensuring that each merchant had a separate account with one of the acquiring banks.)

PayPal, originally a person-to-person transfer network, morphed into a service offering small eCommerce merchants the ability to accept card payments. PayPal did this by operating as an electronic version of a factor, standing between the acquirer and the smaller merchant. This was done in blatant (if unknowing) defiance of the rules.

PayPal simply became the “merchant” in the transaction, submitting transactions to their acquirer (Wells Fargo Bank), and separately accounting for the sub merchant. As merchant, PayPal assumed the responsibility for the submerchant’s obligations – and they had the support of their bank (who was liable for their actions) in doing this.



Why did the card networks permit this?

In the immediate years following the introduction of PayPal's service, it is important to remember how very new the whole concept of eCommerce and indeed the Internet was. Few bankers, or card network executives, understood what was happening or whether or not it would prove to be material. PayPal's market in particular was discounted as trivial, consisting at the time of small eBay sellers (often dismissed as selling "salt shakers and Pez dispensers"). PayPal had a powerful Visa member bank, Wells Fargo, as its card acquirer: one can imagine that Wells was a strong advocate of PayPal within Visa, encouraging Visa to adopt a "wait and see" attitude.

As PayPal grew (and began to have "off eBay merchants") it did two other things to strengthen its position. It concentrated heavily on risk management of the underlying merchants, so that the card acquirer, the card networks, and the card issuers were not exposed to unusual levels of chargebacks or customer annoyance. (The card rules permitted a card issuer, for online transactions, to return, or "chargeback" a transaction when a consumer claimed "I didn't do it." The card networks tried to keep the level of these chargebacks to less than 1% of total transaction volume for any given merchant.) PayPal was able to effectively manage losses. Although they do not disclose their techniques, presumably, these included anomaly detection software, address verification services, negative (and positive) databases to identify known bad and good actors, and, in later years, IP geolocation and device "fingerprinting." As their user base grew, their transaction history also got more robust, giving them better insight and risk management capabilities. PayPal also cooperated with efforts to ensure that the messages flowing through the network contained both PayPal's and the submerchant's name, so that the cardholder could easily identify the transaction and avoid a call to their card issuer.

As executives at the card networks watched this growth and the evolution of eCommerce in general, they saw a new model that was not exposing any of their constituents to unacceptable risk, but was driving new card volumes. After all, a healthy percentage of these transactions were funded by cards bearing their brands, and many of these were transactions that would have been paid for by other methods had PayPal not existed.

By 2000, the card networks moved to change their rules and formally endorsed factoring for eCommerce transactions, with specific rules to manage the particular requirements of this new environment.

The next stage of the story occurred in 2010, when the start-up Square launched, enabling smart phone users with an app and a small card-reading "dongle" (inserted into the audio jack of the smart phone) to accept card payments.

Square's vision was to be the "PayPal of the Point of Sale," and to cater to small merchants (nannies, gardeners, and flea market sellers) who had not previously accepted cards. Again, this was not in full compliance with card network rules: the rule changes made for PayPal (and its competitors) had been restricted to the eCommerce domain.

Industry watchers were curious to see what would happen at the networks. This time, the reaction was relatively swift. The networks modified their rules to accommodate this new scenario. Along the way, Visa invested in Square. Multiple competitors entered the marketplace, all pursuing the smaller, previously non-card accepting merchants.

The card network actions, seen from a broad economic view, were endorsing "good business." The card networks changed their rules to increase volumes and the penetration of their cards into previously cash and check acceptance environments. By doing so, they grew their networks, and increased economic opportunities both for themselves and for other network participants. This is a particularly significant example, because the economic interests of the network members arguably were not served well by expanding interoperability to include a new class of participants (the submerchants). But the economic interest of the network itself was served by increasing transaction volume.

Conclusions - Hypothesis # 1

Of course, it seems obvious that private sector providers are acting in their own economic interests. But when competitors collaborate to achieve interoperability, and to some extent jointly grow the business, it raises questions of whether the motivations are purely economic, or are replaced by (or complemented by) motivations simply to operate the system well on behalf of participants, consumers and merchants. The economic lever is always the dominant one, even in situations where it appears that players are acting against their own economic interest. So Citibank, at first keeping its ATM network proprietary to gain market share, later reversed that decision – not in order to "play nice" with its competitors, but to prevent an erosion of that share when the interoperable ATM network became competitive in size with Citibank's. Bank of America gave up its proprietary ownership of the BankAmericard brand in order to grow its share in a larger market. And Visa (and later MasterCard) changed its rules to accommodate PayPal, in order to increase the number of branded card transactions being done in the market.

Hypothesis #2: Effective Regulatory Bodies

> **Effective regulatory bodies: Industry associations or councils can foster rapid voluntary interoperability, particularly when encouraged by regulatory bodies.**

Too-early or too-heavy attempts to regulate payment innovation can stifle market development and interoperability. While an aggressive regulator can impose interoperability, regulators often have more success working with industry associations or councils to encourage voluntary interoperability. In the absence of such associations, the road to interoperability can be long and messy. Banks, as participants in national payments schemes that are interoperable by definition, belong to associations, councils, and clearing houses that are natural forums for cooperative action when new products and services are being introduced into the market. Regulators, with authority to oversee payments systems, also may work with these groups, or at times independently, to direct the course of new product development.

In some countries, and in some situations, these groups have proven to be highly effective at planning and implementing new products. The coordinated delivery of new products tends to enable interoperability. Such groups often operate with either the explicit or implicit backing of the central bank or other regulatory body.

In other countries and other situations where regulators or industry bodies have not played this role, interoperability is delayed or hampered by conflicting product development efforts.

The Introduction of "Chip and PIN" in the U.K.

MAINTAINING INTEROPERABILITY AS TECHNOLOGY CHANGES

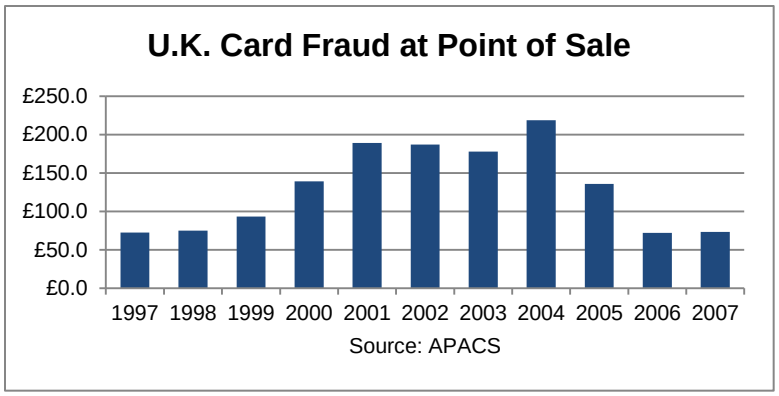
In the late 1980's, UK card issuing banks began to become increasingly concerned about the growth in fraud losses - particularly counterfeit card fraud.

In parallel in France, the bank issuers had adopted a chip card technology for domestic use which offered both counterfeit card protection as well as offline cardholder verification using PINs.

The French technology suppliers to this effort along with the French banking organizations began evangelizing chip card technology to the international card schemes as the best solution to card fraud problems inherent in magnetic stripe card technology. However, in a strict business case sense, the costs of migrating to chip card technology significantly outweighed the then-existing levels of card fraud - and interest in adopting chip technology stalled as far as the international card schemes were concerned. The UK banking industry, as is the case in most other countries, is more concentrated than in the US. A relative handful of major issuing and acquiring banks actually shape the domestic card strategy in the country. As part of their focus on card fraud, the banks collaborated to form a new initiative - Plastic Fraud Prevention Forum -

to examine industry fraud issues. Over time, this effort merged with another pan-industry group - Association of Payment and Clearing Systems (APACS) - which continued to focus on card fraud.

In 1990, the Home Office of the UK government began increasing focus on payment card fraud in the UK - initially by funding a study of the issue by Michael Levi, Professor of Criminology at Cardiff University. That initial report led to the formation of a plastic fraud prevention forum by APACS which provided the framework within which industry initiatives began to help prevent card fraud. A number of strategies were pursued including identifying potential fraudulent applications, increasing card authorization rates while reducing floor limits, anti-counterfeiting techniques on cards, and more proactive identification of potentially fraudulent usage. In combination, the industry was successful in reducing card fraud levels from 0.31% to 0.09% of payment volume over the next five years.



It was not legislation or regulatory action that brought the UK card industry together to focus on card fraud. It began with the Home Office funding the Levi report - which then helped catalyze industry cooperative efforts. A commentary in the paper "Crime, Labour and the Wisdom of Soloman" (Ken Pease, Policy Studies, Vol. 19, No. 3/4, 1998) provides some color on these initiatives: .”..talk to the executives of APACS, and they will tell you that their drive to reduce plastic card fraud came before they deemed it commercially rational to do so, as a result of pressure from politicians." However, counterfeit card fraud in particular continued to increase - culminating in agreement among the banks to revisit the issue at the APACS level and the creation of a formal project to examine the issue and to make recommendations for action. Once again, it was not regulation but rather a study funded by the Home Office that helped draw the issue into focus ("The Prevention of Plastic and Check Fraud" by Michael Levi, June 2000) and spurred acceleration of chip card deployment.

As a result of the earlier French experience with the implementation of chip cards, the international card schemes agreed in the early 1990's to work collaboratively to define a standard for chip card technology. This became known as "EMV" - standing for the three

scheme players who led its development: Europay, MasterCard and Visa. By the late 1990's, this standard was fully defined and ready for deployment. As APACS continued its work, industry consensus was reached to pilot chip and card technology without the usage of PINs. Some banks were concerned that requiring PINs might impact credit card usage - thus the initial focus on only using chip technology to deal with counterfeit fraud. However, in the years following, attitudes shifted and the consensus was reached that the combination of chip technology and PINs would most effectively deal with both counterfeit and lost/stolen card fraud. The UK card industry began the migration to "Chip and PIN" in late 2003 and completed the rollout in 2006 - with over 140 million chip cards issued and almost a million POS and ATM acceptance locations upgraded. Importantly, the banking industry worked closely with the British Retail Consortium during this effort and gained their support through a combination of both incentives as well as benefits from helping eliminate card fraud. As a result of the action in the UK, domestic card fraud losses were reduced significantly - although fraud on UK issued cards internationally increased because they could continue to be used in magnetic stripe acceptance environments outside the UK.

Over time, this has led to increasing pressure on other countries to also begin migration to chip cards - leading recently to Visa and MasterCard announcing new rules incenting merchant adoption of EMV acceptance in the US by 2015.

The introduction of chip and PIN in the U.K. could not have happened as quickly, and as efficiently, without the prodding of national regulators and the pan-industry oversight functions provided by APACs.

The Introduction of Debit Cards in the U.K.

INTEROPERABILITY INEFFICIENCY AS TECHNOLOGY CHANGES

A counter example of this hypothesis occurred in the same country, when debit cards were introduced to the U.K. market – with no coordinating body involved.

In the mid-1980's, the UK banks began working on "EFTPOS" - an effort to create a unified debit card for the UK. Essentially all of the UK banks were involved in the EFTPOS effort.

In parallel with this effort, Barclays began developing a debit card for its UK customers and worked with Visa to create a new "Visa Delta" debit mark which it launched in 1987 as Barclays Connect.

Barclay's launch of Connect was not well received by the other UK banks who were upset with Barclays moving independently. The other banks - led by Midland, National Westminster Bank and Royal Bank of Scotland - agreed to get an alternative product - ultimately branded "Switch" - to market as soon as possible that would compete with Barclays Connect. Importantly, they worked with the Retailer Consortium to get their support for Switch and they priced the product

very attractively for retailers at a low per transaction fee versus Barclays which had launched Connect with an *ad valorem* pricing structure.

At the time, Barclays was also the largest UK acquirer - but it did not have the ability to acquire Switch card transactions. For acquirers who were not Switch issuers, there was no interoperability with Switch. The Switch banks only allowed acquiring in combination with bank issuance. Ultimately, interoperability became possible when Switch agreed to allow an acquirer-only membership. This eventually enabled Barclays and Lloyds TSB to acquire Switch card transactions even though they issued competing non-Switch-branded debit cards.

Mexico and the Expansion of SPEI

AGGRESSIVE REGULATORY ACTION INCREASES SCOPE OF INTEROPERABILITY

Banco de México, Mexico's central bank, has played a strong activist role throughout decades of crisis for Mexico's economy, participating as the government orchestrated the privatization, de-privatization, and consolidation of Mexico's banks.

The story of Banco de Mexico's development of the SPEI payment system is a fascinating case of what can be done with a strong, activist central bank.

All developed countries have at least one real-time, large-value electronic transfer system. The United States has two: Fedwire and CHIPs. These systems, over the past twenty years, have gradually migrated to an RTGS (real time gross settlement) basis, meaning that each transaction settles with finality as it is made. The systems are used for financial market transactions, inter and intra company trade transactions, and settlement of other payments systems net obligations. These systems are rarely used for consumer or small business transactions, with the possible exception of real estate closings, large account-to-account transfers, or emergency funding.

But one can argue that were a country to start a brand-new payment system today, the preferred architecture would be these systems. Previously, limitations in communications and processing technologies required high volume consumer systems to work on a batch, net settlement basis. Net settlement, practically speaking, required the convention of "next day funds" which is common in most electronic payments systems worldwide. Furthermore, the protocol within the card payment system of real-time authorization, in advance of the batch process, was developed to bridge the gap between the immediacy of the purchase transaction and the delay of the payment transaction.

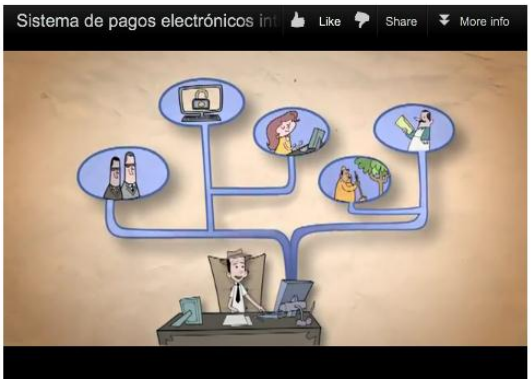
In Mexico, the central bank takes as one of its jobs to "push" the private sector (that is, the banks) beyond the boundaries it might undertake on its own.

In Mexico, under the forceful guidance of the central bank, the large-value electronic transfer system, known as SPEI (Sistema de Pagos Electrónicos Interbancarios) was opened up for smaller value transactions. The system was introduced in 2004 to replace an older large-value system: it is important to note that this action was just one of a series of important steps the central bank made to modernize core payments systems. Other countries, including the United States, have left the need for real-time or quasi real-time payments to the private sector. A variety of proprietary programs, such as PayPal, have emerged. One can argue that this initiative in Mexico will, over time, obviate the need (or the opportunity) for these proprietary programs by instead having the "high speed rails" of an existing interoperable system opened for new uses and new participants.

How did Banco de México do this? As the operator of the scheme, Banco de México controls all of the key parameters of the SPEI system.

As a ***rule-maker***, the central bank: sets message standards and protocols, sets processing standards (banks must offer real-time money transfers to their clients through their e-Banking systems and must credit the beneficiary's account within 30 seconds after receiving the transaction), sets end-user pricing parameters (receiving banks may not charge customers for a SPEI deposit; originating banks may not differentiate fees based on the amount of the transaction), and defines system participation requirements. Banco de México allows non-banks as direct participants (today, 41 out of 88 participants are non-bank).

As a ***processor***, the central bank: operates the "switch," ensures system quality (by aggressively reducing targets for time-to-send and time-to-credit), maintains a low cost structure (by replacing old systems with newer technologies), and provides value added services, including a payments tracking service, available to the public at no charge, and an electronic receipt service, available to recipients

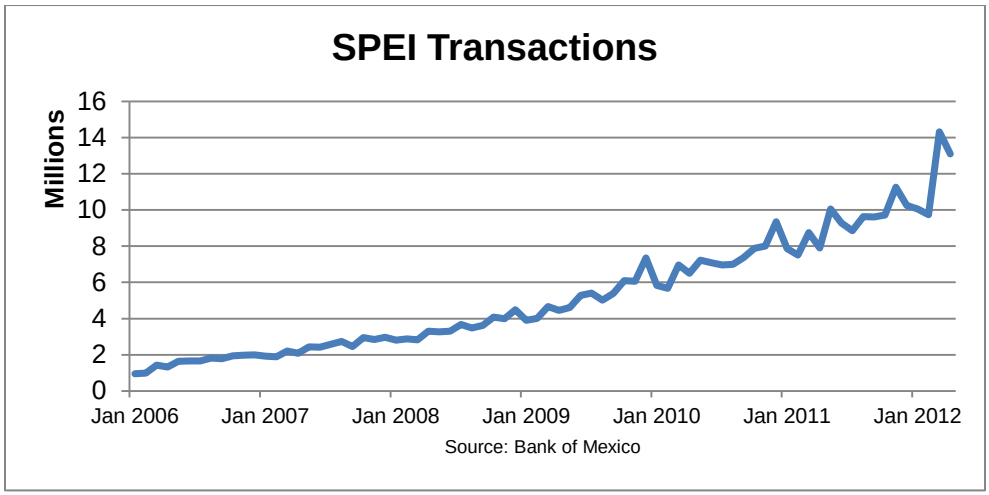


In addition, Banco de México has supported the growth of the system through campaigns to increase public awareness, (mass media advertisements and a consumer-oriented website, including professionally produced YouTube videos), and by encouraging the government's use of SPEI for payments. Since 2008, the Federal Government processes its payroll and providers' payments through SPEI, which now processes close to 100% of these. In March 2012 social security payments began to be disbursed by SPEI.

Banco de México is today working on standards and rules to encourage the use of SPEI transactions initiated by mobile phones, and deposited into either bank accounts or prepaid card accounts. This is an important component of financial inclusion in Mexico, targeting the substantial base of unbanked consumers.

Although it is not yet used for point of sale transactions (the processing time would need to drop to one second or less, to match current card network authorization times), one can easily imagine the system developing in this direction, allowing a consumer to "push" a payment to a merchant, in real time, at the point of sale.

By any measure, the SPEI system and the initiative to expand its use to smaller value transactions has been a success. The chart below shows the growth in daily transactions:



An attempt to duplicate this structure in other countries, particularly developed countries, would undoubtedly meet stubborn resistance and cries of outrage, especially from large commercial banks.

A good example of regulatory intervention to force interoperability has been the move, in many countries, towards mandated number portability for mobile phones. Without regulatory action, it is unlikely that mobile network operators would forego the significant "account stickiness" resulting from customer's desire to keep their phone number. In the United States, number portability for landlines was required in 1997 and for mobile phones in 2003.

Some features of SPEI (including the rules limiting receive side pricing, and the value-added services offered centrally) are particularly unusual in payments systems. Nonetheless, the system itself is the envy of many developed countries.

What can we conclude about why Mexico was able to succeed?

The financial crises in Mexico, beginning in the 1980's, gradually strengthened the role and authority of the central bank, providing an opportunity for action that may not exist in other countries. Also, modern payments systems were seen as key enablers of a strengthening Mexican economy. Although the actions of the Central Bank were quite radical, a gradual approach was taken to introduce the new ideas to banks, and develop a workable implementation timeline, thus avoiding an active rebellion against the ideas on the part of the banks. Finally, these actions were made possible by a small group of highly able, visionary leaders within the central bank "thought outside the box" and saw the potential for new uses of the RTGS system.

Conclusion - Hypothesis #2:

Strong, and at times aggressive, actions by regulators are the most important drivers of interoperability though this does not necessarily mean mandating interoperability by regulation. At times, the role of the regulator is in the background, and a non-governmental industry association or body is the visible party: but the authority of that group, and its ability to act effectively, is the direct result of oversight or direction by regulators, "behind the scenes." In the U.K., a Home Office anti-fraud focus gave APACs, a financial industry group, the ability to take a leading role in orchestrating the introduction of "Chip and PIN" into the U.K. market. Without a regulator or group like APACs taking the lead, a similar new product introduction in the U.K. market, of debit cards, led to a fragmented effort. In Mexico, direct control of an interoperable payments system by the central bank (acting both as regulator and as operator) allowed the system to be expanded in its uses and increased the scope of participation, and therefore interoperability.

The role of regulators in supporting private industry groups "behind the scenes" is of critical importance. In markets where regulators sit back, and allow private industry groups to act alone, those groups rarely achieve the effectiveness necessary to lead industry-wide actions. In the United States, for example, regulators have largely absented themselves from decisions around card payments systems issues. Groups which in theory could play a leading role (such as The Clearing House) find themselves without authority to do so.

Hypothesis #3: Government Payments to Grow Systems

> **A government commitment to pay G2P benefits, salaries, and/or vendor payments through a payment system can help establish and promote interoperability.**

The Growth of the ACH System in the U.S.

In the United States, the Federal Reserve Bank system has played critical roles at multiple points in the development of the national payments systems:

- As a rules maker, it has established rules which have promoted interoperability;
- As a promoter of infrastructure, it has acted as a processor, providing missing pieces of functionality that have ensured that systems could interoperate;
- And as a user of payments itself, it has chosen to aggressively pursue the use of electronic payments, thereby ensuring the successful growth and adoption of early stage electronic payments systems.

In the early twentieth century, the United States had more banks than any other country in the world: in 1934, there were over 14,000 commercial banks, with thousands of additional depository institutions, including savings banks, thrifts, and credit unions. These banks shared the use of a common payments system: checking.

The Federal Reserve Bank, early in its own history, worked with the banks in the country to ensure that checks cleared at par, meaning that a depositing customer received the full, not a discounted, amount of the check. (This contrasts with the current interchange-based card systems in use throughout the world.)

The check payment system was governed by a complex web of commercial law, state banking regulation, federal regulation and private clearing house rules. Although checking was interoperable (meaning a customer of one bank could deposit a check drawn on another bank), the back end clearing among the banks was time consuming, expensive, and risky, particularly for checks cleared between two banks who did not belong to a common check clearinghouse. In those days, before laws changed to enable national banking that meant any check crossing state lines; it generally meant any check crossing city lines as well. Bank A in one state depositing a batch of checks drawn on Bank B in a second state would generally receive payment for those checks by a wire transfer sent by Bank B to Bank A, or by a series of credits and debits to bilateral accounts held by the two banks.

As commerce grew, these practices became increasingly difficult to scale. The Federal Reserve Bank created a National Settlement Service that allowed clearinghouses and banks to clear obligations with other parties. This service, which still operates today, enabled the checking

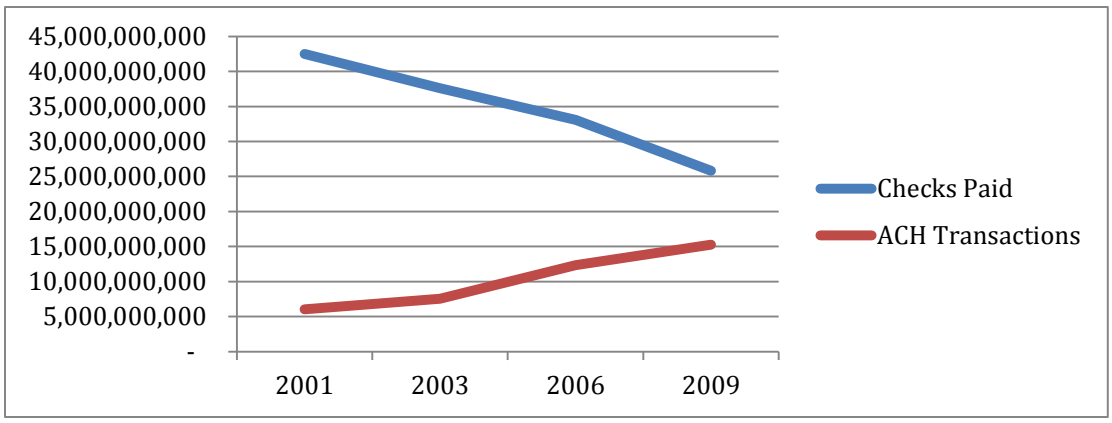
system to smoothly grow: it became increasingly important as laws changed to allow interstate banking.

The processing of batches of checks exchanged between banks was automated in the early 1960's with the implementation of the MICR line standard (the magnetic ink characters printed on the bottom of a check): this standard came about as a result of a study group formed by the American Bankers Association, and industry group. Again, as commerce grew, bank check operations staff were processing huge volumes (over 20 billion items in 1970) and overseeing the processing of transport of sacks of checks into trucks headed to and from clearing houses. The transit and personnel costs of both intra-city, intercity and interstate checks grew apace.

In California, a group of bankers concerned about these costs formed a group, SCOPE, to look into issues around using electronic messages instead of checks: literally sending only the "MICR line" (the magnetic ink characters at the bottom of a check) to each other. The result was the formation of local "automated" clearing houses in many cities around the country: these eventually consolidated into regional groups. The emerging ACH's did not process the transactions: rather, the rules they developed called for an "operator" role – an entity that would take the transactions from one bank participant and switch them to another participant in the same ACH.

The federal government played a number of critical roles in supporting the growth of the ACH system. In processing, the Federal Reserve acted as one of the national operators, complementing its ongoing role as a check clearing service. Today it remains the largest operator in the ACH system. The Fed's National Settlement Service, described earlier, provided the interbank and inter-regional settlement necessary to enable interoperability.

But perhaps the most important role that the federal government played was in the use of the ACH system for federal payments.



All new payments systems suffer from what is known as the "chicken and the egg" problem of all two sided markets– one party does not want to start using it until the other party does as

well. In the case of ACH, the stumbling block was bank participation in the open loop system. Why would a bank invest time and money in participating in a new system, if nobody was using it? And why would any consumer participate in something their bank was not offering?

The federal government solved this problem in 1975, by beginning to pay both Social Security benefits and federal payroll by ACH. The Treasury Department was then active in going to the banks, along with the Federal Reserve Bank, and saying, essentially, "do you have any customers who receive Social Security benefits?" The Fed was also instrumental in ensuring that the design of the system made it simple, and relatively inexpensive, for bank participation. This was done by providing a variety of access methods to the Fed (which was one of the operators of the service that banks could choose to use.) Later, the federal government added vendor and tax payments to the list of ACH uses. It also played a role in supporting the use of ACH by state governments.

In the early years of the ACH, the federal government was the dominant user of the system. By 2003, commercial payments had grown to 86% of total volume, and by 2011 represented 91% of total volume.

Industry groups, as well as the federal government, were important in the development of the ACH. The American Bankers Association, for example, was the entity behind the formation of NACHA in 1975, and supported its key rule in harmonizing regional rule sets into national rules. The regional clearing houses were, and are, important organizations helping banks and their customers to use the ACH system. The Clearing House (formerly the New York Clearing House) and its EPN (Electronic Payment Network) unit in particular continue in an important role as the other (non governmental) ACH Operator in the country. But it seems clear that without the aggressive support of the federal government, as a regulator, a processor, and a user, it is unlikely that the ACH would be as large – or as successful – as it is today in the United States.

Conclusion - Hypothesis #3

Government use of payments systems is a strong driver of system interoperability. There seem to be two major components. One is the simple lever of transaction volume – by providing large volumes early in the life of a system, a government can ensure that the system is attractive for bank participants, therefore creating a healthy interoperable system. (After all, interoperability would be pointless if the banks did not participate.) Secondly, the breadth of a governments "reach" to consumers and businesses is an important driver. Since in the U.S. the government was paying consumers in all 50 states, no single bank (at its inception, banks were still limited to state boundaries) could even dream of serving all of the consumers – interoperability made practical sense.

Today, around the world, we see examples of governments encouraging the use of electronic payments by setting a good example. In India, the Ministry of Finance mandated in April 2012 that all payments above a certain threshold be paid electronically. In Mexico, as we have already noted, the government is an enthusiastic user of the SPEI service.

Hypothesis #4: Early Dominance

> **Early dominance by one provider can slow or stop interoperability.** The attractiveness of the "franchise" created by the early player effectively creates an economic barrier to an open system. Particularly in cases where the early dominant solution is expressed in broadly deployed technology, it can become almost physically impossible to achieve interoperability without major investment and infrastructure changes.

Japan and FeliCa

EARLY TECHNOLOGY LEAD THWARTS INTEROPERABILITY

Japan presents a case study of the lack of interoperability in stored value cards. It is complicated by the shift of these cards to the mobile phone.

The Japanese payment market has some unique characteristics. With over 127 million people and a maturing population, most consumer payments are cash-based, with very little credit card and virtually no debit card usage. This cash usage makes Japan very unusual among developed countries.

The country is, of course, very mobile-centric: there are over 122 million mobile subscribers (95% of the population), with 84% having mobile internet access. There is one dominant mobile operator – NTT DoCoMo, with 60 million subscribers.

Eight major e-Money schemes have been introduced in Japan over the past decade – all created by transit operators, mobile operators, or retailers, not by banks. These schemes in general have not interoperated, or interoperate only in clusters or small geographical areas.

What the schemes do have in common is the use of a specific chip card operating system – Sony's FeliCa. FeliCa is a contactless card technology, used not only in Japan but also in Hong Kong and Singapore. It is a variant of the contactless card technology used elsewhere in the world, but does not comply exactly with those standards: this means that it is also not technologically capable of interoperating on a global basis.

The contactless card payment systems introduced included Suica, ICOCA, Edy, QUICpay, nanaco, and Waon. A customer using multiple transit systems, or shopping in stores that accepted only one or a few of the above systems would need to carry multiple cards. Similarly, stores would need to sign up for each scheme independently. Each system had different card acceptance reader requirements, and merchants in some situations were required to have different terminals.

In a partial attempt at achieving interoperability, in 2007 transit operators introduced the PASMO card. Also based on FeliCa, it interoperates with most (not all) of the eMoney schemes described above, essentially by providing a "translator" service.

Mobility

With the rapid growth in mobile phone usage in Japan, the major wireless operators added new chips - based on the same FeliCa technology - to their handsets which also support the payment applications of the existing stored value system players and which can interoperate with their fare collection devices.

However, this has been implemented by segregating the payment applications and their respective stored value amounts into different "purses" within the mobile chip itself - and has not involved any cross-system interoperability between the various systems. There is no significant financial institution or open loop payment scheme involvement in these systems.

In 2004, DoCoMo introduced “Mobile FeliCa” through a new subsidiary, FeliCa Networks (owned by NTT DoCoMo and Sony). FeliCa Networks was an attempt to further monetize the success of the FeliCa standard. DoCoMo then developed a mobile wallet based on this, and licensed the wallet to partners both in Japan and other parts of Asia. The mobile wallet system is called Osaifu-Keitai. Using Osaifu-Keitai, multiple FeliCa systems (such as Suica and Edy) can be accessed from a single mobile phone, thus accomplishing a form of “parallel system interoperability.” The investment by DoCoMo and Sony in the mobile wallet system anticipated three sources of revenue: license fees from mobile operators (not just DoCoMo), “platform management services” (including the enablement of card data onto phones) and hosted services (cloud based software) for application providers. Both parties were interested in expanding the ecosystem.

The term Osaifu-Keitai became widely used to describe mobile handsets integrated with FeliCa (not only DoCoMo handsets). Furthermore, DoCoMo bundled Edy as a standard e-Money application on their handsets. A series of expansions followed:

- Early 2005: expanded to Sumitomo credit
- Late 2005: launched iD platform for other issuers
- 2006: launched DoCoMo DCMX credit (mini/full) on iD platform
- 2003: McDonalds offers downloadable coupon images
- 2007: McDonalds, DoCoMo form new JV (70/30), supporting a new McDonald’s membership club: Kazasu Coupon, also enabling the acceptance of DoCoMo’s iD at McDonald’s locations

The result in the marketplace is generally understood to be anemic. Although usage of the cards and phone apps for transit is high, the use for general purpose purchases remains disappointing.

Is this the result of non-interoperability?

One can argue that the early dominance of the FeliCa technology was an important factor in creating the “patchwork quilt” of systems that exists today. As owner, SONY was interested in ensuring that multiple different parties adopted the technology, but had little motivation to ensure that the various systems interoperated. (In fact, it is possible to conclude that they

One surprise "winner" in the Japanese experience was the success of the mobile phone coupon programs. As one analyst said: "Without points programs, coupons and other incentives, mass adoption of contactless-mobile payment will not happen in Japan."

actually had an active interest in non-interoperability). Also no central coordinating body emerged, which might have specified standards for interoperability.

Today, individual players have made investments in, and gotten customers habituated to, the non-interoperable systems. It is difficult to retroactively engineer such systems to achieve interoperability. In the meantime, some appearances of interoperability are made possible by the mobile phone, which can disguise, from the user's perspective, the clumsiness of actually having separate "purses" for various systems.

By way of contrast, a completely different scenario unfolded in the California Bay Area. Through a combination of tactics of persuasion and regulation, the Metropolitan Transportation Commission in the San Francisco Bay Area took steps to require that the transit agencies under its authority implement a new shared contactless-based fare collection technology called Clipper. The involvement of this agency provided the necessary stimulus to create this new card capability that consumers can use in an interoperable fashion on any of the Bay Area transit systems. MTC provided the regulatory stimulus to bring together many different fare collection systems used across the transit systems in its geographic area.

It took the MTC a very long time to accomplish this. Discussions and plans on the subject, of having a common payment mechanism across multiple transit systems serving the area, go back over 20 years An early attempt, using a magnetic-stripe card, was introduced as Translink, in 1993, but was closed after two years because of operational problems. Planning for the current system took over a decade. But today, the "Clipper" program, first introduced in 2009, now supports seven separate transit systems with contactless-card technology. Although it is tempting to look at the lengthy gestation period and conclude the project was a failure, it illustrates the difficulty in achieving this type of interoperability with different groups – especially groups not used to inter-operating. (This contrasts, for example, with both banks and telecommunications carriers, who have needed, for various reasons, to interoperate in the past.) Although Clipper took a long time to arrive, it seems clear that the role of the MTC in making it happen was critical.

M-PESA Interoperability

EARLY MARKET LEAD PREVENTS INTEROPERABILITY

In the developing world, the M-PESA system in Kenya is the "poster child" for mobile wallet services. It was introduced to the market in 2007 by Safaricom, (a Vodafone affiliate), the dominant mobile network in Kenya.

The M-PESA wallet allows a customer to deposit cash, transfer funds to other M-PESA customers, and withdraw cash from the wallet; the deposit and withdrawal functions are enabled by a broad network of Safaricom-affiliated retailer agents.

M-PESA, which is used by about 80% of Safaricom customers, is not interoperable with wallets or money transfer services developed by its competitors, including Airtel Money, Yu Cash and the Iko Pesa Orange Money account. Currently, an M-PESA subscriber can send money to a non-Safaricom phone, but the recipient does not receive that into a competitor's wallet, but must rather withdraw cash from a Safaricom agent.

The issue of interoperability of M-PESA and its competitors is currently under debate. Some have argued in favor of *scheme interoperability*. This would require some kind of network or scheme manager: each existing wallet provider would join the scheme and conform to its rules. Such rules, obviously, would have to be developed, but one could imagine that they would include the ability for a subscriber of one wallet service to send money to a subscriber of another wallet service: some processor would need to provide the switching and settlement utility to allow this to occur. It would be logical with scheme interoperability for the role of agent to become more open, so that an agent of one wallet provider might handle cash in and cash out transactions for the subscribers of another wallet. It would also be logical in this situation for there to be some form of intra-scheme compensation (similar to interchange), depending on the relative costs and burdens of the various participants in the system. Given that all participants were part of the same scheme, it would make sense for there to be a scheme brand or mark – this could be used instead of or (more likely) in addition to the brands of the existing wallets. ***This scheme interoperability would be the payments system equivalent, for example, of all providers joining the "Visa" system.***

A lighter-weight version of interoperability could be achieved with network interoperability. This would require that a subscriber be able to send a transaction to another subscriber's wallet, and would require switching, settlement, and possibly interchange components as mentioned above. It would not, however, necessarily mean that an agent of one wallet provider would service subscribers of another provider, nor would it require a common brand. ***This network interoperability would be the payments system equivalent, for example, of the agreement between China UnionPay and Discover to enable Discover cardholders to access merchants in China.***

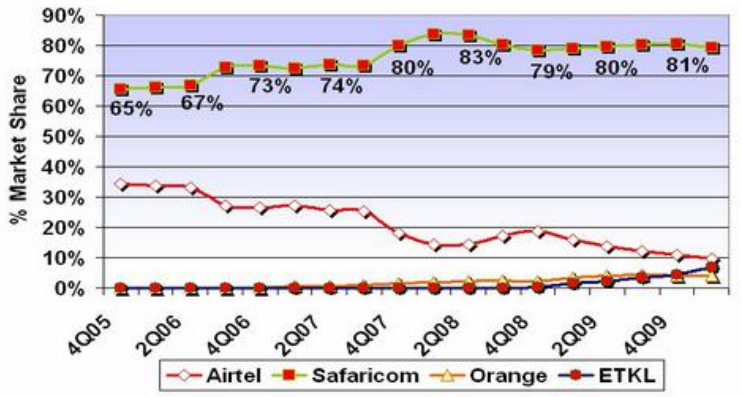
Finally, it would be possible to achieve some benefits using *parallel system interoperability*. This could be used in particular on the agent side of the transaction. If all agents were free to contract with any and all wallet providers (instead of being exclusive to one wallet provider, as is currently the case with M-PESA), they could serve subscribers of many different wallet providers. With time, one would expect that intermediary services would be developed to provide agents with common information portals and settlement accounts, in order to efficiently manage relationships with multiple wallet providers. Logically, this could be offered

by the same entities as today manage some agent networks. ***This would be the payments system equivalent of a merchant in Europe being enabled by its acquirers to accept both MasterCard and Visa, without having to support expensive dual processing systems or terminals.***

Parallel system interoperability would not solve the subscriber transfer problem (a subscriber of one wallet provider could not pay a subscriber of another wallet provider), but a combination of parallel system interoperability and network interoperability could achieve most of the benefits of true scheme interoperability.

How M-Pesa Could Move to Interoperability

What would make a provider such as Safaricom agree to some form of interoperability? Today, not surprisingly given the success and dominance of its platform, Safaricom is resisting the concept. They have, in fact, argued forcibly for maintaining a closed network, citing customer protection as a reason: "Our concern would be the negative impact it would have on the customer if funds have to go through a clearing house as is currently the case with conventional banking"[1]. As it is not at all obvious that customers of global card networks are harmed when funds "go through a clearing house," it seems more likely that the protection of current revenue, and retention of its wireless customers, are the leading reasons for resisting interoperability.



It is interesting to note, of course, that Safaricom has enabled certain types of interoperability – with a variety of bank and non-bank providers of ATM networks, as well as enabling certain

[1]Safaricom CEO Bob Collymore, January 2012 in blog Larry Madowo

types of bank-to-M-Pesa transfers (and vice versa). These transactions, apparently, are not deemed "harmful" to customers – unlike the threat posed by interoperating with competitors. These transactions, presumably, do not threaten the mobile phone relationship between Safaricom and the consumer.

A regulator, of course, might mandate interoperability. Or economic conditions could evolve to create situations in which Safaricom would want to interoperate. This could happen, for example, if competitors were to band together and create an interoperable network that had more participants than the closed network. This would recreate the scenario that led Citibank to participate in open ATM networks. Or, conceivably, the situation could change so that Safaricom saw greater opportunities (a larger market) through interoperability than by remaining closed. This would recreate the scenario that led to the formation of Visa from the original BankAmericard.

Neither of the latter two possibilities seems likely in Kenya, however – which illustrates the challenge of early dominance by one provider. The combination of the power of market leadership in mobile phones and the success in terms of penetration of the M-PESA service with subscribers makes it unlikely that interoperability among wireless carriers will be achieved without direct government regulation.

Conclusion - Hypothesis #4

There are two very different situations in which an early dominance by one provider creates barriers to interoperability. In Japan, the dominance of a technical solution (the Felica platform) gave rise to multiple, non-interoperating payments products. In Kenya, the early market leadership of Safaricom, with M-PESA, created an economic barrier to interoperability.

These two situations also illustrate some of the findings from our other hypotheses. In Japan, the lack of an effective regulatory body (either directly or behind the scenes of an industry group) meant that no entity was requiring the newly developed products to interoperate. And in Kenya, of course, the position of Safaricom is entirely understandable given its economic framework.

Conclusions

The interoperability of payments systems provides some valuable learnings for emerging transaction systems of all kinds.

Economic levers can drive competitors to interoperate – even when it seems unlikely: it is necessary to understand the larger economic motives of participating banks and other payments providers. Sometimes, interoperability is economically desirable because it creates competitive parity. At other times, interoperability is the means to grow a market, with "all boats rising."

Regulation, of course, can mandate interoperability. But more significantly, an effective regulatory body, often with the support of key industry groups, can play a pivotal role in the mechanics of achieving interoperability. In contrast, a weak or missing regulatory presence can lead to failures of interoperability.

Government has other important roles as well. As a user of an emerging payments system, a government can provide the "seed volume" to get an interoperable system going and incent participation by competitors.

Too-early dominance by one private sector provider can quell interoperability, and produce a fragmented and inefficient payments environment. Once established, it is difficult to reverse years of development and investment in proprietary systems, creating an unlikely environment for interoperability.

The technical structures of interoperability that have been developed by payments systems worldwide may also be of use to other transaction systems. Scheme interoperability, network interoperability, and parallel system interoperability all are options for regulators to consider.

Appendices

Appendix I: Payments Industry Participants

Users: Consumers

Consumers, of course, are users of payments systems. Much research has been done on consumer needs and preferences in payments. In developed economies, convenience and financial benefits appear to be the primary driver of payments choice: financial benefits can include both incentives (such as rewards programs) and the avoidance of disincentives (late payment fees, etc.). But it is important to note that in most developed economies, consumers assume that the payments systems are safe - that is "table stakes." In developing economies, that trust is not there, and it is logical to conclude that concerns over the safety of payments would supersede concerns about convenience. Payments-related privacy is a complex issue: consumer needs for privacy vary by individual n connection with payments consumer plays a complex role

Users: Enterprises

Enterprises, including merchants, billers, other commercial entities, and governments are also users of payments. For commercial enterprises, payments are how they realize revenue. In general, they will make choices about payments acceptance based on consumer demand, the ability of a payment method to drive incremental sales (by, for example, providing credit to the buyer), and the cost of using a particular payment method. Those costs are both explicit, (e.g. bank fees), and more complex (e.g. the cost of cash theft, the cost of added time at check out). Governments as users of payments (for both collection and disbursement) have additional needs and motivations, and see efficient payments as a key means of supporting citizens and accomplishing social goals.

Providers: Banks

Banks and depository financial institutions in general, are the primary providers of payments services in most countries. Banks tend to see payments as a component of a larger relationship with a consumer or an enterprise. Within this relationship, banks value payments as a means of forming new customer relationships; continuing those relationships (payments are seen as highly "sticky"), and generating direct and indirect revenue streams. Only in **a** very few highly developed economies are there banks that have large, separate payments business: the credit card issuing business in the United States is an example of this.

Banks most typically belong to multiple bank transfer systems, which are interoperable [reference section below]. Banks, and bank transfer systems, are generally regulated, directly or indirectly, by the central bank of the country.

Providers: Others

There are many other types of providers in payments. **Networks**, including card networks, check clearinghouses, and EFT networks, may be operated as non-profit, or quasi-non-profit bank "utilities," or as for-profit commercial enterprises. Networks are almost always motivated by a desire to drive more transaction volume through their network. Commercial networks also have brand protection motivations. **Processors** of many types provide back-end services to banks, networks, commercial enterprises, and governments. **Private system operators** create branded payments services for consumers and/or enterprises: these operators typically use the bank transfer systems in their back offices to effect payment transactions.

Regulators

Payments system regulators have both micro and macro concerns. At a micro level, they regulate to protect consumer safety, privacy, and fair treatment. At a macro level, they are concerned with protecting systemic risks, and with preventing the use of payments systems for criminal activities. Regulators, particularly in developing economies, also want effective payments systems as a means to enable economic development.

Payments system regulators have, in some instances, relied on the government regulation of banks, as payments system owners, rather than regulating payments directly. In recent years, this model has been challenged by the move to non-bank ownership of card networks, in particular, and the rise of non-bank private payments system operators, including telecom carriers. In many countries, there are debates about whether the bank regulators in that country, or some other regulatory agency, should be charged with regulatory authority over non-bank payments providers.

Appendix II: Payments Industry Economics

The payments industry is interesting, from an economic point of view, in that it is not always clear who pays for a payment! The payment may be paid for by the sender, the receiver, or by the value of float, balances or interest on payments-related lending: this is what is known as "net interest income."

In many cases, the providers receive revenue from multiple parties in multiple ways. For bank providers in particular, the level of balances in a customer's account tends, logically enough, to increase with the volume of transactions. If these balances are high enough, the provider may not assess transaction fees on payments made.

Where there are fees, they may be transactional in nature, set either as a fixed, per-transaction fee, or as an "ad valorem," (per cent of value) fee. Other fees include periodic maintenance charges and exception handling charges. Bank and non-bank providers have found exception-handling fees, often positioned as "punitive" (e.g. overdraft fees, over balance fees, late payment fees) to be a particularly lucrative revenue source.

The development of the card payments systems brought a new practice into the payments economics mix. Merchants and other commercial receivers of payments, who previously would pay only some kind of deposit fee for checks or cash deposited to a bank, were asked to pay an ad valorem fee for the acceptance of cards. This "merchant discount fee," although generally accepted by merchants, who appreciate the convenience of cards and the greater purchasing power of customers using cards, has also been controversial in many countries.

The underlying mechanism that enables this "merchant discount fee" is network interchange.

Interchange

In some payments systems, a fee has been established that is used to balance the value provided by the payment providers with their costs of providing the payment service.

Most commonly found in the credit and debit card payment schemes, this fee typically is collected from the receivers of funds (i.e., merchants via their merchant acquiring bank) and paid to the card issuer's bank. However, in some ATM systems, the flow is reversed with the ATM operator who serves the consumer receiving a fee for providing the service from the consumer's issuing bank.

Historically, interchange fees were based upon cost studies conducted by third-party accounting firms who then provided recommendations to the scheme operators as to how best to balance the costs and benefits. Over time, some schemes have added many different interchange fees as they have adapted their offerings to meet specific market needs and to facilitate expansion of acceptance into new market segments.

Interchange in some jurisdictions has become a "lightning rod" issue for criticism - with those paying (merchants) being the most vocal about the level of the fees. Regulators in some countries have also taken steps to attempt to better understand scheme rationales for setting interchange fees and, in some cases, have taken action to limit those fees where they found them to be excessive. Australia is perhaps the most significant example of interchange regulation - where the Reserve Bank of Australia decided to establish set fees after spending years attempting to understand the schemes' approach to setting these fees. Most recently in the US, the Federal Reserve, under authority included in the Dodd-Frank Act, has regulated debit card interchange fees for the largest US banks (those with over $10 billion in assets).

Appendix III: Payments System Interoperability

It is important to note that certain open loop payments systems in every country are *assumed* by all participants to be interoperable. Let's call these systems the ***"national payments systems"*** to be consistent with the terminology we introduced earlier.

Cash, checking, and ACH-like direct debit and credit transfer systems all fall in this category. These are all bank-provided services, and it is safe to say that all banks (and their customers) simply assume that the systems will interoperate. Central banks, in varying roles as regulators, overseers, or operators of the systems also play an important role in ensuring that this happens, and, almost certainly, would step in to take action if, for any reason, barriers to interoperability were put in place.

Other open loop payments systems do not fall into this category - and it is with these systems that the question of how and if interoperability occurs is the most interesting and informative. The clearest examples are the card schemes - including the original ATM cards, the POS debit card networks that often grew out of these schemes, and the credit card schemes.

Types of Interoperability

What is payments system interoperability? We believe there are two relevant definitions - each applying to specific payments use cases.

Person to Person (P2P) Transfers

For person to person money transfers, interoperability means that one end user, who has a relationship with one provider, can send money to another user, who has a relationship with another provider. If a consumer using a bank's online banking service, for example, is able to make an electronic transfer to a consumer of any other bank in the country, we would consider this to be an example of ***P2P interoperability***.

Key to this definition is that the services that the two end users are subscribing to with their providers are similar. Obviously, there can be questions about what "similar" means. To use a phone service analogy, a consumer using one mobile phone company in her country expects to be able to call another consumer who uses a different mobile phone provider: the two consumers are using a similar service. A consumer's mobile provider might, however, offer a special service - let's say as an example being able to send a ringtone as a gift to another consumer on that mobile network. In that example, a consumer might not have the expectation that the service would work across carriers.

Person to Enterprise (P2E) Payments

For transactions between a consumer and an enterprise (which might be a merchant, an enterprise, a government, or an agent), the definition becomes somewhat more complex. For the purposes of this discussion, we will focus here on payments *from* a consumer *to* an enterprise.

What governs the consumer's expectations of whether or not a given payment method will be accepted at a given enterprise? In most countries, cash and checks are ***national payments schemes***, and a consumer has a broad expectation that these will be accepted at all enterprises. Central bank regulation and law may support this expectation.

With card payments and some electronic transfer systems, P2E interoperability depends on the enterprise (merchant or other commercial entity) having ***chosen to participate*** in the scheme in question being used by the consumer.

In these systems the consumer does not necessarily have an expectation that their payment mechanism will be accepted at a given merchant. Instead, they may need to rely on signs or other messages from the enterprise that tell the consumer that a certain form of payment is accepted. Historically, these have often been in the form of decals on a merchant's door or cash register.

Interoperability Within Payments Systems

Another way of understanding payments system interoperability is to look at it from the perspective of different types of payments systems.

Open Loop Payments Systems - Characteristics

Most of the "national payments systems" referred to above (checks, credit transfers, direct debits, credit cards, and debit cards) are open loop systems. Open loop payments systems share the following defining characteristics:

- Providers (who supply send or receive capabilities to end users) belong to a "scheme," and are obliged to follow the rules of the scheme. In fact the rules of the scheme are what define the ability of providers to "interoperate" among themselves
- The end parties in a transaction can be served by different providers. In many systems, this is the rule, not the exception. Transactions where both end parties are served by the same provider are called "on-us" transactions, and, depending on scheme rules, may be allowed specialized treatment

- Most typically, providers use a common "switch" which physically moves a transaction from one provider to the other. If there are multiple switches, the switches (perhaps operated by the scheme, or by a third party) may have "gateway" agreements among each other to effect the switching

Again, most typically, the scheme specifies the means by which the financial obligations among the providers are settled, usually on a daily, net basis.

Note there are variations to the switch and settlement functions in some payments systems. There are systems that permit direct, bilateral transaction exchange between providers, who then determine their own settlement practices.

Open Loop Systems: Categories

Informal schemes do not need providers to proactively join a system. Rather, the providers practices and obligations are governed by an overlapping set of law, regulation, consumer (and other counterparty) expectations, and mini-scheme rules.

For example, in many markets checking is not governed by a single, coherent scheme. Any bank offering a checking account to a customer, however, knows that that customer expects to be able to give it to a payee who will, in all probability, deposit it into another bank. Both banks' obligations are governed by law and regulation, rather than by scheme rules. The two banks may, however, mutually belong to a check clearinghouse, which has "mini-scheme" rules regarding such matters as the time for check presentments.

Cash is another example of an informal scheme. A consumer taking cash out of an ATM has every expectation of being able to use that cash at most stores; the store manager has the expectation that they will be able to deposit the cash in their bank. In some countries, these expectations may be codified as law, in others, they are simply common practice.

Many bank transfer schemes are what we categorize here as "***narrow rule***." Providers proactively join the scheme, and are governed by its rules. The rules, however, are relatively narrow and practical in scope. The intention of the rules is primarily to make the switching of transactions as efficient as possible. Most country ACH-type payments systems, including "direct debit" and "credit transfer" systems fall into this category, as do ATM and wire transfer schemes. Some debit card schemes fall into this category.

Broad rule schemes incorporate all of the rules of narrow rule schemes, but add to that extensive additional rules relating to membership in the scheme as well as how the product is used by various segments of senders and receivers), how the scheme brand is used, and what benefits and protections may be extended to various participants in the schemes.

Requirements for Interoperability in Open Loop systems

- Membership criteria: providers must meet scheme-specific membership criteria to be able to participate
- Transaction formatting: providers need to agree on protocols for message types and formats, account number structures, security protocols, etc., in order to transact with each other. Note in some payments systems processors play a role in reformatting transactions to meet scheme requirements
- Transaction handling: providers need to agree on rules for how the transaction is handled by the receiving provider – most typically, when and how it is posted to the receiver's account, whether notice is given to the receiver, etc.
- Transaction dispute resolution: providers need to agree on how disputed transactions will be identified and handled, including how liability for the transaction is allocated in various situations
- Intra-intermediary compensation: in some systems, the scheme defines fees that flow from one provider to another – this is usually referred to as interchange [reference section XX]

- Intra-party liability allocation - one of the most important functions of rules in open loop systems is the allocation, often with a high degree of specificity, of liabilities of the various parties in handling a transaction. By understanding this, and relying on the support of the system network to enforce it, the various parties are content to have only indirect relationships with each other. The scheme is typically the ultimate arbitrator of any disputes among the participants
- Participant risk management - the payment system operator (which can be a single enterprise, such as Visa, or the central bank, or, in a virtual system such as checking, the regulator of the banks that participate in the system) manages the risk to the other system participants by setting thresholds for the financial position of all participants and, in some cases by guaranteeing settlement obligations in the event of the failure of a participant

Closed Loop Payments Systems

Closed loop payments systems are offered by a provider who has a direct relationship with both end parties. "Interoperability" as a concept does not apply to these systems.

- Example: gift cards. A merchant issues a card to a consumer, who then uses it at that store
- Example: closed loop credit/charge card networks. A card issuer, such as American Express, issues a card to a consumer, and also has a direct relationship with a merchant
- Example: online bill payments (U.S. market). A bank offers its customer the ability to pay a biller online; the bank must make its own arrangements with a biller (either directly or through a processor supporting multiple billers) to deliver the transaction to the biller
- Example: some P2P schemes. A provider (for example, PayPal) provides customers with the ability to pay other customers on its network

Closed loop systems can look and act like open loop systems in the following ways:

- By providing special ways for out-of-network end users to receive transactions. For example, a proprietary online or mobile "Person to Person" (P2P) provider may have a means to deliver payment to an end user who does not have a relationship with that provider. The transaction delivered to the end user may be inferior in some way (slower, more expensive) than if the end user had a relationship with the provider. Note this same structure is used in open loop P2P schemes, when the receiving end user does not have a relationship with another provider who participates in the scheme
- By having third parties develop "exchange" services. For example, gift cards in the U.S. are often bought and sold on "gift card exchanges." The intermediary, which does not necessarily have a relationship with the underlying provider, buys the gift card from the consumer holding it and sells it to another consumer
- By outsourcing the management of the "receive" side transaction. By relying on third parties to handle the connection to the "receive" side of the transaction; the third party contracts with multiple send-side institutions (example – bill pay processors in the United States)
- By operating in parallel with other highly similar systems. This is a form of ***quasi-interoperability***, discussed in the following section.

Interoperability Between Payments Systems

Different payments systems schemes, whether closed loop or open loop, generally do not interoperate.

However, there are exceptions to this which create different types of interoperability, as well as business practices that create some effects of interoperability.

Network-to-Network Interoperability

Networks may enter into contracts to exchange transactions between themselves. This happened between regional ATM networks in the early years of the industry in the United States, for example. Today, it is more common as a mechanism to ensure cross-border acceptance (for example, China UnionPay agreement with Discover/Pulse). Such agreements can be bil-lateral or one-sided. These agreements are typically only entered into if the network does not have any direct ambition of directly serving the partner's market.

Network-to-Provider Interoperability

In some cases, a network may enter into a direct agreement with one bank, or other provider, rather than with another network. An example of this is the deal struck between China UnionPay and Citibank, which allowed China UnionPay cards to be accepted at Citibank ATM's worldwide. This agreement binds Citibank, but does not extend to the other participants of any ATM networks that Citibank belongs to.

Parallel System Interoperability

In some markets business practices have evolved that create some of the effect of interoperability ***from the receiving enterprise's perspective***.

Let's say, as an example, that a merchant is accepting two different types of card payments, and has indicated this with decals on their door. What the merchant's experience is in handling these two types of transactions can vary tremendously.

Does the merchant have to have different terminals to accept the different payment types? Do they have completely separate (and highly variable) business contracts and operating procedures with each scheme? Or, does the merchant have a relationship with a single ***payments provider*** that enables them to accept both schemes? In the latter case, from the merchant's point of view, the two systems are relatively easy to support "in tandem."

The best example of this is how Visa and MasterCard work in most developed countries. The two payments systems are not really interoperable: if a merchant were to only accept MasterCard, a consumer holding only a Visa card could not make a payment. But practically speaking in most countries, every merchant that accepts Visa also accepts MasterCard, and importantly, from the merchant's perspective, there is virtually no difference between accepting one card or another.

There are a number of requirements for parallel system interoperability to work.

- The rules of the two schemes, which bind the providers on both side the receive side (the card acquirer) must be highly similar
- The card acquirer must have business incentives (or, perhaps more significantly, the lack of business disincentives) to support both schemes. A card acquirer who has an economic or ownership link to one scheme is unlikely to support both schemes
- The card acquirer and/or the card processors used by the acquirer and the merchant must have operational processes in place to make the merchants' acceptance of cards under multiple schemes simple. These processes typically include integrated account funding (settlement) and reporting, integrated dispute resolution procedures, etc.
- The hardware devices (POS terminals) and the software that is run on these devices must support both schemes, or allow scheme-specific software to reside on the same system
- Card technologies, message and account number protocols (such as specified for interoperating systems in section XX above) must be the same for the two schemes

It should be noted that in markets like the U.S., there are varying levels of this parallel system interoperability. Acceptance of American Express cards by merchants, for example, is not as completely integrated from the merchant's point of view as are Visa and MasterCard payments, but the AmEx payments can nevertheless be supported by the same card acquirer and many of the same devices, systems, and processes. AmEx typically requires a direct contractual relationship with the merchant and may separately price acceptance.

Third Party Intermediaries

In some markets, third party private system operators act as intermediaries between non-interoperating schemes. In cross-border eCommerce, as an example, a "Global Payments Services Provider" (PSP) will stand in between a merchant in one country, and a consumer in another country, and allow them to transact. The PSP in this example has a relationship with a bank or other provider in each country, allowing them to tap into that country's payments systems in order to effect the debit to the consumer's account and credit to the merchant's account.