Fundamentals of Global Payment Systems and Practices

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Introduction

Payments are the financial instruments used globally to transfer value in the form of money. This makes them an essential part a company's financial operations, and a complex part given the many different payment systems and currencies used around the world. Further challenges come from the continual introduction of newer payment offerings such as PayPal, Bitcoin and various mobile payment options. The result is that there are now well over 750 payment systems throughout the world—systems that are constantly changing due to new technology or government regulations.

The purpose of this paper is to provide corporate treasury professionals with the working knowledge necessary to make informed decisions about payment practices for their organization. It is divided into six sections:

I. *Payment Systems* describes the essential elements of a payment system and the participants.

II. *Payment Channels* covers the four basic payments types; paper-based, high-value real time systems (wires), batch EFT systems (ACH) and cards.

III. *Payment Processing and Controls* looks at payments from the corporate perspective dealing with topics such as making payments and processing collections.

IV. *Settlement* describes how financial institutions involved in payments exchange value between each other.

V. *Alternative Payments* deals with less conventional, often non-bank, payments systems, such as Hawala, digital wallets, mobile payments and cybercurrencies.

VI. *Conclusion* summarizes the topic and provides directions to additional resources.

I Payment Systems

A payment system is a set of processes and technologies that transfer monetary value from one entity or person to another. Payments are typically made in exchange for the provision of goods, services or to satisfy a legal obligation. They can be made in a variety of currencies using several methods such as cash, checks, electronic payments and cards. The essence of a payment system is that it uses cash-substitutes, such as checks or electronic messages, to create the debits and credits that transfer value.

The value that is being transferred is typically stored in depository accounts at banks or other types of financial institutions. The banks, in turn, are connected to a set of payment systems that they use to process payments on behalf of their customers or depositors. Most US banks are members of a number of different payment systems such as Fedwire (US Federal Reserve Bank network), Point of Sale (POS) and card networks such as NYCE (New York Cash Exchange, a subsidiary of FIS) and CHIPS (Clearing House Interbank Payment Systems). Other countries have similar systems such as CNAPS (China), BOJNET (Japan) and SPEI (Mexico). Banks operating in multiple countries connect to payment systems in each of the countries where they operate either directly or through a correspondent bank. Significantly for the settlement process and for the discussion of less conventional payment systems, banks in many countries typically maintain accounts with a country's central bank and participate in the central bank's payment systems. In the Eurozone, the authorities have taken it a step further by creating SEPA, the Single European Payments Area, under the authority of the European Central Bank (ECB). SEPA was created to provide standardized payments processing and fees among all the various countries within the Eurozone.

In the simplest case involving the traditional banking system, payments involve four participants:

- *The payer:* Makes the payment and has its bank account debited for the value of the transaction.

- *The payer's financial institution:* Processes the transaction on the payer's behalf.

- *The payee's financial institution:* Processes the transaction on behalf of the payee and generally holds the value in an account.

- *The payee:* Receives value of the payment by credit to its account.

This is illustrated in the "four corners payment model" diagram shown below.
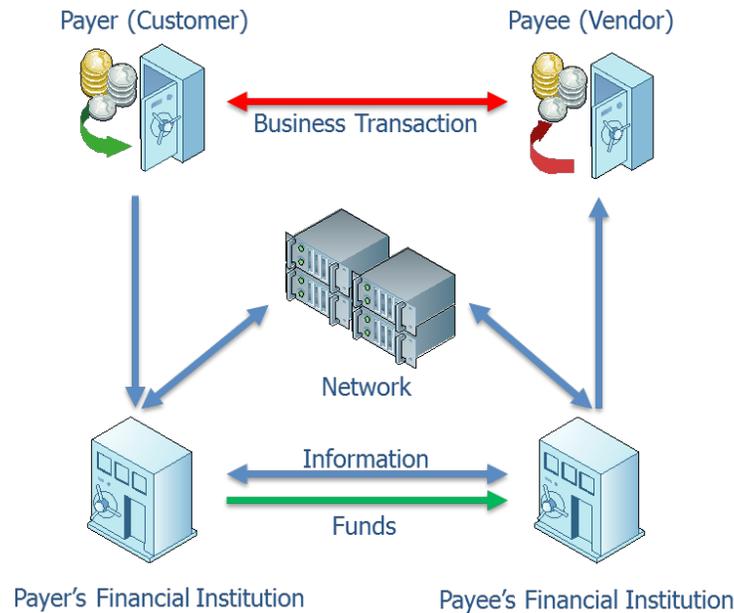
In the simple case illustrated here the two banks may choose to transfer payment instructions and funds directly with each other. It is also possible for the banks to use various intermediaries to help facilitate the transaction. The diagram refers to these intermediaries as "network".

In the real world the network includes central banks such as the US Federal Reserve (FRB), European Central Bank (ECB) and The Bank of Japan (BOJ) along with clearinghouses such as CHIPS. There are also information transmission mechanisms such as the Society for Worldwide Interbank Financial Telecommunications (SWIFT) and payment systems such as Fedwire and BOJNet which also include information transmission systems. Entities such as payroll processors, check printers, systems providers and card systems such as Visa and MasterCard that are outside of the four corners model also participate in the payment process. Non-traditional payment systems such as Bitcoin bypass the banking system almost entirely by fulfilling the roles of financial institution, currency and network themselves.

The operation of the model is often referred to as the payment process and it involves four basic steps:

- Payment instructions are the information contained in a wire transfer or check. These instructions are from the payer and tell the paying bank to transfer value to the beneficiary through the network and receiving bank.

- Payment generation is when the instructions are entered into the system—e.g. printed on a check or transmitted via ACH or wire.

- Clearing is the process where the banks use the payment information to transfer money between themselves on behalf of the payer and the beneficiary (payee).

- Settlement is the final step in the basic process and occurs when the beneficiary's (payee's) bank account is credited and the payer's bank account is debited. Final settlement occurs when the banks irrevocably pass value among themselves, a distinction that has important treasury implications.

The actual payment process will depend on the type of payment instrument that the payer and payee choose to use—or have chosen for them by their financial institutions.
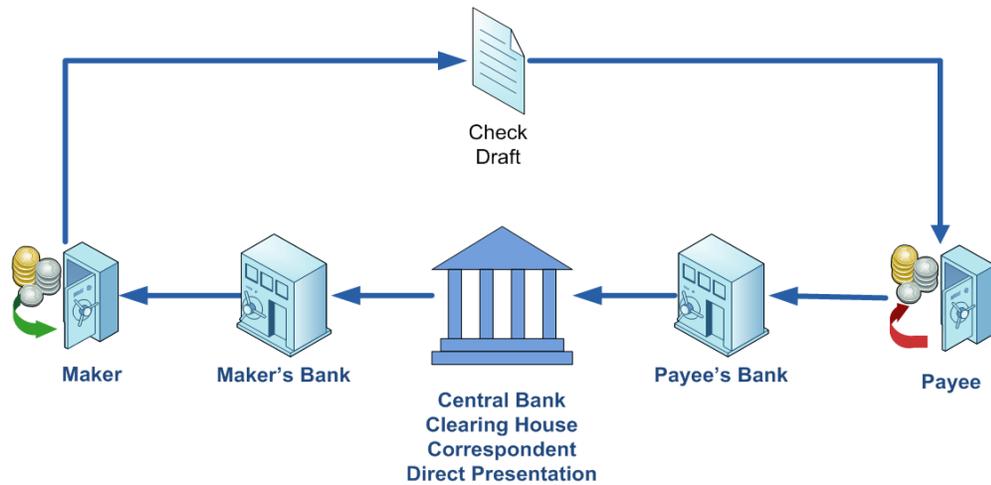
II Payment Channels

Payments originators and their processers can use different channels to make a payment and each has different operating characteristics, rules and settlement mechanisms. Broadly speaking, all payment systems can be placed into one of the following five payment channels:

- Paper-based systems such as checks or drafts. Payments are initiated when one party writes an instruction on paper to pay another. These systems are one of the oldest forms of non-cash payment system. Checks are a common paper-based channel and while in decline are still widely used in the United States and a few other countries.

- RTGS (Real Time Gross Settlement) and other high-value payments; called wire transfers by most people. Wires came into being in the late 1800s with the invention of the telegraph but did not become widely used until the early 1900s.

- Low Value Batch Systems or Automated Clearing House (ACH) batch payments were introduced in the early 1970s and were designed to replace checks with electronic payments. Unlike wires, which are processed individually, ACH payments are processed in batches and were originally intended for small payments under $100,000 such as payroll and consumer transactions.

- Cards are a payment channel that includes credit, debit and stored value cards. They are a heavily used and fast growing segment of the methods for making and receiving payments. The card channel also often provides the "rails" or settlement systems supporting some of the newer ecommerce payment systems such as mobile wallets.

- The explosion of mobile applications, cybercurrencies and other payment alternatives has created several payment methods that do not neatly fit in the preceding four channels. While the rules of settlement and value transfer are not suspended for this channel this paper recognizes them as distinct.

1. Paper-Based Payments

Checks are still a popular way of making payments in the US and some other parts of the world, but they are not the only paper-based payment system. Some countries still operate Giro systems where participants use paper to initiate a money transfer through banks or postal systems, but these transactions are being largely replaced by electronic alternatives. Because Giro systems are slowly going away, this section will focus exclusively on checks.

The process of exchanging value through checks is generally called check clearing and is illustrated in the following diagram:

Check Draft

Maker   Maker's Bank   **Central Bank Clearing House Correspondent Direct Presentation**   Payee's Bank   Payee

The entity or person making the payment, the payer, is referred to as the maker of the item. They mail or otherwise convey the check or draft to the payee. The payee deposits the item in its bank and it is then up to the bank to determine how it will receive value from the maker's bank. The maker's bank, having been debited for the value of the item, then charges the maker's account for the value of the check.

A check contains the names of the payer and the payee, the payer's account number, amount of the check, the date the check was issued and the name and routing number of the maker's bank. There is generally a coding strip at the bottom of the checks that enables high-speed reader/sorter equipment to process them quickly. In the US and Canada the coding strip uses magnetic ink character recognition (MICR); other countries use an optical character (OCR) system. Before the banks can process the check they must add the amount of

the payment to the coding strip at the bottom of the item, a manual step that adds cost and the possibility of error to the check clearing process.

The value of the check is usually made available on a provisional basis to the payee within one or two days. The value transfer is provisional because the payee's bank has not received final confirmation from the maker's bank that the item is valid. Settlement and finality are important issues in payments and are discussed in more detail in the Settlement section. In recent years, check clearing has been improved through the use of images of the checks, which speeds the clearing process while creating a few issues as well. Check images can be created in a number of ways. Sometimes the image is created at a retailer's point of sale where the check is scanned into the register. Yet another way to create check images is through the use of a smartphone or tablet.

2. High-Value Transfers

High-value transfers also referred to as real time gross settlement (RTGS) transfers are generally used between businesses when there is the requirement for fast, secure and final transfer of value. Frequently referred to as wires, they typically provide good value at the time of receipt and are considerably more costly than other electronic systems.

The following diagram shows the elements of a high-value transfer system.
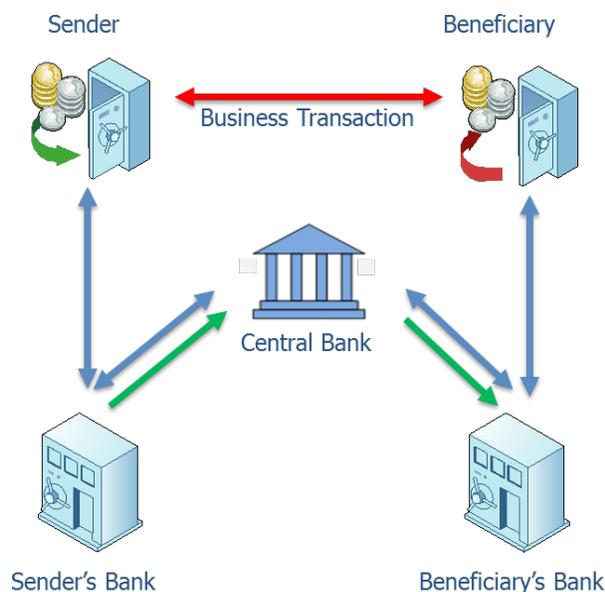
The sender (payer) instructs its bank in a mutually acceptable way to wire money to the beneficiary (payee). Included in the sender's instruction are the name of the beneficiary, the beneficiary's bank and other address details specific to the particular high-value system. In the case of Fedwire this would include the ABA number (American Bankers Association) of the banks being used along with the beneficiary's account number. The sender's bank would then use its direct access to the high-value system to instruct the beneficiary's bank to debit its account with the central bank and credit the beneficiary. Because the instruction is final and irrevocable and because the beneficiary's bank is receiving immediate value from the central bank it provides the funds to the beneficiary virtually on an immediate basis.

A significant point with respect to these types of systems is that the central bank stands as a guarantor of the system to both banks. The receiving bank can rely on the central bank for the funds in the event that the sending bank fails to adequately cover their account with the central bank. This element of RTGS systems adds considerably to the cost and is a major difference between conventional wire payments and new concepts such as crypto-currencies like Bitcoin or Ether and some same day batch payments.

In reality, making high-value payments is a bit more complex. There are a number of ways in which a sender can instruct its bank to effect the payment. These include bank-proprietary systems, ERP (Enterprise Resource Planning) file transfers through SFTP (secure file transfer protocol), third-party systems, SWIFT and occasionally the telephone or by fax. How the sender structures its message to the bank will determine the speed, cost and risk with which the bank can complete the transfer.

While the preceding applies to high-value transfer systems that are RTGS, there are still a few non-RTGS systems in operation. In these systems value is transferred between the sender's bank and the beneficiary's bank on a periodic basis. This reduces the immediacy of the transaction but not the finality. Because RTGS systems are important for global financial stability, non-RTGS systems are in a state of permanent—and rapid decline.

Fedwire, the U.S. based high-value transfer system, is an RTGS system and there are similar public and private large-value transfer systems in most countries around the world. Examples include CHAPS in the UK, LVTS in Canada and CNAPS in China.

3. Batch EFT Systems

Batch EFT systems, such as the ACH (Automated Clearing House) in the US and BACS in the UK were created to handle large volumes of relatively low value transfers. Because these transfers did not have the requirements of immediacy and finality that are common to high-value systems, participants would exchange batches of transfers on a daily basis settling the transfers the following day.

The following diagram shows the participants in the US ACH system; other global systems operate in virtually the same way.
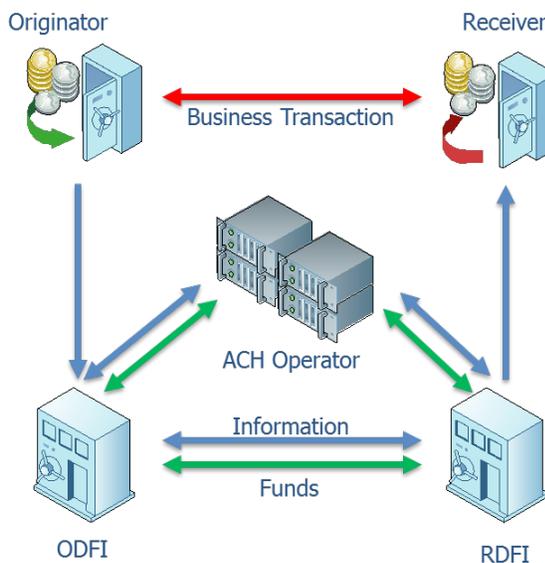
Like high-value systems, senders (payers), called originators in the ACH world, provide their banks—ODFIs (originating depository financial institutions) with payment instructions. Unlike high-value systems, there are usually multiple payments in each batch of instructions sent to the ODFI. The ODFI processes the instructions and sends a file of all customer instructions to its ACH Operator. The ACH Operator then distributes all of the payments in all of the batches to the appropriate RDFIs (receiving depository financial institutions) which then credit the individual receivers (payees). It is also possible within the ACH—and many other batch systems—to send instructions to debit the receiver's account. It is for this reason that the terms originator and receiver are used rather than sender and beneficiary.

While the value of ACH type payments is usually less than large value wires, there is still a considerable range of checks and balances that can apply to

these payments. These include debit filters and blocks, which restrict the ability of anyone that knows a firm's ABA routing code and account number from withdrawing money from the account using the ACH.

ACH has typically been a next-day payment system where it takes a day from initiation of the payment to value transfer by the bank. This is changing in many countries as batch ACH systems are being modified and changed to allow for same day processing and settlement. The US now allows payment systems users the option of same day settlement of both debit and credit ACH transactions.

In addition to same day ACH, many countries are also investigating changes to their batch payments systems to provide faster payments. Faster payments are end-to-end electronic solutions intended to provide near real time settlement 24 hours a day 7 days a week. Faster payments are typically limited to credit payments to reduce the risk of fraud and returned transactions. Most programs currently have transaction limits in the range of $25,000 to $100,000. The UK was one of the early leaders in the effort with their implementation of a program called, not surprisingly, Faster Payments in 2008. Several efforts are underway in the US to provide similar capabilities under the auspices of the Federal Reserve Bank's Faster Payments Taskforce. The taskforce was designed to establish a faster payments governance framework and recommend and establish rules to allow interoperability between systems.

The Clearing House, a payments clearinghouse and provider owned by the 25 largest US banks has begun a program called RTP or Real Time Payments that is currently in pilot in 6 banks.

ACH systems have typically been used for domestic transactions but are now becoming a way of transferring money between countries and currencies using cross-border ACH transactions. In this case there is an interface in the various national systems to provide currency conversion or to debit a currency account of the ODFI. Cross-border ACH solutions are typically much slower than high-value solutions but are often considerably less costly.

4. Card Based Payments

Card based systems, which include both debit and credit cards, are a fast growing form of payment and becoming the predominant channel for retail consumer payments. Although a third-party vendor may issue credit or debit cards, bank-issued cards are the most widely used. A credit card is issued against a line of credit that the institution or merchant has extended, whereas a debit card is issued against a deposit account held by a business or con-sumer. Stored value cards, such as gift and payroll cards, are a special type of debit card that do not access a specific bank account but are prefunded at the time of issuance. Some stored value cards can be "reloaded", where funds can be added to the available balance extending their usability.

The following diagram shows the participants in a typical card transaction. The cardholder presents a card for payment to a merchant. The merchant captures the transaction information and sends it to its merchant acquirer, typically a bank, for authorization. The merchant acquirer queries the issuing bank for authorization for the transaction via the appropriate card network which it then returns to the merchant. If the transaction is denied, the payment is cancelled. If the transaction is approved, the payment is completed. The merchant then sends the final transaction information to the merchant acquirer, either at the time of transaction or more typically in bulk at the end of the day. The merchant acquirer presents the transaction to the issuing bank, again using the appropriate network. Each card network settles the net amount of the day's card transactions between all of its member banks, typically through a separate batch payment system such as the ACH in the U.S. The issuing bank charges the card holder's account and the acquirer credits the merchant's account net of any transaction fees.
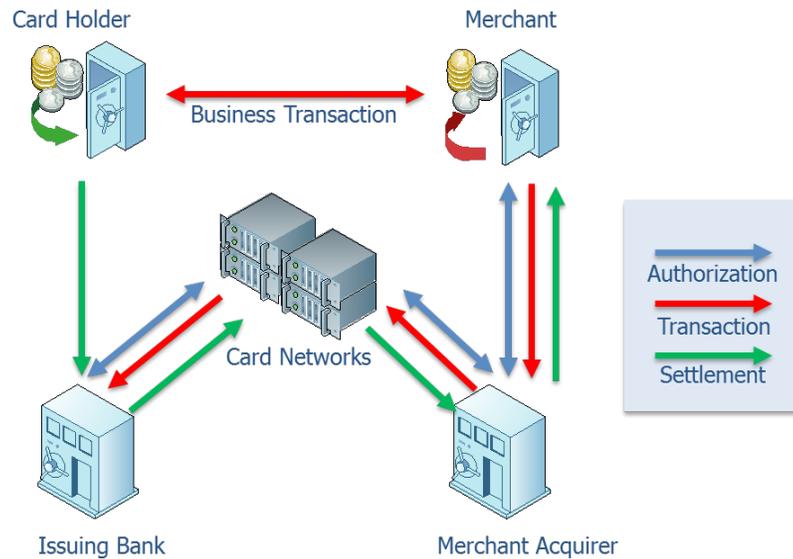
Cardholders can typically dispute charges assessed to their accounts for anywhere from 60 to 120 days after the originally transaction. These disputes may result in a charge-back to the merchant unless the merchant can provide proof of the original transaction, e.g. a signed transaction receipt in the case of credit cards.

Debit card transactions can be signature based in which case they are processed through the merchant's normal credit card networks and the cardholder signs a receipt at the time of the transaction. Alternatively, debit cards can be PIN-based in which case they are processed through an EFT or ATM network and the customer enters a personal identification number, or PIN, at the time of the initial transaction.

There are a number of variations on standard card payments, including procurement cards, single use card and virtual or ghost cards. Each of these is an attempt to improve the security of the basic transaction, but all use the same clearing channels as regular debit and credit cards.

From the casual participant's perspective the infrastructure and rules surrounding card payments are seldom given a second thought. Payments for small retail purchases are often made with a debit card, which can be swiped—or waved—past a terminal with charges taken directly from the user's bank account. While the marginal cost of these payments can be very small for the majority of transactions it is only when something goes wrong, such as fraud or theft, that issues relating to infrastructure and rules are given consideration.

III Payment Processing and Controls

The section on payment channels dealt with the interactions among the participants in a payment transaction. This section discusses the various elements in each payment transaction. The elements contained in payment processing and controls are essential for the efficient and effective completion of a payment. This is an individual/business-centric process consisting of six essential steps:

I.   Entry into the obligation to purchase goods or services or the incurrence of a legal obligation. This could result from a purchase order or an oral commitment to make a purchase.

II.   The obligation is approved and entered into an accounting system by the payer.

III.   The payment method, such as check, ACH, or wire, is selected keeping in mind that this might have been specified when the obligation was incurred. Since the speed and cost of receiving a payment are partial determinants of a seller's profitability, many sellers specify payment types and terms.

IV.   Initiation and execution of the payment by the purchaser.

V.   Funding and settlement of the payment.

VI.   Transaction reconciliation between company systems and external bank accounts.

In a large organization it is unusual, if not impossible, for any one individual or department to have detailed knowledge of the entire process. Instead staff become expert on their step in the chain such as vouchering and the numerous discrete tasks it involves. But all of the processes, which could involve departments such as payroll, accounts payable, human resources and purchasing are connected through the six steps described above.

Effective controls are needed to minimize the possibility and impact of payment fraud. If a fictitious obligation is approved and entered into the accounting system, it is very difficult for systems to prevent the payment from being made. A classic example is where a false invoice from a vendor for services never provided or received is entered into the system. Good controls can

make it difficult for fraudsters to enter and approve this data. Alternatively, fraudsters can try and change the name of a beneficiary on an already approved and legitimate invoice or payment instruction. Here again, strong controls make this more difficult and help to detect any successful alterations before the payment is final. Lacking the ability to modify payments or forge checks, a fraudster with direct access to an external banking system—along with a full set of user IDs and passwords could simply process a payment for themselves. This is the goal of many cyber criminals and hackers. Here again strong controls over passwords and network access can minimize the potential for fraud and theft.

Sound payment processing and effective controls must include adequate performance in three key areas:

I.   *Documentation:* A general description of the collection of physical or electronic evidence to establish that a payment request is legitimate. This could be a completed request for payment form with the underlying invoice attached or it could be an electronic message directing the recipient to a source where underlying evidence of the payment's validity may be found. Regardless of its form, documentation is the first line of defense—and compliance—in good payments practice.

II.   *Due diligence:* The process of ensuring that the documentation and other elements of the payment request comply with an organization's standards. Such standards can include a prohibition on the use of cash or the requirement to confirm new or modified payment instructions via a documented call-back.

III. *Confirmation:* The final step in verifying that the payment is valid and being directed through proper payment channels to the appropriate beneficiary. This is often the final chance to identify and reverse a potential fraudulent payment before funds are irretrievably lost. For example, there could be a change in the remittance address to which a check is mailed, or the account number for an electronic payment. Confirmation before the actual transaction is processed or posted can reveal the change and either stop the payment or attempt to recover the funds in a timely manner.

Documenting a payment is critical both in terms of making sure that money is not being paid for a non-existent obligation and in making sure the money is being paid to the right recipient. Losses can also result from paying an invoice

or payment request that was never legitimate in the first place. Unscrupulous vendors sometimes submit invoices for services never provided and employees have been known to submit falsified payment requests or invoices when they thought they could do so without detection.

Due diligence in documenting payments and confirming payment instructions is critically important. Recently a group of Nigerian criminals targeted firms that they suspected were making large vendor payments using the ACH. The criminals used the internet to harvest financial information about a group of vendors that were supplying a large number of businesses. They then used email and faxes to submit changes in payment instructions that were sent to selected customers of those vendors. Since they were using names of vendors that the companies were already used to paying for goods and services, they did not need to falsify invoices or payments. They just needed to change the payment instructions to redirect the payments to their own bank accounts. Because the financial teams at most companies are very busy, sometimes with limited staff dedicated to confirming payment instructions, there have been a number of cases where fraudulent changes of this type were made without confirming their validity using call-back procedures. The companies then made legitimate payments to their vendors except that these payments went to the wrong banks' accounts.

IV Settlement

Settlement, sometimes called availability, refers to the actual movement of funds from the payer's account to the payee's account - in other words the time at which the payee can have use of the money involved. It is different from finality which is the point in time when the payee knows that the money involved cannot be taken back by the payer or the payer's bank. Settlement becomes final when a payment is unconditional and irrevocable.

Finality varies depending on the payment system and the parties involved in the transaction. For example, payment systems that offer immediate and irrevocable value are called RTGS systems. Others, such as check-based systems, provide immediate information with value following shortly. But the value is sometimes contingent on the payer or the payer's bank not attempting to retract the payment, a right which can exist for sixty days or more depending upon the payment system. This can be a major issue for global companies using many different low value payment systems that feed into some sort of cash pooling or concentration system. While the amount of a rescinded payment may not be large, accounting for the rescission can prove challenging, particularly when it involves two currencies.

From the bank perspective the actual transfer of funds, or settlement, can be handled in several different ways. In a domestic transfer, one in which all parties are in the same country, settlement is often handled between the banks using common accounts held at their central bank. In the United States these accounts are held at the Federal Reserve Bank and referred to as reserve accounts. In a cross-border payment involving more than one country, banks typically use depository accounts with each other, called correspondent accounts, to settle their customers' funds transfers with the correspondent banks using their reserve accounts on behalf of their clients. Settlement through correspondent banks is illustrated in the following diagram.
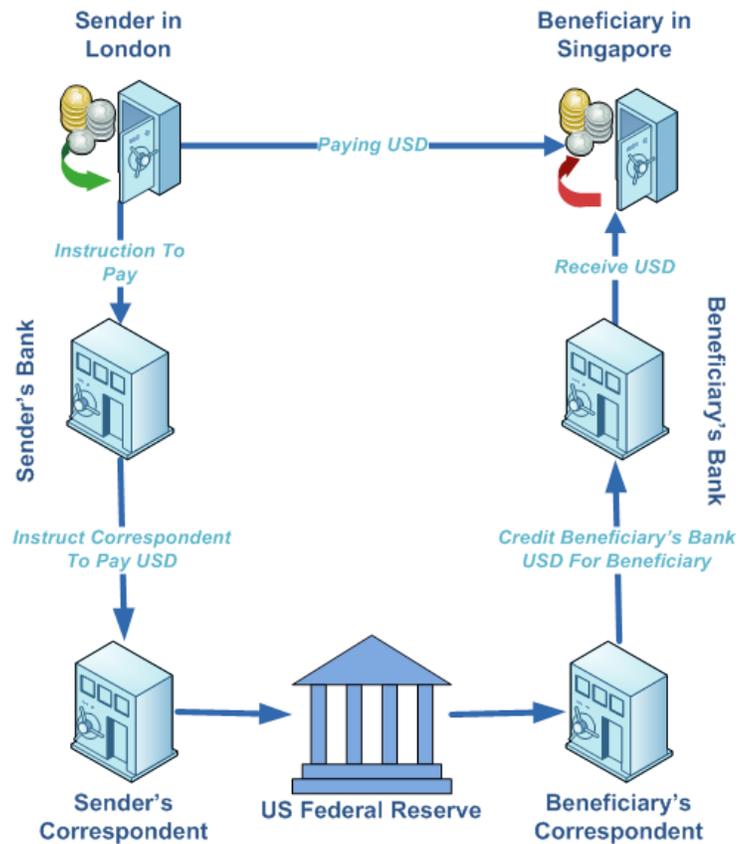
In the example shown, the sender based in the United Kingdom has an obligation in US dollars to a beneficiary in Singapore. Because currencies are always settled in the country of currency the sender's bank and the beneficiary's bank are required to use correspondent banks located in the US that have accounts with the Federal Reserve. This makes the transaction similar to the high-value example shown earlier with the addition of two intermediary banks. This addition adds a level of complexity—and cost—to a very basic transaction. It also impacts the quality of the information that travels with the payment which can often be truncated, removed or replaced with an intermediary bank's reference number. Global banks that operate in a number of countries often use their own branches as correspondents for certain types of transactions. This eliminates the total number of counterparties but not the number of steps that are involved in the payment.

The number of accounts maintained with other banks by a large institution for this purpose can run well into the thousands. These accounts are necessary to participate in global payments systems of which there are well over 750 in the world today.

V Alternative Payment Systems

The need to transfer value is not something exclusive to highly developed economies with sophisticated networks and consumer protection schemes. Merchants and money changers have been facilitating money transfers for customers for centuries without resorting to banks. Hawala, an informal money transfer network predates all the systems discussed thus far. In its modern form, Hawala is a way for payers and payees with limited access to technology and modern banking systems to transfer money between themselves.

A simple example of Hawala is illustrated in the following diagram:
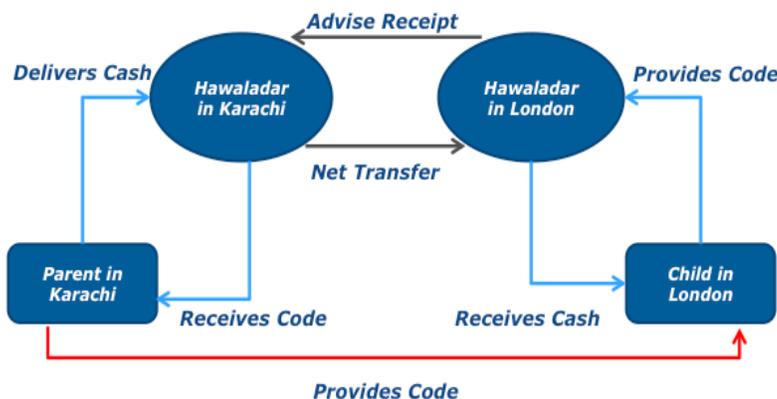
In the situation illustrated above, a parent in one city/country wants to transfer some money to a child in another city/country. Neither the parent nor the child has a bank account so the parent uses a trusted agent, known as a Hawaladar to act on his behalf. The parent brings an amount of cash to the Hawaladar and explains his intentions. The Hawaladar provides the parent with a code that the child will use to obtain the counter value of cash in London. The parent duly provides the child with the code and along with the name and address of a Hawaladar in London who will provide the child with cash when the appropriate code is presented. The Hawaladars then exchange details about the transaction in a way convenient to them and move the appropriate amount of money between themselves using the banking system.

This trust-based system is very effective and reasonably cost-effective for the participants. And these two attributes make it very popular for those with limited means and access to the formal banking system. The Hawaladars

function as banks, aggregating a number of small transactions, which are ultimately settled through the formal banking system. Unfortunately, Hawala has characteristics that also appeal to those operating outside of the law such as criminals or terrorists. A terrorist whose transaction would be flagged and rejected by a bank with access to government sanctioned parties lists would not be flagged by a Hawaladar who would bundle the transfer of funds with other, entirely innocent, transfers. For this reason, Hawala is not looked at with favor by regulators and other officials.

The need and interest of individuals to find low cost ways of moving money between themselves is not exclusive to the developing world. PayPal, a system that has been around for some time is a good example of a system that is low in cost and quite efficient. Essentially PayPal operates as the interface between the payer and receiver handling the payment process and other banking functions and settling the transaction using wire or ACH between the payer's bank and the receiver's bank. PayPal can handle multiple currencies and card payments but the key difference between a PayPal transaction and that of a conventional bank transfer lies in PayPal's role and obligations as opposed to those of a bank. Banks are highly regulated and operate with sophisticated security tools and capital adequacy requirements. If something goes wrong with a payment and the payer has complied with the bank's requirements, any loss or other problem is generally absorbed by the bank. While PayPal may have excellent controls in place, PayPal is not required to operate under the same restrictions and regulations and because of its lower costs and simple interface appears to be more consumer friendly—provided there are no failures of any intermediaries.

Most existing payments systems, whether bank centric or non-bank inter- mediaries like PayPal or Hawala are dependent upon the validity of secure internal ledgers to track deposits and payments. The validity and security of the ledgers is dependent upon the security and indirectly the reputation of the keeper of the ledgers, traditionally banks. With the advent of modern com- puter technology and the internet, shared open ledgers become an alternative to secure private ledgers. This is the concept of blockchain which has the potential to change the entire concept of banking and payments.

Instead of recording deposits and transactions in one or a few secure ledgers maintained by trusted intermediaries such as banks, blockchain transactions are recorded simultaneously in a large number of open shared ledgers that are encrypted so that previous transactions cannot be modified and only

users with the proper security keys can access accounts and order transactions. Even if one copy of the ledger is hacked or modified, the fact that it no longer agrees with all of the other ledgers proves that it is no longer accurate. Blockchain technology was initially used to create so called cybercurrencies or cryptocurrencies such as Bitcoin or Ether which combine the currency and the payment system in a single system. But it is important to recognize that while cryptocurrencies use blockchain, not all blockchain applications are cryptocurrency. Blockchain has other uses as well such as where transactions need to be recorded and reconciled, this can include property records and transfers and international letters of credit.

A person can acquire cryptocurrencies such as Bitcoin by purchasing them with a conventional currency or providing goods or services with the payment denominated in Bitcoin. The holders of Bitcoin can then transfer them amongst other Bitcoin holders using blockchain technology. The more blockchain users there are, the more secure the system is, as the ledgers of all users must agree to validate a transaction. If everyone used Bitcoin, it could be very difficult for conventional currencies or payment systems to compete. There are two aspects of cryptocurrencies that make this highly unlikely.

First is the exchange rate at which one can acquire or dispose of the cryptocurrency for a conventional currency. Like conventional currencies, the rates vary. Unlike conventional currencies the factors that drive this variance are not well known and there is no central bank of Bitcoin—or Ether - to intervene in the market to ensure stability and protect participants. As a result, Bitcoin and other similar cryptocurrencies typically are highly volatile. In addition, Bitcoin is not the only the well-known cryptocurrency. There are currently more than 100 different digital currencies, most of which are highly volatile and many of which are thinly traded. This creates a risk in using cryptocurrencies similar to the use of many conventional currencies—exchange issues and costs which include the possibility of significant loss of value for holders of cryptocurrencies.

Second, cryptocurrencies are not currently regulated or controlled by any government. It is tempting to see this as an advantage for those who wish to keep transactions confidential and avoid government oversight. These characteristics also provide significant opportunities for money laundering and illegal transactions which make central governments ever less likely to tolerate commerce denominated in cryptocurrency. Governments could, and several already do, prohibit Bitcoin operators from changing Bitcoins or other

cryptocurrencies into their currency and depositing the funds in someone's account at a bank in that currency.

Mobile currency or payments made using smartphones or electronic wallets and other technology devices are becoming increasingly common especially as traditional e-commerce becomes more mobile. Mobile payments are often considered alternative payments in that they use are initiated via phones or smart cards and do not appear to use traditional banking systems. On closer examination, however, most of the current mobile payments programs depend upon traditional payment channels such as cards or ACH payments. Card numbers and account information are stored in electronic wallets and used to initiate transactions using traditional card payments or other methods such as PayPal or GooglePay.

The one thing that is clear from looking at alternative payment systems from Hawala to Bitcoin is that the desire for alternatives to conventional systems is strong and technology enables some truly elegant ways of meeting this demand. The future is likely to see additional developments and variations to address the issues and opportunities inherent in alternative systems. For the present, alternative payments are a major risk item that treasury teams need to be aware of.

VI   Summary

Payments are a critical part of modern commerce that are simple conceptually but can be complex in application. The objective in this paper was to provide treasury practitioners with the basic principles of payment systems and their operation to help in understanding the issues involved in developing global account structures and using various treasury techniques. This paper also highlighted the need to monitor the impact on the payments landscape due to the use of new, alternative payment systems.

Operational details of major payment systems such as BOJNet and Fedwire were not included but can be found through a number of resources including the Bank for International Settlements (**www.bis.org**). Also excluded were details of access and transmission systems such as third-party treasury management systems and SWIFT. Similar resources for this area also exist on company websites and the SWIFT website (**www.swift.com**). Finally, there has been limited discussion of hybrid payment systems including mobile banking, payment cards and the like.

Regardless of the payment system or its ancillary details, there is a common set of elements that govern their operation. There will always be a sender and a receiver and both will generally need bank accounts. The banks holding the accounts will need to have a method of exchanging payment instruction among themselves and transferring money between themselves. Central banks will be needed to operate payment systems or operate as guarantors of the systems. More simply, while the names may change, the fundamental relationships and interaction will not.

Treasury Alliance Group consults with clients globally in the areas of treasury operations, banking, payments, technology and risk. With decades of experience our consultants deliver practical, realistic solutions that meet each client's unique requirements. We welcome the opportunity to discuss how our experience can help meet your challenges.

Contact us by email at contact@treasuryalliance.com or call +1 630-717-9728.