International Clearing and Settlement and the Blockchain

By Bob Tapscott

Bob Tapscott's experience as a former board member of Payments Canada (the Canadian equivalent of the ABA) has made him acutely aware of the complexities and delays that exist in today's International Clearing and Settlement systems. His subsequent research for the Blockchain Research Institute has given him unique insights into how blockchains may revolutionize these archaic systems reducing the time to settle from days (or weeks) to minutes, while eliminating the complex time-consuming hedging now needed to mitigate risk. His thoughts more extensively can be found in his recent book - **TRIVERGENCE: Accelerating Innovation with AI, Blockchain, and the Internet of Things, 1st Edition,** *available at your favorite online book store. He is available for speeches or podcasts, on these pressing topics. He can be reached at bob@tapscott.com*

This article will be in three parts, and published in three consecutive issues. This, the first part, will explain how the legacy systems for international payments work today and from where they evolved. I know many mystified and frustrated customers that are baffled why, in the age of bits, inter-country transfers take as long as they do. Once you have read this series, you will appreciate that, when payments are in systems between countries, even your banker does not actually know where your money is. The second will explain the current projects underway to modernize these systems. The third will explain how blockchain, properly deployed could create a better system, with near immediate transfers concurrent to not just hedging but entirely eliminating risk.

Idea in Brief

The Society for Worldwide Interbank Financial Telecommunication network is a member-owned global cooperative, the world's leading provider of secure financial messaging services, and the most trusted network in the world.

The global payment system is the lifeblood of world commerce. In the Internet era, the sluggish pace, high cost, and opacity of international funds transfers, both corporate and consumer, are a source of frustration. Money seems to hang in limbo between institutions for days. Clearing a check from France to the United Kingdom within a bank that has a large presence in both countries can take six to eight weeks!

Transfers are typically based on messages sent through the Society for Worldwide Interbank Financial Telecommunication (SWIFT) network. Most banks will not respond to an international funds transfer request unless it arrives via the highly secure and trusted SWIFT network. Although SWIFT messages for the movement of funds are near instantaneous, legacy processes within the banks are not.

Emerging blockchain technologies may diminish or even replace SWIFT and the systems it supports. Distributed ledger technology (DLT) introduces three possibilities for speeding transfers and lowering costs:

- DLT obviates the need for layer upon layer of complex systems talking to complex systems to manage risk, while adding fees for their services.
- DLT enables funds transfers between countries without any significant delay.
- In DLT, trust derives from mathematics, not from "trusted institutions with their fallible humans and their legacy systems.
- As international commerce has exploded, it has demanded a lower-cost system with fewer time-consuming intermediaries. Smartphone applications will become the ubiquitous payment mechanism for the unbanked. Near- and nonbank payment systems are flourishing with and without underlying blockchains.
- This is a game changer. Consumers and corporations will know exactly when their funds will arrive and need not guess at the final currency converted amount. Payment systems for the poor without intermediaries charging high fees will stimulate greater commerce by removing friction and inefficiencies that impede greater economic purpose.
- There are two approaches in technology to implementing dramatically new systems: (1) revolutionary (the big bang) and (2) evolutionary (the invisible whisper). Almost always, a massive change implemented quickly, no matter how well planned, has unintended and negative consequences. Therefore, the transformation of trillions in international payments made daily over archaic and complex systems to DLT technology must be evolutionary.

Introduction: How the Global Payment System Works

A simple foreign exchange (FX) transaction between banks in two countries can involve many players. The traders (or their computers) agree on the amount, the exchange rate, and the future settlement date of the transaction, which (for simple spot contracts) is typically tomorrow or the day after.

For a simple case, the financial institutions involved need to ensure that the funds are on deposit and available through the central banks of those countries with the currencies involved on the date that the transaction settles. On that settlement date when both central bank clearing systems are up and running, an inter-central bank clearing system known as CLS, an acronym originally developed for *continuously linked settlement*, coordinates the near-simultaneous bidirectional transfer of funds.

If the banks involved do not have accounts at CLS, then they must go through banks that do. To those outside the system, it is about the movement of money. To those inside, it is the movement of debits and credits, with historical audit trails as secured and trusted records, through many dual-entry accounting systems. In truth, it is simply the movement of trusted and regulated bits. Yes, it is just bits.

The counterparties must trust (and accept the risk) of the banks at both ends, the clearing systems of the currencies in their respective countries, the correspondent banks and for coordination CLS. With the possible introduction of DLT, many will trust the mathematics proven to secure token movements and their messages over the trust in the many institutions (and their costs) to maintain their systems properly. Why can those tokens not be dollars or Euros? The answer is that they can be and, we will argue, soon will be.

Why the System Sometimes Doesn't Work

Despite the significant efforts (and systems) to ensure that both sides of the transaction occur simultaneously, our assumptions sometimes fail us. Consider the largest petroleum deal in Canadian history. As negotiations were ending in Calgary, the press announced that the deal was signed. Based on this, East Coast bankers transferred billions of dollars from US banks to Citibank Canada's accounts. The East Coast bankers then went home.

However, the deal was not signed. When the few who were left still working at the US banks realized that they had transferred billions with no corresponding asset (an executed sales contract), they had to convince Citibank Canada to transfer the billions back or notify the US Federal Reserve that they were technically insolvent. It was for both me and Tim O'Connell, a very long night.

Who needs risk management when we can entrust the movement of funds to irrefutable math?

Had they used a blockchain-based smart contract, whereby the terms and conditions of the contract and its execution of massive funds transfers were mathematically inseparable, there would have been no risk. Again, who needs risk management when we can entrust the movement of funds to irrefutable math? There are simple solutions to today's complexity. The original blockchain created an immutable and mathematically provable log of activity. It combined public and private key cryptography to verify identity and a consensus algorithm to verify transactions and prevent duplicate or fraudulent spending, all in a peer-to-peer network. There is no requirement for centralized control. Each feature is not revolutionary. All were available in the 20th century. The simple combination of them may well be.

Bank of England / looking up by George Rex, 2015, used under CC BY-SA 2.0.

A History of Payment Systems

Moving money between accounts within a single bank is easy. The bank simply credits one account and debits another. The consumer covers the cost of these transfers in monthly

account fees. Moving money between banks in the same country is not quite so direct. The money is redirected through that country's central bank, be it the US Federal Reserve (the Fed), the Bank of England (BoE), the Bank of Canada (BoC), or the European Central Bank (ECB). Bank automation has sped up check clearing, but banks kept most of the benefit. New systems could eliminate paper entirely. By using less paper and more bits, the clearing systems have successfully processed the dramatic rise in payment volumes.

Decades ago, most countries allowed banks to hold and, for their own profits, use their customers' funds for many days on checks drawn between financial institutions before the funds were made available to the payee. Country by country, the rules have tightened.

In Canada, the larger value transfer system (LVTS) run by the central bank settles about $160 billion a day.

For example, the US Dodd-Frank Act of 2011 required banks to make the first $200 available the day after a deposit and, if applicable, pay interest. In the Philippines, next-day availability of funds became law in 2017.

In Canada, 30 years ago, the major clearing banks would run their own check sorting machines that sorted the checks deposited according to the various banks of origin. Once a bank had completed this sorting and determined what each of the other banks owed it, it would debit those other banks' accounts at the Bank of Canada, without their prior knowledge permission. The following morning, it would return the checks to the issuing banks to verify the amounts and the accounts of the debits made.

The systemic risk was obvious; a bank in trouble could simply take (in the middle of the night) billions from other banks' BoC accounts, in effect putting them in trouble without evidence to warrant their withdrawals. Typically, if a bank does not have the funds available at the central bank, the government will act as the "lender of last resort." Governments do go to extraordinary efforts (including reserve requirements) to prevent this from happening, but it does.

In the last 20 years, most advanced capitalist countries have implemented RTGS (Real Time Gross Settlement) systems that require settlement multiple times a day. This lowers the size of each settlement to avoid systemic failures. The amount of money is massive. In Canada, the larger value transfer system (LVTS) run by the central bank settles about $140 billion a day. The retail (smaller value) system run by Payments Canada clears about $24 billion a day. In 2023, CHAPS (England's RTGS system) was clearing £91.5 trillion; on average £364.4 billion daily. Given the massive volumes of money involved, no central bank wants to implement a new system until it is proven, beyond any doubt, to be flawless.

In 2016, Canada launched a person-to-person (P2P) payment system through a bank consortium called Interac where accounts can be tied to a cell phone number or an e-mail address. Through Interac, consumers can make near-real-time payments to one another, without knowing each other's account numbers. Accepting the cell phone text message on a deposit releases the funds into the recipient's account. Although to the consumer, the payments appear to be in real time, the funds actually are transferred between the banks later in the day through the central clearing system.

Venmo in the United States offers a similar service, but without direct access to the clearing system, days can pass between the payment initiation and the funds actually arriving.[8] Credit card users pay a three percent fee, but it is free otherwise.

In the summer of 2017, the five largest US banks launched a national consumer payments network called Zelle. The expectation is that two dozen smaller banks and credit unions will join over the next year. Like Interac in Canada, Zelle in the States will provide near real-time P2P payments between consumers. To hasten its adoption, Zelle is a free service, though the bank accounts it accesses typically charge fees.

International checks issued today in one country and cashed in another can be messaged through at least two central banks, a central bank transaction coordinating intermediary called CLS (continuously linked settlement), and possibly the accounts of other intermediaries called correspondent banks (Figure 1 below). Why did this complexity evolve?

The East India Trading Company and Ronald Coase

When we buy an apple at a market, we can see the apple and the vendor can see our cash. If one party cheats, it is easy to challenge the other. When we are 10,000 miles away, that approach is not possible. How does one establish long-distance trust? Very difficult. The other party is likely subject to laws that we are unaware of and vice versa. Clearly, for the exporter, it is imprudent to manufacture and ship without seeing the money. For the importer, it is equally imprudent to pay without seeing the goods. A conundrum.

Economist Ronald Coase presented his views on why the firm existed in a lecture in Dundee in 1932, when he was just 21 years old. He argued that the firm was created and still exists because going to market for the resources was more expensive than hiring those resources internally. More specifically, the firm exists to lower transaction costs.

The search for resources, their coordination, contracting and the establishing trust was easier inside the walls of the firm. He further argued that these transaction costs tend to grow as the enterprises grew. His insights were dismissed and ignored for decades, but he was eventually awarded a Nobel Prize in 1991.

Consistent with his argument the first large-scale historical answer to the transoceanic trust problem was simply to trust oneself. Global companies arose that could buy products in one market and sell in another. No intermediaries.

One example was the Dutch East India Trading Company. It is the largest company in world history. In today's terms, it was about 10 times the size of Apple.

Its English equivalent was also massive. Originally, its main product was shipping tea from India to England. Ultimately, it found the shipment of opium from Afghanistan to China more profitable. To ensure that its version of "trust" was not violated, the governor of India raised armies that were twice the size of England's. It was not the British government that seized India at the end of the 18th century, but an unregulated company that was run by an out-of-control governor and privateer (Robert Clive). Today, he is regarded as a sociopath.

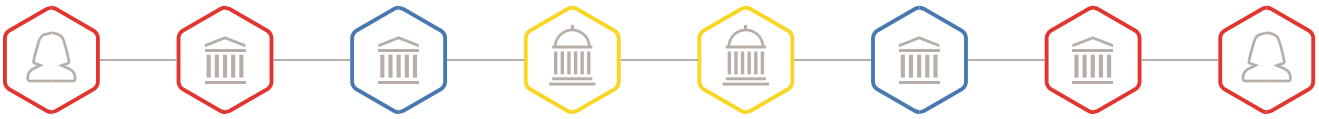
With only 35 employees in its head office in England, the English East India Company was once a model of efficiency. That was until Clive, as a rogue operative, raised and deployed an army of 260,000 without the head office's concurrence. An army was not in the company's business plan.

As Ronald Coase explained, when the transaction costs of this massive overhead (the army necessary to enforce the company's version of trust) became too large the company became unsustainable. When the English government ultimately took control of this private army, some argue it was the birth of the British Empire.

Even today, international payments pass from intermediary to intermediary in relay from sender to recipient.

Figure 1: Current Interbank Cross-Border Payment

Payer$ Recipient £



(intermediaries are called correspondent banks)

Payments between four or more parties that each trust one of the other parties that, in effect, link together for a transaction in a chain of trust. The rise of the mercantile bank, letters of credit and the associated pain.

The solve the trust conundrum emerged was the mercantile bank. It specializes and profits from managing and mitigating international trust issues between buyers and sellers that have no historical trusting relationship. Their major financial instrument to do so is called a letter of credit (LoC). This is a complex set of documents between four or often more parties that each trust one of the other parties that, in effect, link together for a transaction in a chain of trust.

If we don't trust the maker of goods, then someone we know may know someone else that they trust who trusts someone else who trusts another party, who trusts yet another someone that trusts the seller. It sounds completely unworkable, but for centuries these letters of credit were (and, largely, still are) the financial basis for international commerce.

So, for example, one bank would pay for the goods (and accept the risk) when they were manufactured to spec and available for shipment. This bank was then paid by another bank (who would then accept the transit risk) when the goods arrived and were inspected at the dock for export. This bank would then be paid by yet another bank (who would then pay and accept the next phase in the transit risk) when the goods arrived at the importer's docks. This bank was then paid by another, the bank of the ultimate buyer, when the goods arrived as ordered and inspected on the delivery dock of the purchaser. Documenting and negotiating the lengthy terms and conditions of these deals for their successful execution were slow and expensive (Figure 2 below).

For centuries, letters of credit were the grease that made international commerce possible.

The advising bank assured the seller and its bank that the buyer's bank was legitimate. Intuitively, we would expect that the time consumption and the profits of so many intermediaries in a letter of credit would grind the wheels of international commerce to a standstill. In fact, it was the opposite. For centuries, letters of credit were the grease that made

international commerce possible. Those that could negotiate these deals found them highly profitable, for the importer, exporter and all the intermediaries.

These processes, however, often failed in the negotiations of who would exactly accept what risk and when. To grease the international movement of goods, most exporter's governments would give an overriding guarantee to the guaranteeing banks through their import/export bank. Even with government backing, the "manufactured to spec" documents and the transfer of responsibilities with so many untrusting intermediate parties was a difficult but very profitable undertaking. For a bank anticipating the foreign payments of our customers is at best a guessing game that, depending on our effectiveness at playing that game, both we and our customers can win or lose. Today, to meet the foreign currency requirements of their customers, *Nostro* ("ours with you") and *vostro* ("yours with us") accounts are where banks hold their FX balances at other financial institutions.

Figure 2 – The Intermediaries Offering Guarantees In A Simple Letter Of Credit

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These processes, however, often failed in the negotiations of who would exactly accept what risk, where and when. To grease the international movement of goods, most exporter's governments would give an overriding guarantee to the guaranteeing banks through their import/export bank. Even with government backing, the "manufactured to spec" documents and the transfer of responsibilities with so many untrusting intermediate parties was a difficult but, when successful, a very profitable undertaking.

For a bank anticipating the foreign payments of our customers is at best a guessing game that, depending on our effectiveness at playing that game, both we and our customers can win or lose. Today, to meet the foreign currency requirements of their customers, *Nostro* ("ours with you") and *vostro* ("yours with us") accounts are where banks hold FX balances at other institutions in other countries to cover the possible foreign currency demands of their customers. For example, for a bank with branches in, say, 10 countries anticipating tomorrow's customer demand for foreign currency in an 11th country is difficult, if not impossible. Put in too much money, and funds are wasted. Put in too little and a customer's payments may enter into an indefinite limbo. Today, international checks are temporarily held, trying to assess which are legitimate payments and which are not. This is time-consuming and, for many, results in a manually intensive reconciliation process.

All of this is a result of the lack of trust between financial institutions and their customers. Lack of trust is an overstatement, but limits on the extent of trust between banks are institutionalized. In the game of risk management, we can be right on whom to trust but still lose. Through financial markets, one can lose by trusting someone who trusts a third party that turns out not be trustworthy. This is the ultimate nightmare for all bankers. It is called *systemic risk*.

In the game of risk management, we can be right on whom to trust but still lose.

For example, in 2008, those who trusted Goldman Sachs and then trusted AIG would have been in deep trouble without the Fed's massive intervention. When there is no bank crisis conservative and libertarians state that government should not intervene in saving a failing bank. They believe it is wrong to privatize profits and socialize bank losses. History has shown, however, that there is no such thing as an atheist in a foxhole, nor a libertarian in a banking crisis. The slow government reaction to the banking crisis of 2008 seriously deepened the crisis.

What DLT could bring to the equation (by guaranteeing trust mathematically) is clearly a game changer.

The Creation of SWIFT and Its Messaging Service

Up until the early 1970s, banks sent telexes for payment instructions between countries. Though the sums of money could be massive, the processes were manual and error-prone. The instructions were in unstructured sentences, typically in English. Sometimes the intent of these messages was lost in translation. Typed and sent over telephone lines, these wire transfers were easy to lose, easy to misinterpret and easy

to hack. Math was used to detect unauthorized changes to the message, but not as extensively as it should have been.

For example, one fraudster knowing that math was used to create a secret message authentication code (MAC) that verified the from and to counterparties and the amount, simply requested a small valid "wire transfer" message, intercepted it, and then changed the currency from Italian lire to US dollars before forwarding it on, knowing that it would be accepted as an authentic message.

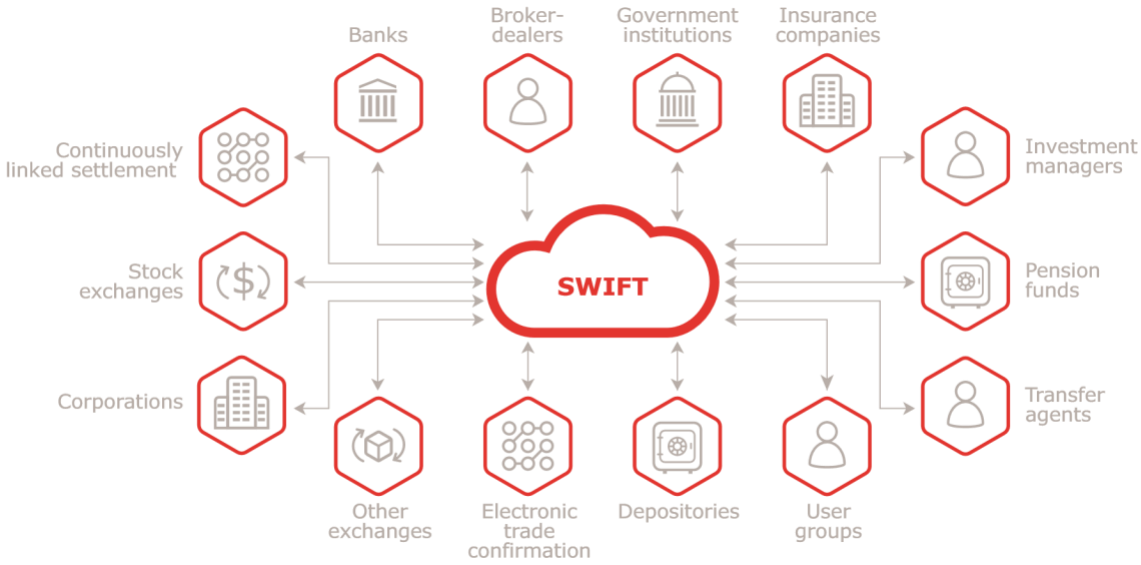
For a few thousand-dollar investment (then many millions of lire), the fraudster's return was exponential. There had to be a better way. There needed to be standards. The introduction of computers to business in the early 1970s enabled a more secure approach.

In 1973, the Society for Worldwide Interbank Financial Transfers (SWIFT) was chartered in Brussels to oversee and automate these processes. By 1978, SWIFT went online with the basic third-party controls necessary to secure financial payment messages between the larger banks and to ensure that two people at the sending institution were involved in "making and then checking" the message before it was sent and that the MAC, the pre-cursor to the digital signature, applied to all fields.

Each transfer was numbered in a sequence to ensure fraudulent insertion or deletion of messages was detected. Further standards were set for codes to indicate counterparties, currencies, dates, branches, intermediaries and action codes for a basic set of financial services. SWIFT message types have evolved beyond payments to include treasury and securities messages (Figure 3).

Figure 3: The Ubiquity of SWIFT

The Society for Worldwide Interbank Financial Telecommunication network is the world's leading provider of financial messaging services. It now has 11,000 members in more than 200 countries



Source: SWIFT (www.swift.com/about-us)

The standard for the message formats and metadata is now ISO 20022 (pronounced ISO twenty-oh-two-two).14 More specifically ISO 20022 is a harmonized set of extensible markup language (XML) financial

messaging standards, across payments, trade, securities, card and FX transactions. For changes to this standard, SWIFT is recognized as the ISO 20022 registration authority.

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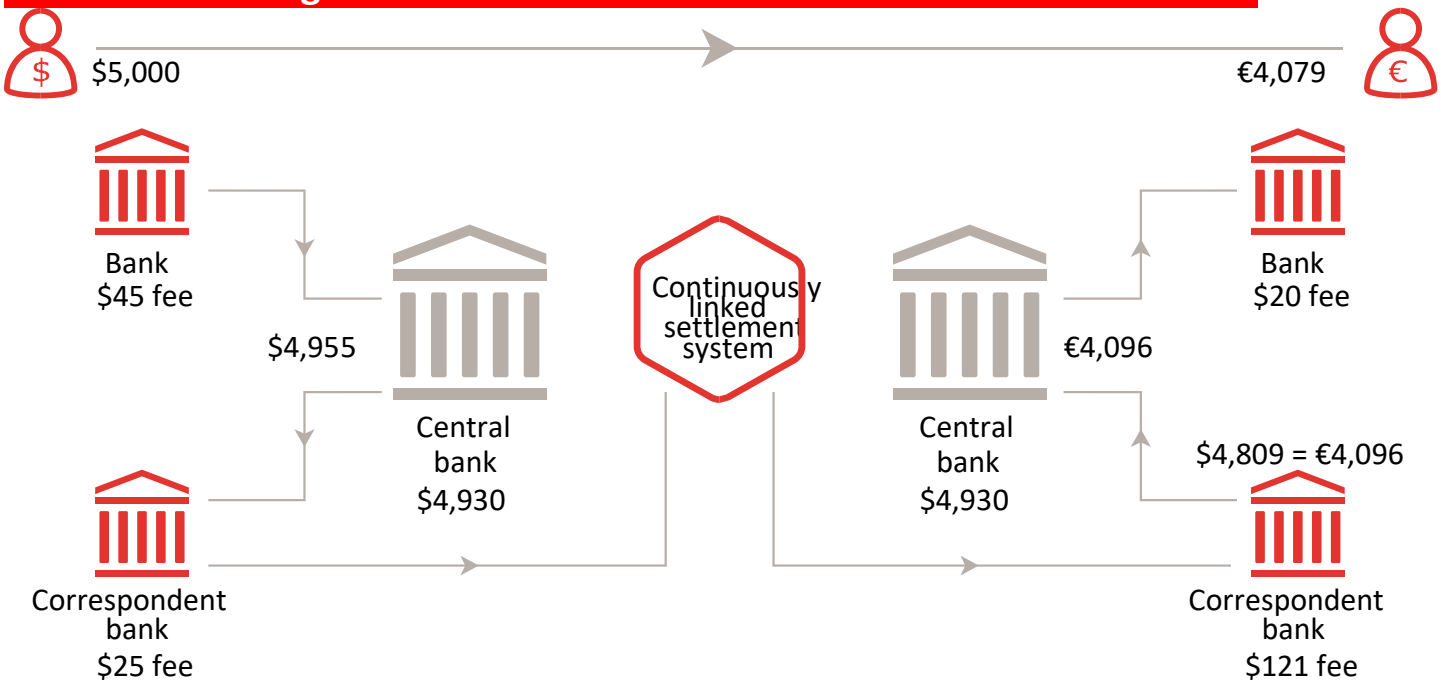
Today SWIFT sets the ubiquitous message standard, reference model, and runs the system and network for international interbank payment instructions. SWIFT is a cooperative society under Belgian law owned by its 3,000 financial institution members. It is one of the world's most trusted systems, averaging more than 27 million transactions per day. The service has expanded to include more than 200 message types including instructions for customer payments and checks, financial institution transfers, treasury markets, foreign exchange and derivatives, collections and cash letters, securities markets, treasury markets, precious metals and syndications and documentary credits. SWIFT facilitates about $150 trillion in transfers a year. That is roughly 50% greater than the planets GDP.

It is important to note that money does NOT flow through the SWIFT network.

It is simply a highly secured text messaging service for encoding, sending, receiving and then authenticating standardized structured messages from one financial institution to another. The actual movement of money typically occurs through the national clearing and settlement centers of the central banks. The timing and coordination of the movement of funds through multiple central banks and, possibly, other intermediary banks in the process makes the system slow and complex.

In a $5,000 transfer from the United States to Europe, $211 goes to the banks. Half of this sum is the difference between the mid-market rate for US dollars – Euro foreign exchange and the buy rate offered the customers. The rest constitutes fees paid to various financial institutions for their efforts.

Figure 4 – The Movement (Like Hopscotch) Of Funds From One Bank In The US To Another In England



Many financial institutions have looked at the efficiencies gained through 40 years of automation efforts as an area for more profitability, not better customer service. To illustrate, on August 23, 2024, at the TD Canada Trust site, we found that, if we converted one thousand US dollars to Canadian dollars and then back again, we ended up with $955.95. In other words, a typical bank would make ~2 percent profit in each direction on the FX conversion between two major currencies. The less significant (and liquid) the currency, the greater the loss would be to the customer because of the wider margin between the buy and sell FX rates charged.

Difficult to measure are the resulting delays in business, and the possible loss of interest in a transaction as the result of the delays anticipated. TransferWise, Venstar, OFX and other systems, although still based on fiat currencies, have discovered how to minimize the cost and the delays. Even before blockchain, the inherent inefficiencies and the profitable opportunities to disintermediate the legacy players and systems presented were compelling.

When SWIFT originally facilitated automated payments for institutions, it was primarily for large FX payments. In the 1980s, for a million-dollar cross-border payment, $50 to $100 in fees was considered acceptable. For a few personal transfers, there were always the inefficiencies of Western Union or the American Express office. With the birth of Internet commerce, however, when buying a $10 item online from China or sending money home to developing countries, $50 in fees is clearly unacceptable. The slow pace of transfers impedes commerce or could be disastrous in a family emergency. SWIFT, the central banks, traditional banks, and fintech are aware of this as a big problem, and the opportunity it offers.

The slow pace of transfers impedes commerce or could be disastrous in a family emergency.

Nevertheless, there is resistance to change. Many financial institutions have looked at the efficiencies gained through forty years of automation efforts as an area for more profitability, not better customer service. They have invested billions in these systems that they are in no hurry to write-off or discount the fees and profits they bring.

For a bank to anticipate the FX requirements of its customers correctly on a real-time basis is next to impossible. In addition, not all banks are happy about the delays and fees associated with cross-border payments. For smaller banks, having another country's currency sitting idle in its nostro accounts overseas, in case of demand, is a necessary but undesirable and unprofitable deployment of funds. For the bigger banks, however, that can act as foreign correspondents of smaller ones and that can reduce unanticipated demands by averaging over a much larger customer base, the profits are very real.

There is a lack of international standards or agreements on the speed of the movement of funds between countries. Expectations were once set based on paper-based manual systems. Inter-country regulations are typically far behind intra-country regulations. As such, there was little pressure for banks to pass on the advantages of automation to their customers. The banks looked at efficiencies gained through computerization as a source of profit, not customer service.

Nostro accounts have always been the most difficult to reconcile and the easiest to defraud. By using DLT, we might be able to eliminate the problems on nostro/vostro account reconciliation. Blockchain solutions improving end-to-end fee and rate transparency have the ability to radically disrupt this market.

Intermediary institutions between the transferor and the transferee's institutions hold and use the transferred funds for as long as possible. Today, a 30-day hold on an international funds transfer is still common. Clearing and settlement systems to avoid settlement risk may queue the funds temporarily overnight. In situations with more than one clearing system, this queue can sometimes last two or three nights. For profitable use of the funds, the banks may hold the currency much longer. Nevertheless, the consumer, confronted with an opaque process, is told that the funds are "in transit." We can track a $50 international Amazon purchase from the point of shipment to the point of delivery, yet $100,000 can hang in limbo for many days. Between countries' regulatory environments, there are few rules to protect the client, be they corporate or consumer.

Damien Vanderveken, head of research and development at SWIFT Lab and head of user experience at SWIFT, said that SWIFT is aware of the issues and has plans in place to address some of the frustrations: "If banks could manage their nostro account liquidity in real time, it would allow them to accurately gauge how much money is required in each account at any given point, ultimately enabling them to free up significant funds for other investments."

Between countries' regulatory environments, there are few rules to protect the client, be they corporate or consumer.

Very true. Nostro accounts in one country, which may be accessible by any of the bank's deposit accounts from many countries, have always been the most difficult to reconcile and the easiest to defraud. By using DLT, we might be able to eliminate altogether the problems on nostro/vostro account reconciliation.

Some of these plans are now in place. Vanderveken explained that the SWIFT global payment innovation (gpi) plans to rejuvenate the correspondent banking model by enabling a tracker feature on international payments for transparency of fees and the possibility of same day availability of funds. No doubt competitive pressures on the banks may result in a change of behavior. Then again, the status quo is so profitable, there will be much resistance to change.

Fintech start-ups that move money between countries have put pressure on the established players to be more responsive, now squeezing margins. Even when services offer nearly instant, nearly free transfers, what customers gain in speed and fees, they often lose in the exchange rate without even knowing it. Blockchain solutions improving end-to-end fee and rate transparency have the ability to disrupt this market.

Payment Systems to Manage Payment Systems

Launched in 2002, CLS is a system owned by the world's leading FX banks to address the differences in timing in settling the two halves of an FX transaction. More specifically, CLS is an international multicurrency clearing system designed to ensure that both sides of an FX contract are executed simultaneously, with certainty and with the finality of payment in two

different countries' clearing systems. The CLS system settles payment instructions of underlying FX transactions in 18 currencies through accounts with 18 countries' central banks. The technical coordination of that many banks' computers with each other in that many countries in that many time zones is not a trivial task.

The CLS system uses SWIFT messages to offer the largest FX cash settlement system in the world. Each settlement member (typically a bank) holds a single multicurrency account with CLS. At the start and end of a normal settlement day, each settlement member and each central bank has a zero balance in its account. It is not a "lender of last resort." Settlement members may submit payment instructions relating to their own FX transactions as well as the FX transactions of their third-party customers directly to CLS. CLS maintains accounts with each of the central banks whose currencies settle through CLS. CLS, settlement members and the national RTGS systems of many countries communicate via SWIFT messages.

CLS works by near simultaneously settling through the RTGS systems in the currencies and countries at times when both countries' central bank systems are open to send and receive payments. This enables concurrent settlement of the payments on both sides of an FX transaction, say, across the Atlantic. If exchanging dollars for pounds, the movement of the two currencies (dollars in New York and pounds in London) is thus coordinated in the short time window when both systems' central bank clearing systems are concurrently accessible.

Without CLS, it is probable that, in the 2008 bank crisis, FX payments would have been frozen and the Great Recession could have been far worse.

With an initial setup cost of over $300 million, CLS was criticized for its expensive structure. The cost of the cure was far (in historical terms at least) more than the disease. To the bankers, this timing difference potential problem is known as Herstatt risk. In CLS's defense, during the crash of 2008, it accomplished its primary mission of keeping FX markets liquid, when many other markets froze. Without CLS, it is probable that, in the 2008 bank crisis, FX payments would have been frozen and the Great Recession could have been far worse.

Setting up a clearing and settlement system to manage the movement of funds between clearing and settlement systems does, however, add complexity to complexity. Given the short overlapping time zones between the United States, Europe and the Far East, the flow of funds is queued and slowed. But it does accomplish its objective of managing timing settlement risk.

Although CLS's membership includes the world's largest financial players, for smaller players the indirect routing of FX transactions between organizations results in days, if not weeks of delays. Let's not forget that every private party in these transactions takes fees, and a delay of a bank taking action for a few days gives them the use of those funds for that period.

To someone outside the banking industry, all these intermediary systems may seem insane. To those with knowledge about banking systems and their history, it is perfectly logical. For bankers, each leg of the meandering journey was designed to ensure greater trust and address specific risks. As we have noted, these steps take time and money. The customer is forced to accept the delays and the costs of the overhead, as arbitrary as they seem.

More to Come…

In the next issue I will explain how different countries are updating their systems to be faster, more secure, yet still complex. I will elaborate further on how blockchains may simplify this process.