SWIFT INSTITUTE

SWIFT INSTITUTE WORKING PAPER NO. 2017-001

THE FUTURE OF CORRESPONDENT BANKING CROSS BORDER PAYMENTS

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PUBLICATION DATE: 10 OCTOBER 2018

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The Future of Correspondent Banking Cross Border Payments

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Abstract

This paper explores whether and how technological innovation, in conjunction with policy measures, can improve the process of correspondent banking cross-border payments. The paper builds on the empirical validation of existing shortcomings in this area of business by using a questionnaire and industry expert focus group sessions. Having identified the key areas of concern (e.g. cost, transparency, speed), several new network models for cross-border payments are assessed, in terms of their ability to address existing problems. Among the possible models, we also explore the use of innovative technologies such as distributed ledger technology (DLT). As a final step, we evaluate the different models and complement our findings with policy recommendations, in particular with a view to further streamlining Anti-Money-Laundering (AML) and Counter-Terrorist-Financing (CTF) as well as conduct of business rules in payments and supporting information sharing on suspicious transactions between institutions globally.

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ABBREVIATIONS

ACH = Automated Clearing Houses
AML = Anti Money Laundering
APIs = Application Programming Interfaces
BIS = Bank for International Settlements
CHIPS = Clearing House Interbank Payments System
CIPS = China International Payment System
CBDC = Central Bank Digital Currencies
CBCC = Central Bank Crypto Currencies
CLS = Continued Linked Settlement
CPMI = Committee on Payments and Market Infrastructures
CTF = Counter Terrorism Financing
DLT = Distributed Ledger Technology
DNS = Deferred Net Settlement
DvP = Delivery versus Payment
EACHA = European Automated Clearing House Association
FATF = Financial Action Task Force
FI = Financial Institution
FMI = Financial Market Infrastructure
FSB = Financial Stability Board
FX = Foreign Exchange
G-SIFIs = Globally Systemically Important Financial Institutions
gpi = Global Payments Innovation
IMF = International Monetary Fund
IPFA = International Payments Framework Association
ISO = International Organization for Standardization
KYC =Know Your Customer
LEI = Legal Entity Identifier
MM = Money Market
PMI = Payment Market Infrastructure
PSP = Payment Services Providers
PvP = Payment versus Payment
QU = Quantitative Easing
RMA = Relationship Management Application
RTGS = Real Time Gross Settlement
SEPA = Single Euro Payments Area
SIC = Swiss Interbank Clearing
SLAs = Service-Level Agreements
SME = Small and Medium-size Enterprise
SWIFT = Society for Worldwide Interbank Financial Telecommunication
UETR =Unique End-to- End Transaction Reference

1. INTRODUCTION

The ability to transfer money across borders in a safe and secure way is an indispensable requirement for the global economy. One of the main methods of executing money transfers globally is via correspondent banking arrangements. Correspondent banking covers the three pillars of cross-border payments, foreign exchange (FX) transactions and trade services. More than 11,000 financial institutions (FIs) engage with each other across more than 1 million bilateral correspondent banking relationships (CPMI, 2016).

In this paper we will examine the area of cross-border payments. There is no clear-cut definition of what constitutes cross-border payments and a multitude of scenarios could fall under this category. Broadly speaking, cross border payments can be defined as payments where the financial institutions of the payer and the payee are located in different countries. This is definition adopted by the EU payments legislation, such as the Payment Services Directive, according to which a payment is considered cross-border when the sending and the receiving Payment Service Provider (PSP) are located in different countries. However, from an operational point of view, a payment can be considered as cross-border when either the sending, receiving or intermediary PSP are located in different countries – i.e. for a USD payment between two German banks, when the payment transaction is processed via an intermediary bank in the US and settled in the US. For the purposes of this paper, we will consider a payment transaction to be cross-border if any of the involved PSPs involved in the transaction chain are located in different countries.

Cross-border payments are very relevant for the banking industry. At the global aggregate level these transactions reached 22 billion in volume, and $22 trillion in value based on figures from 2016 (Boston Consulting Group, 2018). According to McKinsey (2016) cross-border payments *"represent 20 percent of total transaction volumes in the payments industry, yet they generate 50 percent of its transaction-related revenues"*, (i.e. transaction related fees, float income and FX fees), which amounted to more than $350 billion in global revenues in 2014.

In recent years, new technologies and infrastructures have been developing, presenting both opportunities and challenges. For example, several new types of cross-border payment solutions have emerged both in the retail

and wholesale payments space. In retail, we have seen the rise of non-bank payment intermediaries, which leverage various technologies and network types (including mobile networks, e.g. M-Pesa in Kenya) and the emergence of schemes such as the Asian WeChat Pay (owned by Tencent) and AliPay (owned by Ant Financial, an affiliate of Alibaba), in addition to more established players such as Transferwise and Paypal. However, cross-border payment intermediaries often rely on correspondent banking structures to provide FX and settlement services. Furthermore, regional initiatives exist or are being explored for both Automated Clearing Houses (ACH) and Real-Time-Gross-Settlement (RTGS) system linkages. The Single Euro Payments Area (SEPA) is a good example of an initiative to simplify cross-border retail payments across a single currency area and beyond (Wandhöfer, 2010).

In addition, we have seen the emergence of cryptocurrencies such as Bitcoin (and 1000+ other types of altcoins). These solutions are offering a banking-free way to transfer value across borders and have found some appeal in the context of non-government controlled transactions as well as with regard to financial inclusion objectives across emerging economies. Focussing on the underlying distributed ledger technology (DLT), we also begin to see experiments that look to reengineer fiat currency based cross-border payments.

With the emergence and maturing of new technologies, including cryptography, cloud computing, the Internet of Things, as well as techniques such as homomorphic encryption and the prospect of Quantum computing, developing rapidly, there is a need to evaluate how far and in what manner a future global banking system can leverage these new digital pillars. At the same time the industry needs to address key questions, such as how to support business activities resulting from these new technologies and the business models that emerge, many of which require seamless integration of payments into service models (e.g. Uber). Whilst some of these emerging technologies will play a key role in the future, it is essential to align the deployment of those with clear regulatory, compliance and governance models as well as legal rules to ensure a practically workable and legally enforceable system that can be effectively – and efficiently - supervised. Other questions around technological

maturity, scalability and interoperability between DLT and existing systems as well as between DLT implementations will also need to be addressed.

The overarching rationale to strengthen cross-border payments, and in particular the settlement of payments, is reflected in their importance for financial stability as cross-border bank flows can increase the vulnerability of domestic banks and non-banks to external shocks. Despite the enhanced capital and liquidity requirements, including intraday liquidity requirements, as well as leverage limits imposed on financial institutions (FIs) by the Basel framework (Basel III), the potential risks to financial stability lie with the actual assets that FIs hold. As the quantitative easing (QE) strategies initiated by major central banks in the aftermath of the global financial crisis are now slowly coming to a halt, liquidity becomes only available through pledging government bonds to central banks. If those bonds become "junk" – such as during the Greek crisis - then the cash they can generate is minimal, which could lead to another Lehman Brothers scenario for many FIs. This is why the ability to settle with finality even during stress events will become more important going forward as otherwise bank failures could once again trigger systemic risk.

Against this background, the paper seeks to develop the building blocks for a future blue print for cross-border payments. A particular focus will be placed on the wholesale aspects of these flows, as they constitute a systemically important area of business with FI and corporate transactions representing 80% of the cross-border transaction value with 20% of the overall transaction volumes.

A first step in our analysis consists of the identification of the current challenges of the existing correspondent banking model. We then propose ways in which the industry can leverage new technologies and processes, complemented by standards, governance and policy recommendations in order to be able to deliver a substantial improvement in cross-border wholesale payments.

The remainder of this paper is organised as follows. Section 2 provides an overview of the current way that cross-border wholesale correspondent banking payments operate. It develops the context of regulatory and market challenges of this business and explains the way in which the correspondent banking market

is organised. Section 3 presents a review of the literature on key developments in the payment space. Section 4 sets out the propositions of this paper and describes the research methodology. Section 5 provides a summary of the empirical findings, covering the identified pain points and shortcomings in cross-border correspondent banking payments resulting from an on-line survey. Section 6 sets out the key requirements for the future of cross-border correspondent banking payments. Section 7 develops a set of design scenarios for an improved global cross-border payment process, based on the outcome of focus group meetings with key stakeholders (banks, central banks, regulators, technology providers). Section 8 combines an evaluation of the discussed scenarios with a set of policy and standards recommendations that will enable or support the delivery of improvements in the cross-border payments market. Section 9 concludes.

2. CORRESPONDENT BANKING: CROSS-BORDER PAYMENTS

In order to develop a set of design and policy proposals with a view to improving the state of correspondent banking cross-border payments, we will need to first of all understand what correspondent banking payments are and how they operate.

2.1 Definition of correspondent banking

There are various definitions of correspondent banking in the market today. In general terms, correspondent banking can be defined as *"an arrangement under which one bank (correspondent) holds deposits owned by other banks (respondents) and provides payment and other services to those respondent banks"* (BIS, 2016). Further expanding on this concept, we particularly like the definition that was developed by the Wolfsberg Group, which states that *"[c]orrespondent banking is the provision of a current or other liability account, and related services, to another financial institution, including affiliates, used for the execution of third-party payments and trade finance, as well*

as its own cash clearing, liquidity management and short-term borrowing or investment needs in a particular currency." (The Wolfsberg Group, 2014)[1].

Essentially, the correspondent banking model operates via an international network of FIs, which have bilateral account relationships with each other. A bank that is obtaining correspondent banking services from another bank holds a so-called *Nostro* (Italian: ours) account with such provider bank - i.e. 'our account with you' - where the account is denominated in a foreign currency. From the provider bank's side this same account is called *Vostro* (Italian: yours) account, i.e. 'your account with us'. Furthermore, there is a third term called *Loro* account (Italian: theirs), which refers to 'their account with them', or in other words an account held by a third-party bank. In the absence of the sending bank holding a direct account relationship with the receiving bank, the sending bank can transact via its correspondent bank, where that latter holds an account with the beneficiary bank. This tightly woven network of FIs, in which trust plays a central role, has developed to global dimensions over the last centuries. Despite the distributed nature of correspondent banking, the fact that FIs are holding balances with each other, extend credit lines to each, are exposed to vulnerabilities of operational failures and are highly interdependent does create systemic risk potential, which can be significant as we have seen during the banking crisis, which is why improving financial stability in this space is of crucial importance.

2.2 Key risks and challenges in correspondent banking

Key risks of the correspondent banking cross-border payments business include: market, FX, credit and counterparty and regulatory risk (e.g. Anti-Money Laundering (AML) and Counter Terrorism Financing (CTF)). Furthermore, technology and operational risks, as well as risks regarding the availability and cost of liquidity to support the business, do arise. In addition, correspondent banking cross-border payments are relevant for financial stability.

In today's cross-border high value interbank payment space, FIs often lack real time visibility as to the settlement status of transactions as these

[1] The Wolfsberg Group is an association of 13 global banks which aims to develop frameworks and guidance for the management of financial crime risks

payments move along the correspondent banking *Nostro*/*Vostro* account chain. High value transactions that are not properly settled could create a chain reaction in case of default of one of the parties, for example, when a significant payment amount does not reach the beneficiary bank, which has already credited its client. This could lead to a shortfall of liquidity in that bank, which in turn would be unable to settle its own obligations to other banks, therefore triggering a chain reaction, which could lead to default of this bank as well as other banks in the chain. Furthermore, the opportunity cost of wrongly assessed and misplaced intraday liquidity, as well as costs associated with missed deadlines for payments, create further challenges in cross-border payments. The risk associated with correspondent banks' intraday credit lines (usually uncommitted) versus truly funded positions is an area that will remain a risk management priority for clearing banks as long as there is no visibility on how a payment is funded.

An important challenge for the industry, as well as for regulators, is the continued decrease in correspondent banking relationships which results in lengthening of payment chains and increasing reliance on fewer correspondent banks (FSB, 2017). In addition, it may affect a country's or jurisdiction's ability to send and receive international payments. This, in turn could drive some payment flows into the unregulated sector, with potential negative consequences for international trade, growth, financial inclusion, as well as for financial stability.

This process, often described as "de-risking" (see Section 3 for a discussion), has many causes, but regulatory compliance is certainly playing a role. Because of increasingly tightening regulatory requirements (AML and CTF as well as regulatory sanctions requirements that bring with them the risk of regulatory fines) by key jurisdictions, such as the US and Europe, seventy-five per cent of global bank providers in this space have reduced their correspondent banking relationships (IMF, 2017) or withdrawn from this business altogether. As a consequence, the market has seen an increasing concentration trend, where almost half of the banks that took part in the Financial Stability Board (FSB) survey in 2017 reported reliance on no more than two correspondents for the majority of their cross-border wire payments traffic (FSB, 2017). We will be

developing a set of policy recommendations in Chapter 8 to address these challenges.

2.3 The cross-border payments process flow

Despite the risks and challenges described above, cross-border correspondent banking payments is a business characterised by ubiquity and its ability to provide reach, a core advantage over current alternative solutions. At the heart of the correspondent banking payments process we have the two key pillars of messaging and settlement.

For messaging in cross-border payments, the most widely used solution is provided by SWIFT, which enables payment messaging via its secure interbank network.[2] The payment message then normally flows through an entry posting system, which creates a debit to the sender's account in its books and either a credit to the beneficiary's account if this is held with the same correspondent or a posting to the payment system queue for settlement over the RTGS or other payment system, depending on value.

Settlement can be defined as "*the discharge of an obligation in accordance with the terms of the underlying contract*" (BIS, Glossary), which can happen in commercial bank or central bank money. Settlement in the correspondent banking space is usually performed in commercial bank credit via the *Nostro*/*Vostro* accounts across the payment chain. The final settlement of payment, however, is in central bank money via an RTGS system.

For international settlement in central bank money there is a system that supports centralised settlement finality for cross-border payments, CLS - a Payment versus Payment (PvP) settlement system. CLS was established to mitigate settlement risk in the FX market under the auspices of major central banks and enables settlement of FX transactions between participating members, and indirectly on behalf of end users, including FIs.[3] CLS significantly

[2] National payment systems do not generally use SWIFT and can operate on a variety of messaging systems. Even for cross-border payments there are alternatives to SWIFT.

[3] Although CLS is undoubtedly the most important global counterparty for cross-border FX transactions, it must be noted that it covers only a subset of the world's currencies (18 of the most actively traded currencies globally).

reduces the gross intraday liquidity required to settle individual FX transactions for an active FX bank on a daily basis but it does introduce a time specific intraday liquidity position, the pay-in/pay-out time for each currency – which in many instances is outside 'normal' settlement times. CLS is primarily concerned with FX settlement and addresses the well-known Herstatt Risk but does nothing for the greater value of securities payment legs or clean payment settlements (i.e. not involving FX).[4] Today (2018) around 50% of cross-border FX transactions are processed via CLS.[5]

From a process perspective, correspondent banking cross-border payment transactions can include multiple banks and can be executed via two different methods: the "*serial method*" and the "*direct plus cover*" method.[6]

1) The "*serial method*", a step by step process of payment instructions, e.g. a supply chain payment from Tokyo to Mexico, using SWIFT MT 103 messages, where the USD will be cleared and settled via an FMI in the US (where the US FMI uses an MT 103 equivalent message type) and then credited to the beneficiary Bank D in Mexico, by its USD correspondent Bank C (see Figure 1).

[4] "Herstatt risk" is an alternative term for settlement risk, with particular reference to FX transactions. The name comes from the collapse of the German bank Herstatt in the 1970s.

[5] https://www.cls-group.com

[6] Here we refer to transactions that are executed via the SWIFT network.

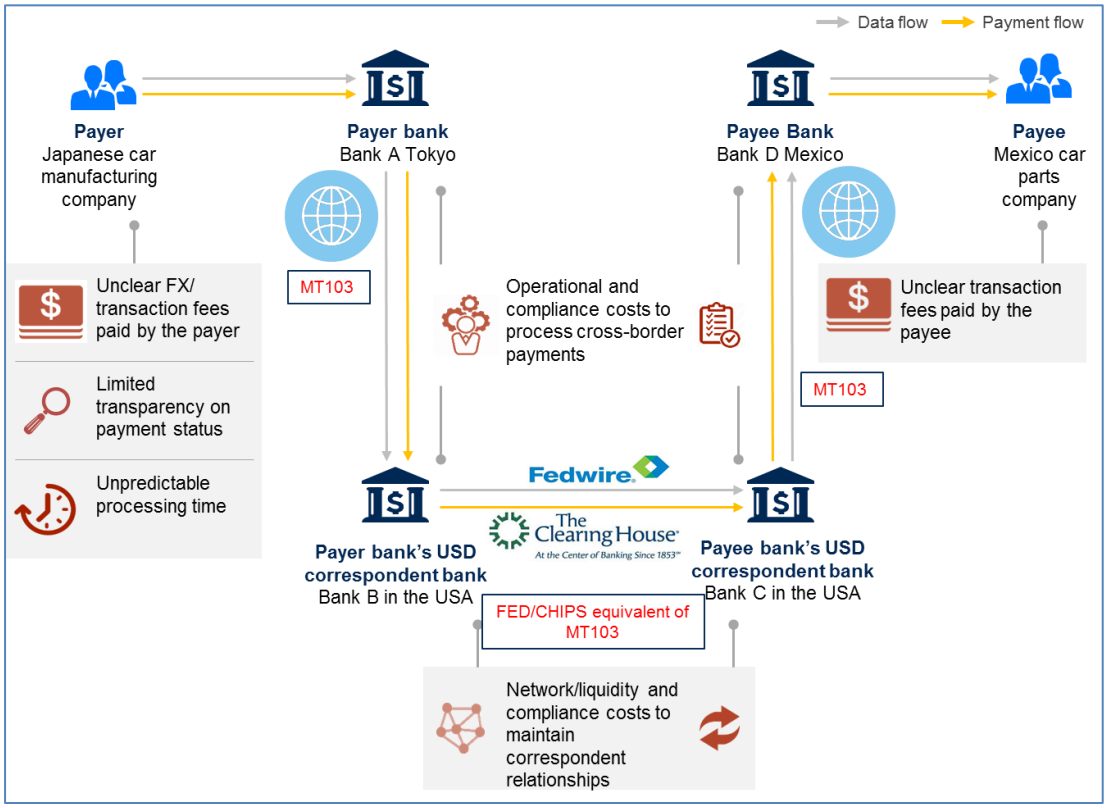

Figure 1: Correspondent Banking Payments Process "USD Serial Payment from a Payer in Japan to a Payee in Mexico"

2) The "*direct plus cover*" method, where the client payment instruction will go directly from Payer bank A to Payee bank D (using a SWIFT MT 103 message), whilst the settlement of USD will again take place between the two USD correspondent banks via the FMI. A SWIFT MT 202 COV message is used between the Payer bank A, the Payer's USD correspondent Bank B and the Payee's bank's USD correspondent Bank D, where in the latter case an MT 202 COV equivalent message is used for settlement across the US FMI. In this second scenario the payment instruction and the settlement of funds therefore travel separately (see Figure 2). Bank C then sends an MT 910 advice message or a MT 940/950 statement message to Payee Bank D. Please note that depending on the RMA (Relationship Management Application) the client payment instruction could also go directly from the USD correspondent bank B to Bank D in Mexico (using a SWIFT MT 103 message). Some banks may leverage their correspondents for this as large Global Transaction Banks have a broader RMA

network and bilateral RMAs are necessary between banks to communicate directly via SWIFT.

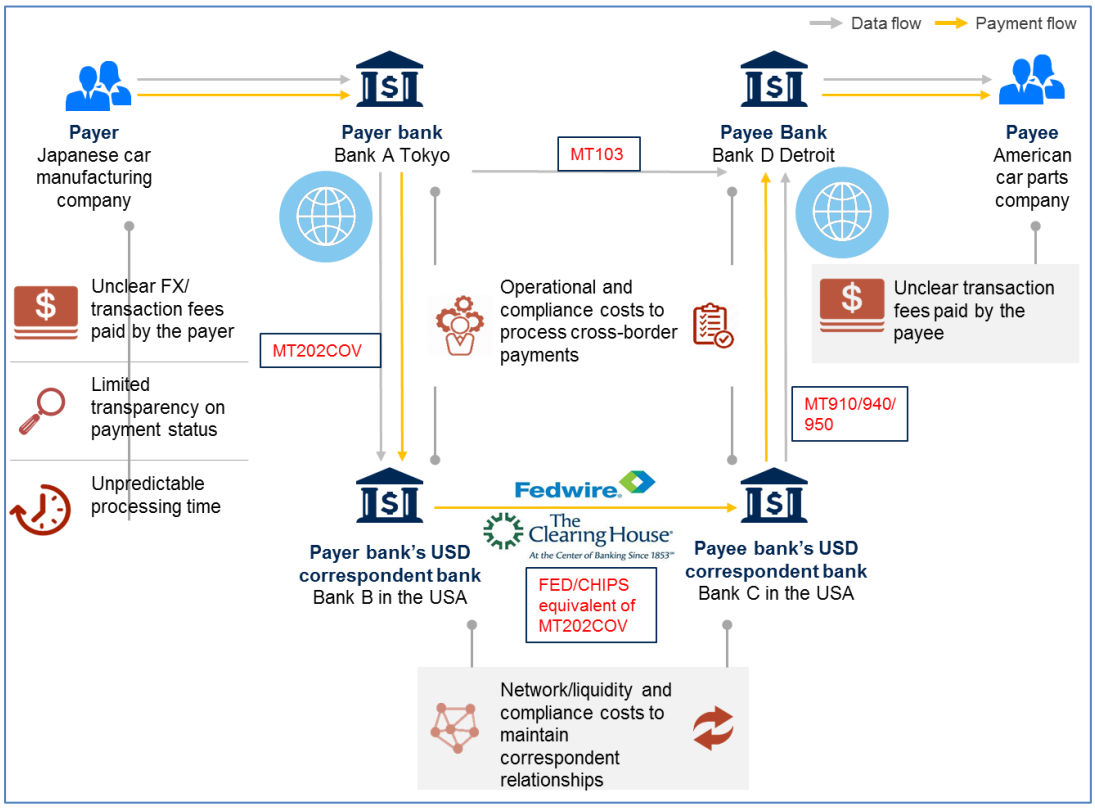

Figure 2: Correspondent Banking Payments Process "USD Direct and Payment from a Payer in Japan to a Payee in Mexico"

To avoid the transparency issues that were associated with the use of the MT 202 format for cover payments, where the clearing banks were generally not aware of the actual payment instruction and only 'blindly' operated the settlement of the financial flow and associated FX (see BCBS, 2009 and CPMI, 2016), the MT 202 COV message was introduced in 2009, so that the underlying settlement could be sanction screened, similar to the original MT 103 message. Counterparty risk may arise as banks can chose to credit the next bank in the chain before having received the cover payment.

There has been historically a lack of transparency related to the status of payments. There are many factors that can influence the speed of a payment, for example Spot FX if banks do not have the liquidity in the correct currency or the fact that an RTGS is closed when sending the payment. Depending on the parties and systems involved, several SWIFT messages could be used in the process. In

addition, some national payment systems (e.g. Fedwire and CHIPS in US, the Australian, Swiss and Japanese RTGS systems) do not use SWIFT messages.

In terms of costs of cross-border payments, transaction fees can be charged by each bank in the chain. Various charging models based on different charge codes exist (e.g. OUR/BEN/SHA)[7] and charging can depend on the market that the payment is being sent to and whether for example credit fee deduction practices are widely used or not. KYC/AML/CTF checks are conducted by each bank and manual intervention is often necessary if the payment stops. Given the fact that multiple banks are involved in the payment chain, multiple break points can arise, thus resulting in payment delays.

In addition, network and liquidity costs are involved in maintaining correspondent relationships. Costs arise for each bank that is involved in the process of funding interbank accounts and managing exposures. The majority of frictions and inefficiencies tends to emerge in the context of local market regulatory requirements, time zone issues and restricted FX in certain markets. Whereas a large portion of payments are processed straight through (STP processing), the remainder tends to increase costs due to various types of exceptions such as a sanction hit, returns or missing information. From a financial stability perspective, the fact that banks often operate on the basis of uncommitted intraday credit lines creates another level of complexity and risk, which resulted in significant problems during the financial crisis, because suddenly these credit lines that banks relied upon for liquidity purposes were closed by the providing banks in order to stop further contagion. This led to further stress in the market, bankruptcies and an overall reduction in world trade (Yan et al., 2016).

To summarise, despite the importance of correspondent banking relationships to facilitate global trade and economic activity, the current model presents a number of challenges. In the next section, we aim to identify and validate these pain points.

[7] Charge code OUR means that the payer bears all the transaction charges; charge code BEN refers to the payee paying all the transaction charges and charge code SHA represents the sharing of the transaction charges between sender and receiver of the payment.

3. LITERATURE REVIEW

There has been a growing literature on correspondent banking over the last decade. Primarily as a consequence of regulatory fines applied in the AML and CTF context, governments and market participants had to deal with the increasing challenge of correspondent banking providers withdrawing services from banks and PSPs that they deemed to be too risky. However, while there are a number of policy papers addressing the topic (see, for example, Alleyne et al. (2017), FSB (2017) and various consultancy reports), little attention has been paid so far by the academic literature, both theoretical and empirical.

On the other hand, there is a growing interest and emerging research literature on financial technology (or FinTech) and on crypto-currencies and crypto-assets. The way in which new technology is transforming access to finance for individuals, start-ups, Small and Medium Enterprises (SMEs) or corporates (for example through online platforms for crowd funding, marketplace/peer-to-peer lending, and third-party payment systems) is also gaining attention. There are a number of descriptive works covering these emerging issues, particularly in the form of consultancy reports or books (see, for example PwC (2017) Global Fintech Report).

For the purpose of this analysis, we will focus our literature review on three related areas: correspondent banking; settlement risk and finality; and new technologies in payments.

3.1 Correspondent banking

The decline in the number of correspondent banking relationships is a source of concern for the international community, as evidenced by the attention paid to the issue by supra-national organisations, such as the FSB, the BIS, the IMF and the World Bank, as well as leading central banks. Regulators worry that, in affected regions, the decline of correspondent banking may impact the ability of firms and households to send and receive international payments. This may drive some payment flows outside the regulated banking system, with potential adverse consequences for the stability and integrity of the financial system (FSB,

2017). In particular, the risks associated with money laundering and terrorist financing form a key part of the risk of flows passing through informal systems. Another risk is that those banks that have been de-risked could become 'nested' correspondents, i.e. they would maintain correspondent accounts through those banks that have managed to maintain their correspondent relationships. This would translate into longer interbank chains and the risks of separation of related inter-bank payment messages.

To find out whether such a range of de-risking is indeed happening, the World Bank (2015), with support from FSB and the CPMI, surveyed banking authorities and banks worldwide to examine the extent of withdrawal from correspondent banking, its drivers, and its implications for financial exclusion/inclusion. The participants in this survey, carried out in 2015, included 110 banking authorities, 20 large banks, and 170 smaller local and regional banks. The World Bank survey confirmed that most of the participants were experiencing a decline in correspondent banking relationships, particularly international banks. In terms of products and services, the most affected by the withdrawal of correspondent banking are: international wire transfer; clearing and settlement; check clearing; trade finance; cash management services; investment services and, to a smaller degree, foreign exchange services and lending. In addition, the ability to conduct foreign currency denominated capital or current account transactions in US dollars (USD), Euro, pound sterling (GBP), and Canadian dollar (CAD) in particular has also has been significantly affected. Most respondents indicated the following as the main reasons driving their decisions to end correspondent banking relationships: economic slowdown in some regions and regulatory risk (AML/CTF), including concerns about international and national sanctions. Overall, the results of the survey indicated that, while large banks might be cleaning up their balance sheets and ending relationships with customers deemed to be risky, the risks might end up in sectors that are less transparent and less regulated, thereby increasing systemic risk. This is a cause for concern for regulators. To address these concerns Grolleman and Jutrsa (2017) present a framework to monitor the development of correspondent banking relationships, to be used by national central banks and supervisory authorities, based on the fact that national authorities can access

more granular, bank level data, and are better placed to conduct detailed market analyses. The monitoring framework proposed by Grolleman and Jutrsa (2017) includes two scenarios: (1) a Minimum Scope Template for collecting data from banks and the conduct of a full assessment of the domestic banking system's ability to access the international payment system, and (2) an Expanded Scope Framework, which includes the values and volumes of individual transactions using banks' SWIFT payment data.

In March 2018, the FSB published a progress report addressing the decline in correspondent banking, following its four-point action plan of November 2015 (examining dimensions and implications of the issue; clarifying regulatory expectations; building domestic capacity and strengthening tools for due diligence in correspondent banking). The progress report highlights promising developments. These include the Wolfsberg Group updating its correspondent banking due diligence questionnaire, which will support a more standardised collection of information on correspondent banks. It is important to note however, that whilst increasing the efficiency by streamlining the due diligence process, the practical problem in the market is that there are banks seeking correspondent services that do not have the necessary controls in place. The FSB also reports on the latest additional steps including: (i) data collection and analysis: the update of global data on correspondent banking relationships, using data provided by SWIFT as of end-June 2017; (ii) clarifying regulatory expectations through new guidance by the Financial Action Task Force (FATF) and revised guidance by BCBS; (iii) further steps to promote the coordination of domestic capacity building to improve and build trust in the supervisory and compliance frameworks of affected jurisdictions; (iv) develop technical solutions aimed at improving the efficiency of due diligence procedures and reducing compliance costs; and (v) stocktake on remittance service providers' access to banking services, including recommendations to improve accessibility.

3.2 Settlement Risk and Finality

Settlement risk is the risk that settlement in a funds or securities transfer system will not take place as expected and may comprise, credit and liquidity

risk, as well as operational and legal risk, where all of these have the potential to trigger systemic risk (ECB, 2010). Secure settlement of payments is therefore at the heart of protecting the stability of the financial system. It is in this context that the role of payments has gained such importance over the last decades.

In order to remove settlement risk, settlement needs to be final. Final settlement is defined as "*the irrevocable and unconditional transfer of an asset or financial instrument, or the discharge of an obligation by the FMI* [financial market infrastructure] *or its participants in accordance with the terms of the underlying contract. Final settlement is a legally defined moment*." (BIS Glossary, 2018).

Settlement finality can occur in different qualities of settlement assets, reflecting different levels of risk. For example, settlement in central bank money is considered as the safest settlement asset (BIS, 2003) but can only occur in central bank RTGS systems and between direct participant accounts in the books of the central bank. Unless an FI holds an account at the central bank, all other settlement is in commercial bank credit, represented by commercial bank account balances (King, 2016). To note here is that FIs settling in central bank money can also be leveraging intraday liquidity lines for this purpose, meaning that they settle on the basis of central bank provided intraday credit lines.

Settlement in commercial bank credit, where this money represents a liability of a commercial bank, "…*carries a risk: settlement funds may not be available in the event of the insolvency of the commercial bank that is providing the settlement services*." (Francioni and Schwartz, 2017). This represents a key risk in correspondent banking payments.

In parallel to the work of central bankers and policymakers, there has also been an increased academic interest in payment economics, a strand of the literature which examines the purpose of the payment infrastructure and its design in terms of mitigating settlement risk that can arise between counterparties as well as in view of providing efficiencies and the ability of economic actors to transact. Wandhöfer and Berndsen (forthcoming) provide a comprehensive review of the literature on payment finality and settlement.

3.3 Innovation in payments

Beyond these developments, the payment services sector has seen considerable technological change and has been subject to increased regulatory scrutiny and reforms. Examples of significant innovation in the retail payment space include the SEPA initiative in Europe (Wandhöfer, 2010) and the arrival of real-time retail payment systems. At the same time, the wholesale payment space has moved from deferred net settlement systems (DNS) to real time gross settlement systems (RTGS) and several central banks are currently in the process of renewing their systems (e.g. Bank of England RTGS review). The payments sector has also seen the emergence of a range of new providers, such as Google, Amazon, Apple and PayPal, offering various digital wallet or e-wallet products, specific methods for payments over the internet and mobile payment services and applications.

There is now a rather sizable volume of research on FinTech, largely produced by consultancy companies, incumbent firms, industry associations and regulators, although academic studies are also emerging. The past decade has seen an increasing number of FinTech start-ups and non-bank PSPs entering the payment arena, taking advantage of regulatory change (such as the European Payment Services Directive 1 and 2) and new technologies, including cloud-based solutions and application programming interfaces (APIs).

Many economists agree that the future of money will be digital. Bofinger (2018) identifies four major areas where digitalisation could modify the traditional forms of money and credit and as a consequence modify the theory and practice of monetary policy:

- the substitution of cash with electronic money (in a retail payments context);
- the substitution of traditional bank deposits and bank notes with cryptocurrencies;
- the substitution of bank deposits with central bank deposits for everyone ('universal reserves');

- the substitution of bank lending with peer-to-peer lending on the basis of digital platforms.

Banks face new challenges, and their central role in the payment system could be diminished. The impact of new technology in payments, particularly digital and crypto currencies, is still unclear. The potential of DLT for wholesale payments is increasingly interesting and a number of players believe that DLT can be leveraged to transform the payment industry, including correspondent banking.

4. PROPOSITIONS AND RESEARCH METHODS

Against the background of technology innovation, the question of what the future of cross-border payments will look like is becoming more and more relevant and will be explored throughout the remainder of this paper.

With the arrival of technologies such as DLT and digital tokens or crypto currencies, the question is whether we may be able to create a tool that would deliver a global payment system that is fit for the global market? Our research provides a step forward on this quest by posing the following questions:

1) What are the correspondent banking industry's major pain points with the current way the market operates?

2) What key requirements an improved future cross-border payments model would need to satisfy?

3) What could a viable design for future cross-border payments look like?

4) Which standards, regulatory and governance related principles should be applied in order to support such a future model?

Our research strategy includes a combination of theoretical and empirical work. To address the first question, we have designed and carried out an on-line questionnaire aimed at industry participants. For the other three questions we have held industry focus group meetings.

5. EMPIRICAL FINDINGS: SHORTCOMINGS IN CROSS-BORDER PAYMENTS

5.1 On-line questionnaire

We begin with a review of the existing technologies and try to assess the key frictions as perceived by market participants. To this end, a short online survey (see Appendix 1) designed to identify the key pain points and issues faced by banks in the cross-border payment space was sent to more than 2,000 bank contacts during the months of September and October 2017. We targeted industry participants across the banking, financial institutions and non-bank payment service providers, as well as the industry expert universe.

The questionnaire had two main aims:

- Validation of pain points
- Innovation approach

Although the number of respondents was lower than we anticipated (with a response rate of around 5%) we had nonetheless 95 respondents, from 37 countries. Please note that such a high non-response rate is quite common for these types of online surveys. Most respondents' organisations were headquartered in Europe (over 50%), with organisations from the Asia-Pacific region second, followed by the U.S.A. Most respondents work for banking institutions (around 90%). We had an almost even split between Providers (45%) and Users (55%) of correspondent banking services, as illustrated in Figure 3.

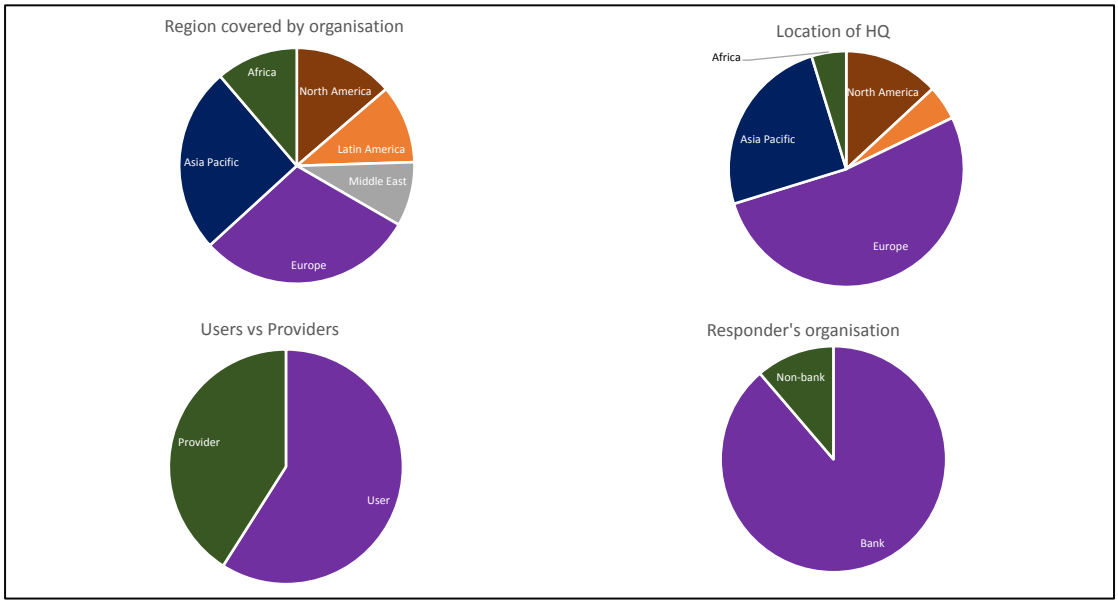

Figure 3: Characteristics of respondents

Tables A2.1 to A2.3 in Appendix illustrate the answers to the on-line questionnaire. Table A2.1 reports all respondents; Table A2.2 illustrates possible divergences of views between users and providers while Table A2.3 illustrates views and perceptions in different regions (Europe, Asia & Africa, Americas).

The on-line survey allowed us to identify, validate and rank the key pain points, as illustrated in Figure 4. The strength of problem has been categorised as the ratio of respondents who agreed with the proposed statement to those who disagree.

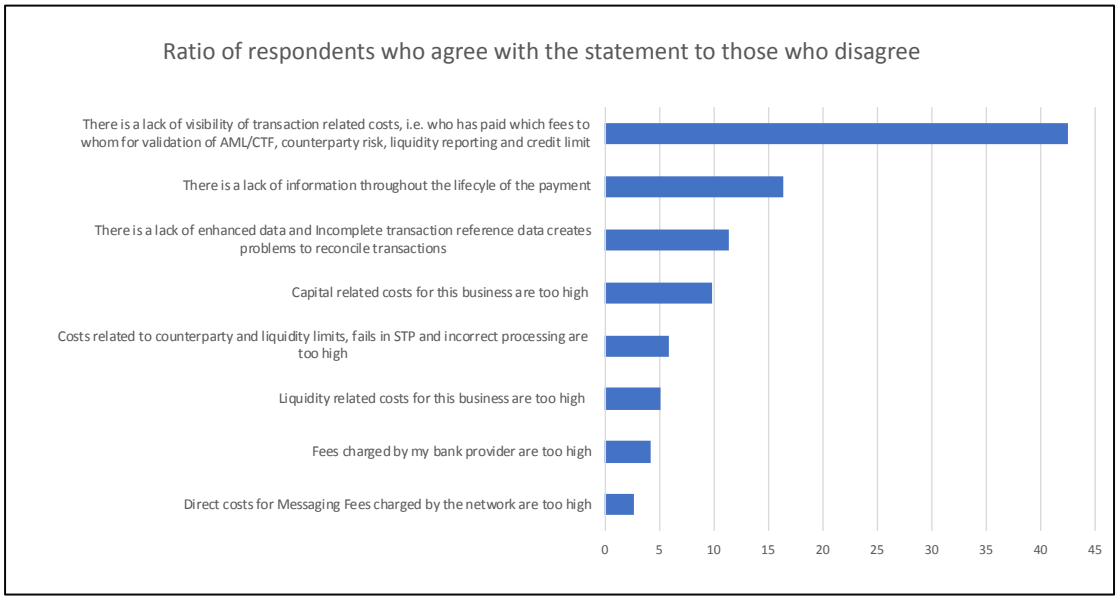

Figure 4: Pain points identification and ranking

As summarized in Figure 4, respondents felt the strongest about the lack of visibility of transaction related costs, followed by the lack of information throughout the lifecycle of the payment and lack of data and/or incomplete transaction reference data, which create problems to reconcile transaction. From these results, it emerges that pain points related to information and transparency are even more relevant than cost-related frictions, such as liquidity and capital costs, and costs for messaging fees and costs charged by the provider. The survey results then constituted our starting point of discussion with the focus group, where the aim was to propose a potential approach to remove the identified pain points.

5.2 Focus groups

Following the results of the survey, we engaged in a number of focus group meetings. At the first focus group, held on 15 January 2018 in London, participants' views were sought on the survey results and the ranking of pain points and whether the latter was in line with the current observations on de-risking in the market. The output of this meeting was an agreement on key requirements for an improved future of cross-border payments, as set out in Section 6.

The second focus group meeting was held on the 7 March 2018, following a conference call held in February. This meeting focused on elaborating and discussing a set of potential design scenarios for the future of cross-border payments with the objective to align as much as possible with the set of key requirements that had been previously identified. As a second step the group also discussed a number of areas that could be improved through policy, regulation and standards with a particular view on the regulatory challenges associated to cross-border payments. The output of these discussions has been used as a basis to develop Section 7.

6. KEY REQUIREMENTS FOR A FUTURE CROSS-BORDER CORRESPONDENT BANKING PAYMENTS MODEL

Building on the identified shortcomings and pain points from an industry practitioner point of view, the first focus group sessions developed a set of key requirements that a future cross-border payments model would need to be able to satisfy.

Based on the experiences of the financial crisis of 2008/2009, when the lack of transparency on where market liquidity actually was, combined with a significant shortage of liquidity supply, an overall need to safeguard financial stability in this space became apparent. Against this broader background the discussions of the focus group arrived at the following key success criteria for a sounder and more efficient future cross-border payments model.

6.1 Key Requirements:

1. Settlement (including synchronisation)
2. Liquidity efficiency
3. Availability (technical access and uptime)
4. Ubiquity (relevant connectivity between systems and players)
5. Transparency
6. Predictability
7. Interoperability of systems

We will discuss these key requirements in detail below. In addition, focus group participants recommended that particular attention should be paid to policy, standards and best practice in the industry, as to achieve a blueprint for a substantial improvement in cross-border payments.

6.1.1 Settlement (including synchronisation)

Settlement of transactions with finality is a key requirement in order to mitigate credit risk. Settlement can occur in commercial bank credit as well as central bank money, which have different risk factors. Irreversibility of transactions and legality of settlement is determined by law. The

recommendation from the focus group is that for significantly high value transactions, settlement in central bank money should be the preferred option from a financial stability perspective. This would exclude transactions across an individual FI's own network.

In the context of emerging technologies such as DLT one of the central questions to address is 'how to create both PvP and Delivery versus Payment (DvP) outcomes in this new environment', i.e. atomic settlement' via code, rather than law. The early conversations around 'synchronisation' are starting to point in that direction.[8]

6.1.2 Liquidity Efficiency

Managing the balance sheet cost of supporting payment flows through efficient use of collateral/cash to safely process payments is a crucial requirement for an improved global cross-border payment process. Liquidity management tooling and cash/collateral movement would be features that enhance a commercial bank's ability to manage liquidity. Transparency of participants' balance sheet exposures at any point in the chain should be a key priority for banks. Furthermore, in order to reduce exposures between commercial parties and resultant cash/collateral needs, whether bilateral or multilateral, netting solutions have the potential to support efficiency of participants across payments and FX. This would implicitly add some delay in the transaction against the benefit of reducing cost and counterparty risk.

6.1.3 Availability (technical access and uptime)

This requirement is essential in order to make payments, as relevant systems – messaging, internal bank systems, CLS, etc. – will need to operate (i.e. be live) and do so properly and safely. In the scenarios developed in Section 7, availability will specifically indicate the live status of the respective scenario (that is, the technology/system is available today, at least in some form, rather than being potentially available in the future).

[8] Synchronisation in this context is the concept of a payment (or group of payments) settling if and only if another payment (or set) also settles (Bank of England, 2018).

6.1.4 Ubiquity (relevant connectivity between systems and players)

Connectivity is at the heart of a network industry such as payments. This criterion looks at the existing network of connected parties and the network dependencies, as well as the ease of connection to additional parties (e.g. scalability and potential access), including other networks or DLT like structures.

6.1.5 Transparency

This key requirement considers primarily the traceability of transactions, complemented by data around fees. The relevance of transparency as a key requirement was also evidenced in our empirical questionnaire, as respondents indicated that frictions around information and transparency were considered the most relevant pain points (see Section 5.1).

6.1.6 Predictability

In line with the empirical questionnaire results, this requirement considers service-level agreements (SLAs), rulebooks and process timescale-guarantees that enable certainty of sufficient data to facilitate automated reconciliation and postings. This implies operation and technology stacks at any end point to handle the transactions quickly, automatically and at any time of day.

6.1.7 Interoperability of systems

To reduce fragmentation, complexity and associated costs and risks, a long-term goal is to improve interoperability between PMIs and FIs, with a view to supporting convergence on the global ISO 20022 standard, which enables the exchange of larger data sets in a more harmonised way.[9] This will also help mitigate risks around AML/KYC/CTF and reduce the occurrence of exceptions and transaction fails.

[9] ISO 20022 is the international standard that defines the ISO platform for the development of financial message standards. Its business modelling approach allows users and developers to represent financial business processes and underlying transactions in a formal but syntax-independent notation. The first focus of ISO 20022 is on international (cross-border) financial communication between financial institutions, their clients and the domestic or international 'market infrastructures' involved in the processing of financial transactions. (https://www.iso20022.org).

6.2 Policy, standards and best practice

Beyond these criteria, the overarching objective of a future blueprint for correspondent banking transactions is to support financial stability and increase trust and direct communication between FIs around the world, such that more customers and markets can be reached. In addition, a more efficient way to manage regulatory risk across KYC/AML/CTF and sanctions-related assurance, as well as cyber resilience, will need to be addressed with the help of policy, standards and best practice recommendations. These will be elaborated further in Chapter 8.2.

Future cross-border payments models also need to consider the FIs' challenge to replace, interoperate with, or reuse infrastructure at a time of increasing costs and competition. The complexity and risk of wholesale systemic change is high and new models will need to take into account prolonged coexistence of traditional technologies and approaches. Furthermore, various central banks around the world are working on renewing their payment system infrastructure; for example, the Bank of England's RTGS renewal program; the new Canadian high value payment system; Australia's New Payment Infrastructure, among others. A big ambition in all of these system upgrade initiatives is the perspective of potential future cross-border coordination and interoperation between for example central bank RTGS systems.

In some regions of the world, the problems of de-risking, cost and lack of speed in cross-border correspondent banking and/or the desire to promote inter-regional trade lead central banks to step in and provide a connection to non-domestic/regional FIs (e.g. Gulf States). Whilst this has been perceived as a challenge by FIs in terms of removing the specific income stream associated with this business, future opportunities for FIs are in the area of data driven value-added solutions. As these forces of change transform the commercial model for banks in the correspondent banking business, it can be expected that the transaction fee model will be further simplified with a view to removing deductions and that over time value-added and data centric pricing models will come to the fore.

The evolution of cross-border payments will also need to consider the reality of the payment markets moving into the "real time" space. With the expectations of end users moving to a near real time service provision, the current trend in retail payment systems becoming near-real time is poised to become the norm in the future. There is rapid growth of Faster/Immediate Payments in many countries, filling the gap between traditional ACH and RTGS and perhaps constituting the beginning of a potential merging of Faster/Immediate Payment Systems and RTGS Systems.

A challenge for banks will be the fact that they usually don't have 100% real time availability of liquidity but instead manage their liquidity to the minimum necessary to cover for the payments they make. Liquidity has a cost to providers and hence any increase in the amount needed will drive up costs for banks and therefore users. Real time payments, where payments include final settlement, require greater liquidity as there is limited opportunity to smooth peaks and troughs of demand through netting and offsetting. As the boundaries between wholesale and retail payments continue to blur, and the future of real time unfolds globally, real time intraday liquidity management will become the central building block to make this business safer and more efficient. And as long as liquidity costs are below potential banking charges, the market is poised to become more efficient.

In the next section we develop a number of scenarios, reflecting existing and future cross-border payment design models and see how far these can respond to the identified challenges, requirements and trends in the market.

7. DESIGN SCENARIOS FOR AN IMPROVED CROSS-BORDER PAYMENT PROCESS

Our main objective is to propose a blueprint to take correspondent banking into the digital age. This can translate either into a new model altogether – i.e. correspondent banking arrangements will be replaced by something else – or it can represent changes to the way correspondent banking works today, for example in relation to the messaging system/type/content, the introduction of utilities etc.

In this section, we will explore alternative cross-border payment design models, both existing models and emerging ones, as well as potential/theoretical scenarios. We will then assess these scenarios in terms of how well they would address our set of requirements. Our evaluation of these models will also consider the need for practical feasibility, stakeholder buy-in and execution viability to actually implement these changes in the near to medium-term future. Ultimately, we aim to propose solutions that can have a meaningful and practical impact on the way the industry operates.

Table 1: Design Scenarios for Cross-Border Payments

Scenario 1	SWIFT Global Payments Innovation (gpi)
Scenario 2	A 'narrow' Clearing Bank
Scenario 3	Interconnected Automated Clearing Houses
Scenario 4	Integration of regional RTGS Systems
Scenario 5	Global Settlement Utility Model
Scenario 6	Synchronisation and Interconnectivity of RTGS Systems
Scenario 7	gpi Next Generation

In the remainder of this section, we will review these scenarios in detail, and highlight pros and cons.

7.1 Scenario 1: SWIFT Global Payments Innovation (gpi)

The launch in early 2017 of the SWIFT Global Payments Innovation (gpi) solution shows that some of the drawbacks of the current system of correspondent banking can be removed by collaboration, business rule discipline and a willingness of FIs to deliver improved services for end-users.

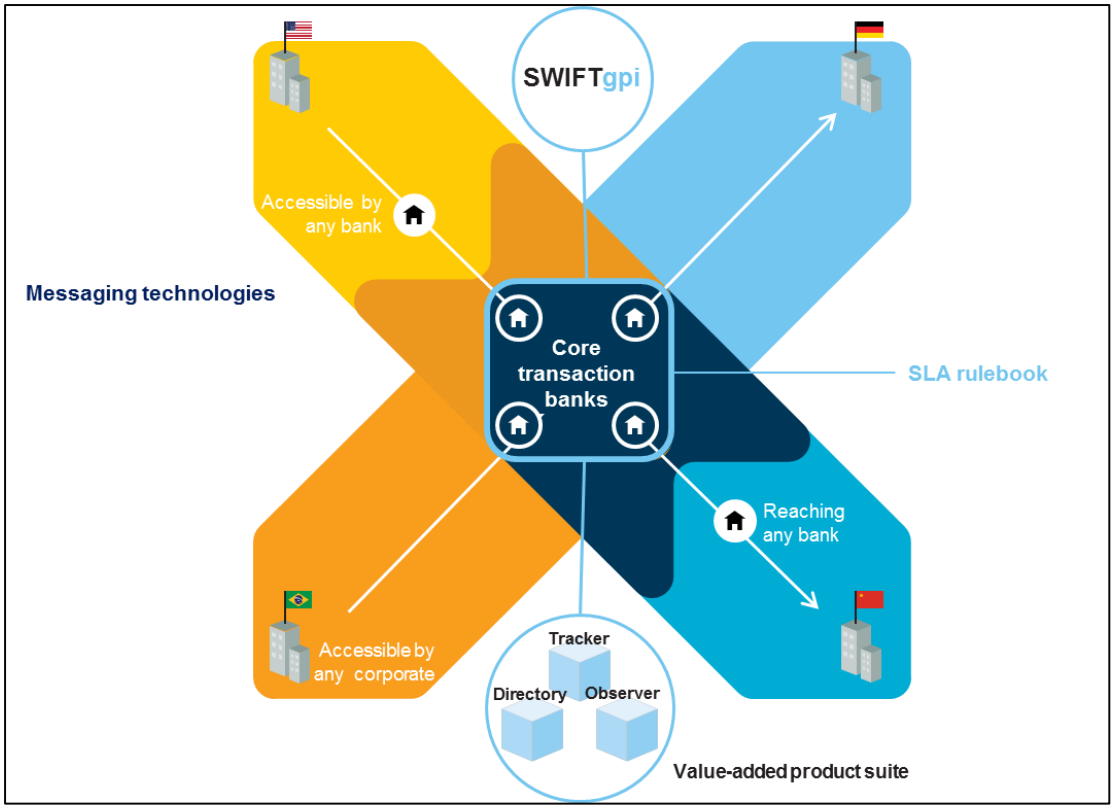

Figure 5: GPI model (source: SWIFT)

With the objective of reducing friction and enabling FIs to work better together, gpi provides a cloud-based service, accessible via APIs or MT 199 messages, which enables FIs to track their payment transactions in real time by deploying a Unique End-to-End Transaction Reference (UETR) for every gpi transaction. This will bring transparency along the chain around payment fees and final payment amount that will reach the beneficiary, along with the commitment by beneficiary institutions to credit – within their time zone – the beneficiary same day. Such an outcome supports payment users in better managing the accounts payable component of their company's working capital equation. Those FIs and PSPs participating in gpi start to see significant reductions in their payment enquiry costs, as counterparties now first consult the payment status in the cloud. There is also an enhanced perception by customers, as they receive an improved service for cross-border payments. Correspondents are now increasingly being asked to provide their 'gpi compliance score' by potential customers.

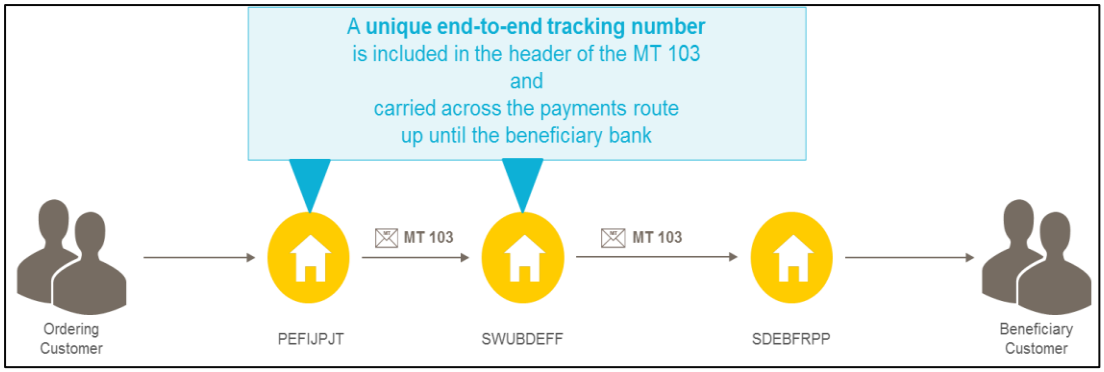

Figure 6: Illustration of UETR (source: SWIFT)

Thus far more than 200 banking groups of the roughly 3,000 banking groups on SWIFT, initiating cross-border payments, have signed up to gpi, including 49 of the top 50 institutions in terms of value of transactions processed. 75 FIs are live with gpi as of October 2018. gpi payments cover more than 700 country corridors and represent a value of over 100 billion USD per day, or 30% of SWIFTs total cross-border payments in over 120 currencies. In order to achieve the strategic objective of extending gpi to all cross-border payments on SWIFT by 2020, the large clearing providers will need to bring their own global branch networks into gpi. In addition, smaller or more occasional users will need to implement a basic gpi service where the outcome of a cross-border payment is provided to the gpi tracker.

Despite the absence of an empirical market benchmark around pre-gpi speed of cross-border correspondent banking payments, there is a perception that transactions have become faster due to the peer pressure resulting from the transparency of the tracker. In addition, there is a requirement in the gpi SLA that payments are credited same day (depending on the receiver's time zone and cut off time). While for some banks this is not a challenge, others had to make changes to their daily operations in order to be able to conform to the gpi SLA. To complement the gpi rulebook and tracker, the 'gpi Observer' provides the critical success ingredient by objectively measuring gpi participants' compliance against the gpi rulebook. gpi statistics now indicate that almost 50% of gpi payments result in a credit to end-customers within 30 minutes, with 90% of gpi payments being credited within 24 hours. For the remainder, the reason for delay can objectively be attributed to particular regulatory and compliance requirements, such as extra document checks and local FX controls.

From a financial stability perspective, it is important to mention that a correspondent banking payment message is only passed on to the next bank in the chain once the relevant *Nostro*/*Vostro* balances have been updated, i.e. each bank has to settle its position with the previous bank in commercial bank credit. In response to demands of major cross-border banks for gpi support by market infrastructures (MIs) such as Fed, CHIPS and TARGET2, relevant steps were taken in 2017. At this point in time (October 2018), more than 55 SWIFT-based market infrastructures are able to clear gpi payments (with 17 used in production); 20 more SWIFT-based MIs will be able to transport the UETR (and become full gpi if interested) as of November 2018, and local gpi market practices for Fedwire Funds Service (USA), CHIPS (USA), CIPS (China), SIC and EuroSIC (Switzerland) and FXYCS (Japan) have been made available (3 used in production), allowing the gpi to cover at minimum the top 10 currencies used for cross-border payments today.

In November 2018, following the next annual SWIFT Standards Release, generating, passing on and receiving the UETR will become a compulsory requirement for all SWIFT users. This will permit gpi customers to track any gpi transaction they are party to from an end-to-end perspective, unlike the current situation where the gpi message flow stops at the non-gpi FI in the chain. This will also enable those non-gpi FIs and PSPs to immediately adopt the UETR as the de-facto common language for enquiries and investigation events such as AML/CTF requests or requests for information, supporting all players in improving their risk management capabilities. FIs are exploring innovative ways to use the cloud database, for example in order to reconcile their own transactions with their own transaction records. From 2020 all SWIFT FI users will have to provide a mandatory end beneficiary credit confirmation.

Moreover, as part of planned improvements gpi will include the ability for gpi-enabled FIs to immediately stop and recall a payment, irrespective of where this payment is in the gpi-inter-bank chain. This is a vital feature in the fight against fraud as well as error management. In addition, the transaction's progress on FIN will also be tracked, helping the FI beneficiary of the cover to track whether the cover was initiated – which is particularly useful from a

counterparty risk perspective (tracking of cover is planned for November 2018; tracking of institutional payments is to be confirmed).

In sum, the gpi scenario does address some of the key pain points expressed by market participants, which means that our recommendation is for participating FIs in correspondent banking to embrace and implement gpi to their own benefit and to the benefit of their clients. SWIFT gpi does not require structural changes to the current correspondent banking *Nostro*/*Vostro* account-based model and has a value and technology roadmap to help the community address the fundamental challenges of cross-border payments, as opposed to models introducing disruptive technologies and thus requiring banks to rethink and replace their front-to-back office infrastructures.

Table 2: Benchmarking gpi against key requirements

Settlement	gpi is only a messaging solution and does not deliver settlement *per se*. However, it does support transparency and risk management in commercial credit settlement.
Liquidity Efficiency	gpi reduces payment delays and thus can improve liquidity efficiency.
Availability	Yes
Ubiquity	Limited to SWIFT users and their clients.
Transparency	Yes
Predictability	SLAs and Rulebooks deliver key improvements. More work is on-going to deliver 'up front transparency'.
Interoperability	gpi is technology agnostic. Once SWIFT messages move to ISO 20022, gpi will also become ISO 20022 compliant.

7.2 Scenario 2: A 'narrow' Clearing Bank

This is a scenario that captures the situation where a clearing bank – narrow bank - connects individual banks and corporates to an ACH and allows them to exchange funds in real time, leveraging the bank's messaging network. This scenario is already a live scenario in the UK[10] and even though it is currently

[10] Clear Bank, launched in 2017, is the UK's first new clearing bank in more than 250 years. It offers banking services to financial service providers, FCA-regulated businesses and FinTech.

restricted to the UK, we have listed this as a potential scenario as the ambition is to expand this model globally.

Settlement is achieved in near-real time in commercial bank credit and all positions are pre-funded, such that counterparty credit risk is managed. Ultimate settlement in central bank money would happen through the RTGS system that the clearing bank is connected to. From a financial stability perspective, as the Clearing Bank acts as a connection layer between corporates and banks one the one hand and clearing systems on the other, even if critical volumes of high value transactions were to be processed via the clearing bank, such an entity would not need to become an FMI governed by settlement finality legislation and subject to CPMI-IOSCO principles for systemically large FMIs.

From a structural perspective this model combines the features of traditional correspondent banking, i.e. banks holding *Nostro*/*Vostro* accounts, and centralisation (i.e. banks connecting to the central clearing bank), which achieves the outcome of seamless STP. Additional services and functionality, such as KYC/AML/sanctions checking could be built on top and messaging should be based on IS0 20022 standards to enable global alignment and facilitate the use of a larger data set to facilitate improved predictability and transparency as well as reconciliation. For banks not directly connected to the clearing bank, there is the option to indirectly connect via entry point banks, which means that the service is likely to be slower than real time. In addition, institutional end users, such as corporates, would have the option to directly connect to the clearing bank, resulting in a shorter end-to-end payment chain and lower associated operational and regulatory risks.

Whilst the solution provides commercial money settlement, the liquidity and settlement dimension could become more challenging as higher value transactions start to be processed in this way, given both the need to pre-fund and the fact that per transaction settlement does not occur in central bank money. At a structural level, this scenario flips the traditional correspondent banking *Nostro*/*Vostro* model on its head by replacing the inter-bank account chain with a direct FI or corporate to clearing bank connectivity via *Nostro*/*Vostro* accounts. Hence this scenario is disruptive but may in practice be complementary to correspondent banking cross-border payments. The success

of this model depends on the extent to which there is network adoption. This is likely to be a challenge, as would be costs arising from KYC/AML risk management, in particular at a cross-border level. The difference to traditional ACHs competing for market share lies in the fact that the narrow bank acts as an aggregator that provides access to clearing, rather than being an ACH itself. Whilst this solution is limited to a domestic scenario today, the objective is to expand this to the cross-border space, i.e. expand the connection to other ACHs.

Table 3: Benchmarking a "narrow" clearing bank against key requirements

Settlement	Yes, but only in commercial bank credit; deferred net settlement in RTGS (BoE).
Liquidity Efficiency	From a liquidity perspective pre-funding could be costly unless FIs have efficient intraday liquidity management processes in place. Netting will only become efficient if this gets broad adoption.
Availability	Yes.
Ubiquity	Subject to adoption levels; no international level.
Transparency	Yes.
Predictability	Rulebook based but possibly less predictable than gpi.
Interoperability	Yes as based on ISO 20022.

7.3 Scenario 3: Interconnected Automated Clearing Houses (ACHs)

Rather than having one and the same clearing bank facilitating real-time-payments with the option to expand to cross-border, a more complex but also more network-effect friendly way would be the interconnection of national Automated Clearing Houses (ACHs), reflecting an increasing number of those already operating in a near real-time environment today (reflecting the blurring of ACH and Faster/Instant Payment Systems). Examples of this exist, e.g. in Europe where we have an interlinking of ACHs under the EACHA – the European Automated Clearing House Association – Framework, which connects 27 member institutions across SEPA on the basis of the international ISO 20022 messaging standard. In this regard it is important to remember that the SEPA scheme rulebooks, covering credit transfers and direct debits in euro, still reflect a lack of harmonisation, given the many options for banks and communities to

define different approaches, e.g. in relation to remittance data and associated field structure, etc.

Mexico on the other hand has created a hybrid structure by interlinking its domestic RTGS to the United States ACH (NACHA), enabling cross-border payments between these two markets.

At a global level, we have the example of the International Payments Framework Association (IPFA), a global interoperability scheme rulebook for cross-border retail payments, based on the ISO 20022 standard, similar to SEPA. This scheme leverages the existing correspondent banking network for cross-border low value transactions and payment aggregators deliver retail transactions via the different bank accounts they hold across more than 60 countries, often relying on the existing local payments infrastructures.

The difference between this model and the clearing bank model is reflected in the need to have an overall interoperability scheme rulebook, complemented by harmonised messaging standards. At the same time, end users are usually not directly connected to the respective local ACH, which means that the payment chain would be longer and more complex compared to the clearing bank scenario. In the case of IPFA, the reliance on the underlying inter-bank 'rails' indicates the dependency on correspondent banking.

Overall, the Clearing Bank and ACH interconnectivity models have limited application in the context of managing settlement risk in the high value cross-border inter-bank space. ACH transactions are not immediate and irrevocable in all instances and systems usually have transaction amount limits.

Table 4: Benchmarking *Interconnected* ACHs against key requirements

Settlement	Settlement in commercial bank credit deferred net settlement in RTGS
Liquidity Efficiency	Cross-border netting capability (tbd)
Availability	Yes for EACHA; IPFA closing down in 2018
Ubiquity	Inter-ACH connectivity difficult and not proven at scale in cross-border context. SEPA/EACHA is most significant example in Europe
Transparency	No tracking, unless based on gpi
Predictability	Yes, rulebook based (e.g. SEPA, IPFA)
Interoperability	Would need to be ISO 20022 based (SEPA, IPFA are)

7.4 Scenario 4: Integration of regional RTGS Systems

A parallel approach at the wholesale payment level would be to directly connect national RTGS systems with each other, creating almost an analogy to commercial banks being connected to each other via correspondent banking.

Such a model is for example currently in roll-out mode across six countries in the Middle East under the Cooperation Council for the Arab States of the Gulf (GCC) (please note that another variant of cross-border payments via RTGS has been developing across two African countries). The connection of the six Gulf state RTGS systems across Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates has been established on a legal basis, with the objective of supporting economic development and trade within the region. This will address the issues of end-to-end costs for users and the time taken from initiation of a payment to final delivery.[11]

Whilst the participating countries have not created a monetary union with a single currency, five out of the six countries have had a fixed peg to the USD for many years with Kuwait having a peg against an undisclosed basket of currencies, where that basket is assumed to be heavily weighted by the USD.

Many of the USD intra-GCC payments executed today start life as a debit to a local currency account of the sender, are then converted to USD, remitted as USD and then converted back from USD to local currency in order to credit the account of the receiver. There are also a number of pure USD-to-USD intra-GCC payments debiting and crediting USD accounts. An underlying rationale for the Gulf-RTGS initiative is represented by the objective to reduce the power of the USD as a reserve currency, given the nature of its risk profile and regulatory burden.

The Gulf model provides a central RTGS system, which links all participating RTGS systems and thus provides a full cross-border RTGS solution. The domestic RTGS systems in the region have accounts in each other's books, enabling transactions via the system to settle immediately with finality in central bank money. This will provide financial stability.

[11] The integration of regional RTGS system is not unique to the Gulf, there are other examples among African states, for example between Kenya and Uganda.

Central banks will deal with each other at a daily fixed currency translation rate. The reserve management operations of each participating central bank can decide whenever they want to settle or trade currency, or hold, or buy bonds etc. The central banks don't cover positions transaction by transaction; they will build up balances in each other's books and will choose at intervals when to trade out these balances either to USD, their own currency or any other currency depending on their reserve management policy. Regulatory KYC and AML/CTF compliance responsibility for transactions settled in the RTGS remains with commercial banks.

Funds are co-mingled at FI direct participant level, meaning that domestic and cross-border liquidity is managed in the same pot, but is then being routed either nationally or cross-border. Enhanced liquidity management tools will be available, going hand in hand with the centrally aggregated liquidity. The list of eligible collateral is not the same across the different RTGS systems, which is an issue if it were to be a single standalone system. There is currently no netting foreseen, but this could be developed for the future.

The Gulf system is also being built for other countries to join if they wish to do so. It could ultimately provide settlement of a single Gulf currency in the region, if/once available. The new system will also support USD payments and the settlement agent for these transactions could be a commercial bank settlement agent but that is still to be resolved.

The Gulf example reflects the development from commercial bank correspondent banking to "central bank correspondent banking". In addition, it is a good example that shows that a monetary union is not a prerequisite to achieving a multi-country and currency RTGS.

However, the GCC model is very specific to this region and it is unlikely that this can be easily replicated at a global scale, given the legal, regulatory and political as well as standards and operational related challenges of alignment. Still, the formation of regional RTGS hubs should be encouraged with a view to creating interoperability bridges between the regions, which would allow for an increasingly global coverage.

Table 5: Benchmarking an integration of regional RTGS Systems against key requirements

Settlement	Yes, in central bank money
Liquidity Efficiency	Depends on ILSM. In addition, netting solutions could be added on top of the infrastructure
Availability	Not yet
Ubiquity	Good within the subset of participating RTGSs.
Transparency	Yes
Predictability	Yes
Interoperability	Will become ISO 20022 once participating RTGSs will switch to ISO 20022

7.5 Scenario 5: Global Settlement Utility Model

Expanding the regional RTGS System hub creation – exemplified by the Gulf model - one could also consider the creation of a global market utility that facilitates settlement in central bank money by connecting country RTGS systems on the one hand and commercial banks on the other. At the same time optionality could be developed such that funds could either be settled on a net or gross basis. In addition, various value-added services could be connected to the market utility in order to allow for a platform approach, which would enhance competition and innovation as well. Services could include foreign exchange, information exchange – in particular intraday liquidity management related data – and the netting and offsetting solutions. This could deliver a payments and settlement utility for global trade and trading.

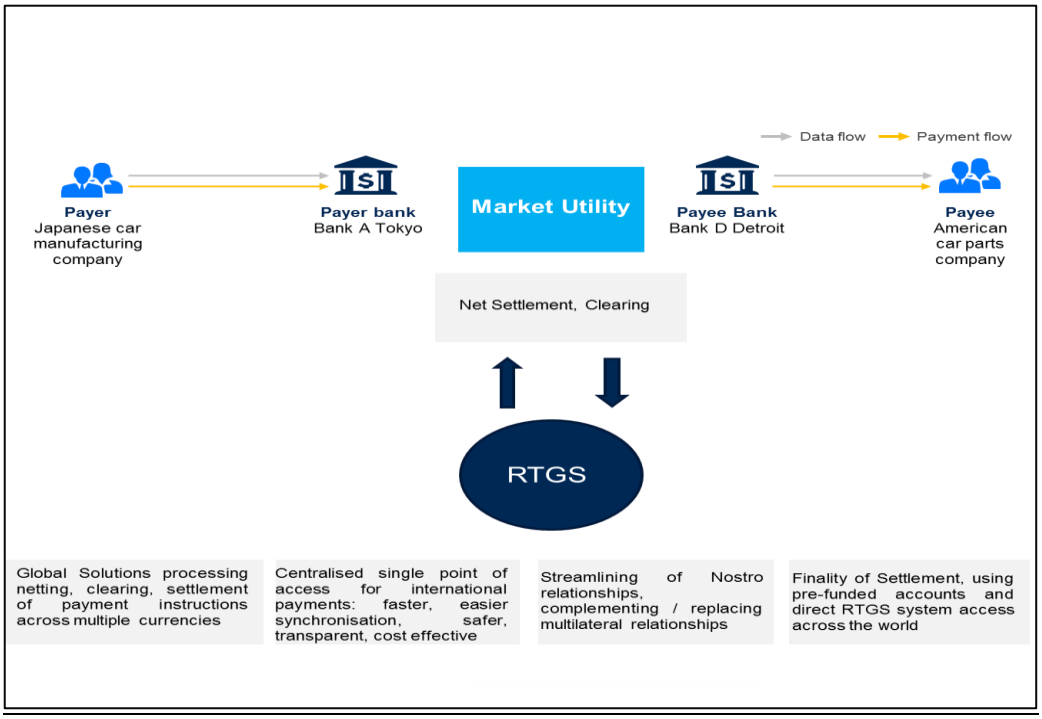

Figure 7: Cross-border Market Utility Model

A global settlement utility should be developed in a way that would cover all of the identified requirements. However, its implementation would face a number of non-trivial challenges, ranging from network adoption to agreement on a common scheme rulebook and compliance with multiple regulatory regimes. The entity would have to be a regulated FMI under settlement finality legislation and in compliance with CPSS-IOSCO principles for systemically large FMIs. In order to manage the risk of "too big to fail" specific contingency measures would also need to be put in place. Open questions include: "In what currency would settlement take place? Which FMI would manage and control the settlement? How would liquidity across the system be managed? Would the FMI be responsible for sanctions/AML/CTF etc.? In which currency would FIs have to fund their accounts with the FMI in? Would the FMI accept relationships with every bank globally and how would this be practically managed?"

Table 6: Benchmarking a Global Settlement Utility model against key requirements

Settlement	Yes; would need to be provided in central bank money
Liquidity Efficiency	Would need to offer multilateral netting solutions
Availability	No, but global infrastructure does exist for FX.
Ubiquity	Would be good within the participant subset
Transparency	Yes, this would be required
Predictability	Yes, SLAs and Rulebooks would need to deliver this (similar to existing global FX infrastructure).
Interoperability	Yes, it should be ISO 20022 and aligned with gpi

7.6 Scenario 6: Synchronisation and Interconnectivity of RTGS Systems

A variant of the global settlement utility model could be the deployment of the method of synchronisation, leveraging emerging (e.g. DLT) or existing technologies. Such a model is currently being discussed in central bank circles.

The objective is to create a "third party provider model", where an RTGS would have the functionality required for such trusted third party, the "Synchronisation Operator", to connect and offer synchronisation services to the market. The operator would have permissions to earmark and transfer funds between participating institutions' accounts in the RTGS, but would not hold an account itself. The service could be used by multiple Third Party Providers, and the functionality designed would be 'agnostic' to what the fund movements were being synchronised with, and so could be PvP or DvP, domestic or cross border. In a cross-border context Synchronisation Operator(s) could be working with multiple national RTGS systems to synchronise cross border payments. Furthermore, the design of the RTGS functionality could be agnostic to the technology used by the Synchronisation Operator. Therefore, no particular technology, for example DLT, would need to be deployed in order to make the model work, as it will be for the Synchronisation Operator to determine the appropriate method, technology etc. for delivering their particular service.

Figure 8 below depicts the steps of synchronisation, provided by the Bank of England.

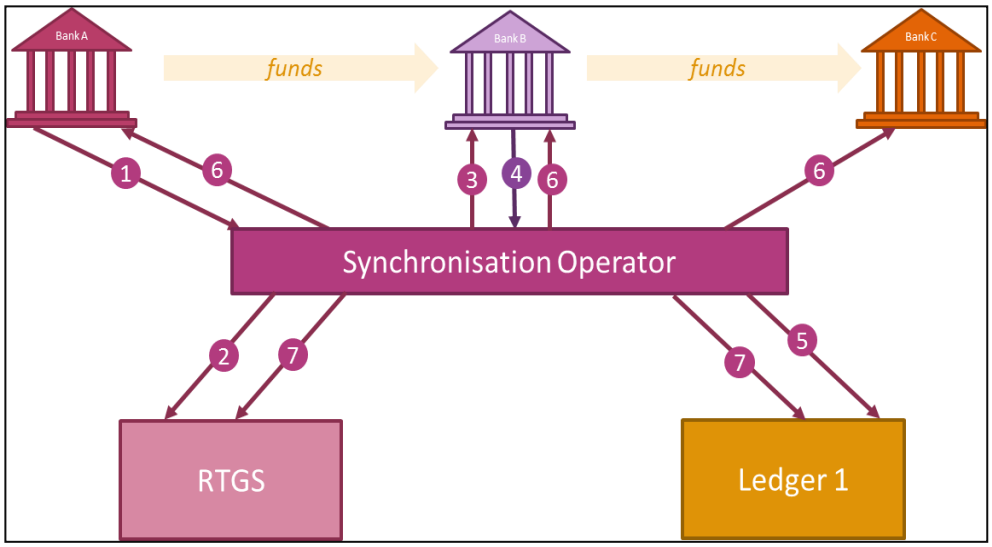

Figure 8: Synchronisation via RTGS System (source: Bank of England)

1	Bank A notifies operator than it wishes to make a synchronised payment with Bank B in order to pay Bank C
2	Operator earmarks funds in Bank A's RTGS account
3	Operator notifies Bank B that funds are earmarked in RTGS
4	Bank B confirms that it is happy for funds to be earmarked in Ledger 1
5	Operator earmarks funds in Bank B's Ledger 1 account
6	Operator confirms to all parties that funds are earmarked
7	Operator simultaneously orders RTGS and Ledger 1 to release the earmarked funds to Bank B and Bank C respectively

The potential benefits of such an approach could be a simplification of some existing processes and the reduction of operational risk. There could be a reduction of credit risk by enabling DvP and PvP, whilst participants could avoid the need to prefund some large corporate transactions. Furthermore, this approach could lead to increased competition, particularly for new entrants, and allow participants to offer new products to new customers.

There are however also potential risks and challenges. For example, FIs are likely to want to retain control over payments (i.e. to have option to stop a payment), particularly where large sums are involved. Earmarking of funds would have implications for managing available liquidity and may in practice not represent a performance guarantee in itself. Processes for 'exceptions' will need to be very clearly defined and the service functionality will need to be attractive enough to result in broader market adoption, which may be challenging if new

technologies such as DLT are being deployed (due to migration complexity and potential associated costs). The Reserve Bank of Australia is already deploying synchronisation with regard to domestic housing transactions.

Building on the concept of synchronisation, design scenario 6 (see Figure 9) provides a perspective of how cross-border flows could be managed, by combining earmarking and synchronisation capabilities between central banks with the flow of correspondent banking payments.

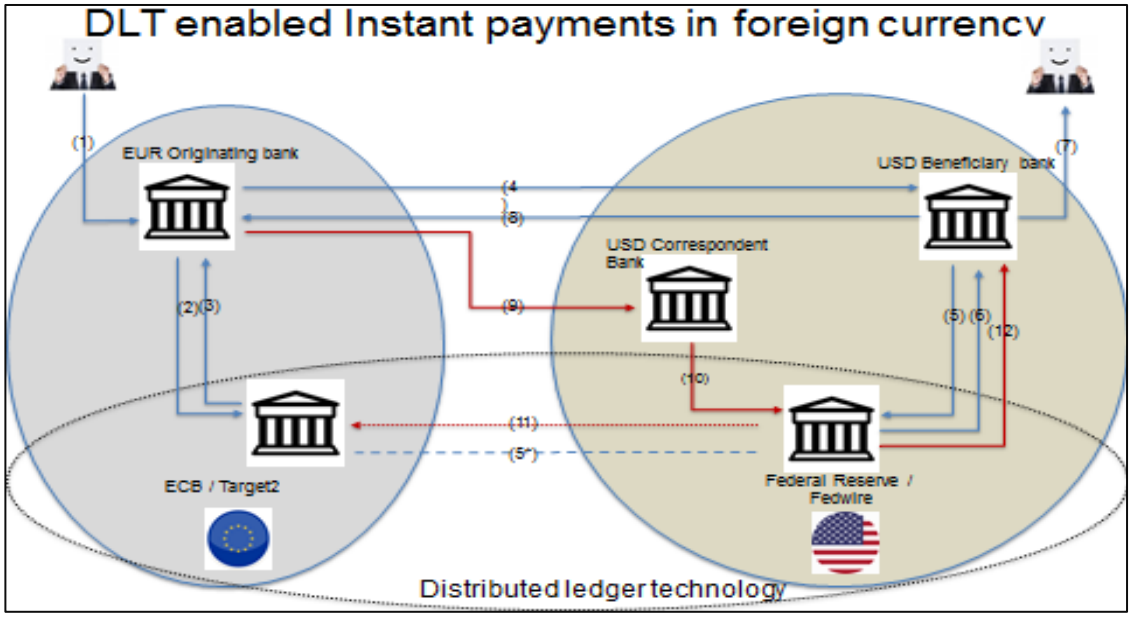

Figure 9: Global RTGS System Interconnectivity

In this model we chose to use a private DL structure, where central banks connect with each other for purposes of earmarking funds. The abovementioned Synchronisation Operator would thus be represented by the DL itself in this example. Alternatives could also include leveraging the Utility Settlement Coin model, which would enable a more efficient flow of inter-bank balances held in RTGS systems. The asset on the DL would be a reference representing the earmarked amount, based on relevant central bank balances held by the sending bank (or on its behalf by the intermediary provider). The transaction steps depicted in Figure 9 are as follows:

(1) Customer initiates a payment instruction in USD

(2) EUR originator bank makes a request to reserve USD for the transaction towards the ECB
(3) If the ECB can reserve the funds on behalf of the EUR originator bank, it sends a positive acknowledgement – with a reservation ID
(4) EUR originator bank sends the payment message (credit transfer) to USD Beneficiary bank, which includes the ECB reservation ID
(5) USD beneficiary bank validates the request and asks for a confirmation from the Federal Reserve if the payment can go through
(5*) The Federal Reserve confirms if the reservation at the ECB is guaranteed via the DL, which connects the two central banks
(6) The Federal Reserve informs the beneficiary bank that the payment can go through / is guaranteed
(7) The beneficiary customer is credited
(8) The EUR ordering bank receives the confirmation that the beneficiary has received the funds
(9) The ordering bank releases a 'cover' payment (e.g. MT 202 COV)
(10) The USD correspondent bank debits the *Vostro* of the EUR originator bank and settles the payment via Fedwire; the correspondent also provides the FX to the EUR originator bank
(11) The ECB/Target2 is informed that the reservation can be released, using DLT
(12) The USD beneficiary bank receives the funds

When discussing this scenario, several key questions and issues were identified. The objective of this scenario is to increase financial stability and lower the risks associated with commercial bank credit settlement for cross-border correspondent banking payments by leveraging central banks' support through earmarking. However, in the context of the current potential model for synchronisation, as explained above, earmarking funds may not be equivalent to extending a central bank guarantee. Synchronising the earmarking process with the actual payments flow in the correspondent banking space is a further challenge. Therefore, it is likely that liquidity risk would still be an issue for the beneficiary bank, i.e. in the situation where the beneficiary customer is credited

before the beneficiary bank itself has received the funds from the correspondent bank (i.e. induced settlement risk). Additional questions around time zones and difference in value dating remain (e.g. the US to Australia corridor). It is equally unclear who would be responsible for sanctions screening in this model. Potential issues around application of funds, repairs, rejects and returns would equally need to be considered. Operations and reconciliation could potentially be streamlined using DLT, but technology alone cannot satisfactorily fix the set of identified issues in correspondent banking payments.

In a hypothetical future scenario, a potentially viable way to enable central bank money settlement for cross-border transactions leveraging DLT would be if central banks were to issue fiat currency on the DL and, via the establishment of Interledger protocols, provide central bank settled cross-border payments via atomic settlement. However, such an approach could potentially have significant implications on the way the payment industry operates. Despite regional RTGS hub initiatives, discussed in scenario 4, a large-scale approach of RTGS connectivity via DLT deployment and issuance of Central Bank Digital (or Crypto) Currencies (CBDC/CBCC) is an unlikely scenario in the short to medium term. As proposed by the Bank of England synchronisation model, other technologies could be explored for this purpose, allowing for ease of migration and adoption. Cross-border legal and regulatory questions as well as the extent to which such as solution could truly reduce inter-bank settlement and counterparty risk, would need to be tackled.

Table 7 summarises which requirements such a scenario is likely to be able to cover under the circumstances.

Table 7: Benchmarking Synchronisation and Interconnectivity of RTGS Systems against key requirements

Settlement	Yes, in commercial credit
Liquidity Efficiency	No specific improvements unless gpi supports indirectly through predictability and transparency
Availability	N/A; DLT is not yet mature, and Interledger connectivity would need to be established
Ubiquity	This would be a key requirement to ensure reach
Transparency	Yes, this would be required
Predictability	Yes, a Rulebook would be required
Interoperability	Should be ISO 20022 based

7.7 Scenario7: gpi Next Generation

A final scenario, which we will call gpi next generation, looks further at reducing systemic risk in the critical area of inter-bank high value payments.

The aims of reducing settlement and counterparty risks in correspondent banking is being tackled from a gpi perspective with the roll out of the gpi Financial Institution Transfer (gFIT) service, tentatively planned for the beginning of 2019. In order to bring transparency and real time information to these critical high value transactions, the service will provide tracking of institutional payments (over FIN) by tracking MT 202 and MT 205 messages, followed by the plan to issue a rulebook for participants that will enable tracking of these transactions over non-FIN networks and market infrastructures and will include business rules. The rulebook will require FIs to confirm to the tracker once the beneficiary's Agents *Nostro* account has been credited, or flag any processing issues inside the FI, such that FI intraday liquidity management can become more accurate and reconciliations of payments can improve. This step, in combination with gpi-compliant infrastructure settlement in RTGS, would deliver significant benefit in managing systemic and counterparty risk, despite the reality of the continued practice of operating often undisclosed and uncommitted intraday credit lines – where these are ultimately more liquidity efficient than pre-funding of every transaction. This is likely to be the best possible outcome in light of the impossibility to establish harmonised bankruptcy laws across the globe that would otherwise define that positive funds held in *Nostro* accounts cannot be clawed back by the respondent FI (the User of correspondent banking services) in a scenario of intraday failure of such institution.

By 2022/2023 SWIFT is planning to migrate to the ISO 20022 standard, including gpi, which will allow parties to send more data in the payment message, allowing for more clarity on purpose of payment and the parties involved (such as on-behalf-of payments). This will bring a substantial risk related improvement compared to today's MT messages, which are limited in the number of characters and often create AML compliance challenges for FIs. ISO 20022 will allow FI's to optimally include 'Know your Transaction' – KYT – data.

This move also ties in with the increasing use of ISO 20022 in FMI/PMIs and will enable improved compliance in correspondent banking payments.

A planned "pre-validation service" (for 2019 and beyond) will further support preventing STP and data gap related issues (e.g. missing clearing codes) as well as problems with closed or wrong beneficiary accounts down the payment chain. And finally, to complement Case Resolution service currently under exploration would further support FIs in the context of missing information in payments and specifically support sanctions related requests, given that sanctions information cannot be pre-validated at the start of a payment. This move would also support enquiries related to repairs, rejects, returns, and transactions that cannot be applied to an account. An important element here is that this service will directly connect banks that need to resolve the issue rather than requiring them to go back through the banking chain. Furthermore, an audit trail of communication would be provided.

SWIFT has also experimented with DLT in the context of a Proof-of-Concept to deliver real time *Nostro*/*Vostro* account reconciliation. The exercise demonstrated that business requirements were met but point to the challenge of industry adoption, such as the prerequisite for FIs to move from batch to real-time liquidity processing and reporting as well as requiring IT back office upgrades. It also showed that DLT is only one of several potential technologies that could be deployed, which indicates that technology itself is not the determining factor (SWIFT DLT PoC Findings, 2018).

Table 8: Benchmarking gpi Next Generation against key requirements

Settlement	gpi is only a messaging solution and does not deliver settlement *per se*. However, it will further support transparency and risk management in commercial credit settlement for high value payments
Liquidity Efficiency	gpi reduces payment delays and thus can improve liquidity efficiency
Availability	In future
Ubiquity	If on SWIFT network, limited to users and their clients
Transparency	Yes
Predictability	Yes, Rulebooks would be in place
Interoperability	gpi is technology agnostic. Once SWIFT messages move to ISO 20022, gpi will also become ISO 20022 compliant.

7.8 Design Scenario Evaluation

In this section we discuss the results of our design development exercise. We have ranked the outcomes in line with the set of key requirements as defined in Section 6. To complement these practical design scenarios, we have also developed a set of policy recommendations (Section 8) that would be key enablers for delivering improved cross-border payments. Table 9 provides a ranking and high-level evaluation of the different cross-border payment design scenarios discussed in this paper with a particular view on time to delivery and associated effectiveness of the measure.

Table 9: Ranking and Evaluation of scenario

Ranking	Scenario	Commentary
1	gpi	Easiest to implement and impactful. Remaining settlement risk on clearing banks but increased adoption by FMIs, including RTGS systems helps end-to-end transparency. Limitation: to SWIFT users and their clients (but represent the majority of cross-border market players); importance of contingency/resilience/security of network and established multibank governance model.
2	gpi Next Generation	Potentially very impactful in terms of achieving messaging-based transparency for high-value interbank transactions. Could meaningfully reduce settlement risk on clearing banks. Expected future benefits in the context of AML/CTF compliance and sanctions screening once those solutions will come into place. Limitation: to SWIFT users (but represent the majority of cross-border market players); importance of contingency/resilience/security of network and established multibank governance model. The planned move to ISO 20022 will further add benefits as discussed.
3	Regional RTGS	Impactful in terms of financial stability but restricted to the region; very difficult and time-consuming to design and implement; disruptive impact on business models of traditional correspondent banks; potential to interlink regional hubs as they emerge (e.g. GCC with Eurozone)
4	Clearing Bank	Positive as it reduces the length of the interbank chain and hence complexity and risk; commercial bank credit settlement only and mainly focused on retail, low value transactions. As boundaries blur between retail and wholesale with high value transactions being managed in a low risk way, relevance could increase; needs network adoption and currency

		expansion; use of ISO 20022 positive.
5	ACH Interconnectivity	In place globally for some time with the IPFA scheme but little adoption (now being decommissioned); commercial bank credit settlement only and main focus on retail transactions – once boundaries blur between retail and wholesale with high value transactions being managed in a low risk way, relevance could increase; use of ISO 20022 positive.
6	Market Utility	Whilst addressing settlement finality in central bank money, the utility could become too big to fail/centralising flows and risks; operational contingency important; question whether this should be a non-commercial FMI; governance/regulatory/investment challenge to set this up.
7	RTGS Interconnectivity leveraging DLT/Synchronisation	Model discussed does not sufficiently address the market problems. Additional challenge of technology adoption of DLT and no clear picture as to how this could really improve financial stability and settlement finality, unless we move into a CBDC/CBCC and Interledger Protocol world. If everything becomes real time, there is no possibility for liquidity optimisation as there is no ability to net. Synchronisation element looks theoretically promising but will require more in-depth development.

8. POLICY RECOMMENDATIONS

In order to complement the above design recommendations and with the objective of addressing the challenge of AML/KYC/CTF and sanctions in cross-border payments, the following actions are recommended.

First of all, for the purpose of ensuring a harmonised process of identification of payers and payees in a transaction and consistent with the views of the CPMI (CMPI, 2016) we recommend FIs to use the global Legal Entity Identifier (LEI) – a standard identifier for legal entities - in the payment message. As a complementary measure, the development of a second standard identifier for individuals could be considered, and this information could also be carried in the payment message. ISO might be an appropriate entity to look into such standardisation work, given the need for global consistency.

Furthermore, national regulators tend to require information on business, customer address, Business Identifier Codes (BIC), or bank account identifiers,

tax identification numbers, etc. All of this information could be stored in a national KYC registry, which could serve as a golden copy for customer KYC data in that particular country – an approach that is also supported by the CPMI (CPMI, 2016). Note that various types of local and regional registry solutions have already started to emerge over the last few years (e.g. SWIFT registry, Nordic banks registry, Singapore etc.). Such registries would need to be continuously updated by banks with fresh information including fraud alerts and other relevant data. One could even consider putting registries on a DL and allowing the government to validate legal identifier information. In order to establish the required legitimacy and effectiveness of use of such registries for the purpose of enhancing trust in cross-border payments, the Basel Committee in collaboration with the FATF could consider developing a set of key requirements that these national KYC registries would need to fulfil. Benchmarking alignment with these criteria could be performed via a peer review process, similar to the Basel Accord compliance peer review process, highlighting which countries have made the required efforts. The end goal would be that transactions between countries with 'reviewed and endorsed' KYC registries can flow more easily across borders, helping to support more trust between FIs. An essential item to address in all of this is legal liability for KYC in the context of outsourcing. Unless we have liability ownership of KYC utility (and other relevant compliance solution) providers that service FIs, we will continue to see limited success of those initiatives in bringing about the desired efficiency for this business.

A further measure, also endorsed by the CPMI (CPMI, 2016), could be an improved process of information sharing between FIs across borders, in relation to their due diligence and AML/CTF/KYC and sanctions related obligations. The challenge of FIs today is that local data privacy legislation and unclear messages from various national regulators make it difficult for FIs (which in some cases require due diligence information on their customers' customers – also known as "KYCC") to share related information with each other. FATF clarified in October 2016 that FATF recommendations do not require financial institutions to conduct customer due diligence on the customers of their customer (KYCC). However, in cases where there is any unusual activity or transaction on the part

of the respondent, or any potential deviations from the agreed terms of the arrangements governing the correspondent banking relationship, the FATF noted that, in practice, the correspondent institution will follow up with the respondent institution by making a request for information on any particular transaction(s), possibly leading to more information being requested on a specific customer or customers of the respondent bank. Information sharing is a key area that will need to be fostered further.

With a view on the regulatory and policy angle, cross-border payments of any kind would significantly benefit from a harmonised set of rules when it comes to the conduct of FIs/PSPs - as inspired by the European Payment Services Directive (PSD 2 - Directive (EU) 2015/2366). In particular, the requirement of transparency around fees, deductions and FX rates applied as well as the prohibition to take float on incoming customer payments would have the potential to further enhance the practical messaging initiative of SWIFT gpi as well as to improve those payment transactions that remain outside SWIFT.

9. CONCLUSION

In this paper we took a pragmatic approach to addressing the challenges surrounding cross-border correspondent banking payments. We engaged with practitioners to establish a set of agreed areas of challenge and associated design criteria. These have fed into the development of a set of design scenarios and options – some live and some planned or theoretical. We reviewed seven scenarios and evaluated the potential benefits and drawbacks of each.

Our conclusion shows that gpi implementation by FIs has the potential to deliver more transparency to cross-border payments. This enhanced transparency, complemented by increasing predictability and discipline over time as additional rulebooks and SLAs are put in place, will be able to help institutions to better manage counterparty and financial stability related risks in the interbank space. Even though the risk associated with extending intraday credit to FIs will not be directly reduced via gpi, the transparency will help participants to see where the cover funding is in the payment chain and based on that information decide whether to pay out or not. The early visibility will allow any emerging problem to be tackled before it risks going out of control (i.e. avoid

a Lehmann scenario). Furthermore, we will have to be alert to the dynamics of peer group pressure and whether this transparency and predictability will encourage "good" or "bad" behaviour by institutions.

Regulators will play a key role in further promoting the adoption of ISO 20022 and the LEI as well as taking measures in support of the industry's ability to comply with AML/KYC/CTF (e.g. KYC registries), harmonisation of rules and provision of more clarity and encouragement for inter-FI information sharing. Based on experience, liability ownership of solution providers in the context of KYC utilities and other relevant solutions will be the only way to truly unlock the benefits of these solutions. This will need to be complemented by FIs taking active steps in addressing shortcomings in group level intraday liquidity management, both at the correspondent bank and user bank side.

We also highlight that the deployment of new technologies, such as DLT, is no panacea. Apart from the lack of maturity of this technology, there are only a few international bodies that have thus been successful in delivering distributed network management across a range of diverse stakeholders. Network governance is a key requirement that cannot be delivered by technology alone and there is a need – as identified and addressed by gpi – to deliver more SLAs and transparency between FIs.

Before we can consider moving into a new technology stack based on DLT, we will need to prove that the technology can work in the intended way at a scale, and that the technical migration challenge is feasible for the size of the network we need to cover. Future plans for central bank RTGSs to leverage Synchronisation Operators to facilitate cross-border payment connectivity whilst delivering the financial stability benefit of settlement finality will need to be developed further, before any practical steps for implementation can be taken.

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Annex 1: CROSS BORDER PAYMENTS INNOVATION QUESTIONNAIRE

ABOUT YOUR ORGANISATION

1. **Please indicate the type of organisation**

□ Bank
□ Non-bank
    if "Non-bank" please indicate
    □ Payment services
    □ Other financial services (e.g. FinTech)
    □ Central Bank
    □ Other _____

2. **Which geography does your organisation cover? (Please tick as many as appropriate)**

□ Europe
□ Middle East
□ Africa
□ North America
□ Latin America
□ Asia Pacific

3. **Please indicate the country of your organisation (location of HQ)**

[dropdown list countries]

4. **Is your organisation a SWIFT user?**

□ Yes
□ No

5. **Whilst most banks are both providers and buyers of correspondent banking services, please identify which is your PRIMARY focus:**

□ Provider
□ User

ABOUT YOUR ROLE

6. **Please indicate your job title**

[free text]

7. Please indicate your job function (select the one where you spend most your time on)

☐ Network Management
☐ Cash Clearing Product Management
☐ Operations
☐ Product Development / Innovation
☐ Other, please specify: _____

VALIDATION OF PAIN POINTS

8. As user and/or provider of correspondent banking services do you agree with the following pain points in the context of costs?

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
A) DIRECT COSTS FOR MESSAGING FEES CHARGED BY THE NETWORK ARE TOO HIGH	☐	☐	☐	☐	☐
B) FEES CHARGED BY MY BANK PROVIDER ARE TOO HIGH	☐	☐	☐	☐	☐
C) LIQUIDITY RELATED COSTS FOR THIS BUSINESS ARE TOO HIGH	☐	☐	☐	☐	☐
D) CAPITAL RELATED COSTS FOR THIS BUSINESS ARE TOO HIGH	☐	☐	☐	☐	☐
E) COSTS RELATED TO COUNTERPARTY AND LIQUIDITY LIMITS, FAILS IN STP AND INCORRECT PROCESSING ARE TOO HIGH	☐	☐	☐	☐	☐

9. As user and/or provider of correspondent banking services do you agree with the following pain points in the context of transparency?

	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
A) THERE IS A LACK OF INFORMATION THROUGHOUT THE LIFECYLE OF THE PAYMENT	☐	☐	☐	☐	☐
B) THERE IS A LACK OF ENHANCED DATA AND INCOMPLETE TRANSACTION REFERENCE DATA CREATES PROBLEMS TO RECONCILE TRANSACTIONS	☐	☐	☐	☐	☐
C) THERE IS A LACK OF VISBILITY OF TRANSACTION RELATED COSTS, I.E. WHO HAS PAID WHICH FEES TO WHOM FOR VALIDATION OF AML/CTF, COUNTERPARTY RISK, LIQUIDITY REPORTING AND CREDIT LIMITS	☐	☐	☐	☐	☐

INNOVATION APPROACH

10. Is your organisation currently participating or planning to participate in any of the below SWIFT Innovation Initiatives? Please tick as appropriate.

☐ GPI
☐ DLT PoC Nostro/Vostro Reconciliation
☐ None

11. Do you believe that Blockchain/Distributed Ledger Technology could be deployed as the basis for a new generation cross-border payment network?

STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
□	□	□	□	□

12. Does your organisation experiment with or already deploy blockchain/Distributed Ledger Technology?

□ Yes, please provide some high level detail on the area of application:
_____
□ No

13. Would you be available to be contacted in order to participate in our research?

□ Yes
□ No

14. If yes, please provide your name, organisation, e-mail and/or phone number where we can contact you.

[data fields]

Annex 2: CROSS BORDER PAYMENTS INNOVATION QUESTIONNAIRE RESULTS

Table A2.1: Percentage of respondents that strongly disagree, disagree, are undecided, agree or strongly agree with statements describing costs, information provision and technology development (all)

Statement	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1A	2	14	34	28	19
1B	0	12	28	42	16
1C	3	9	23	45	18
1D	0	5	34	42	16
1E	0	12	13	45	27
2A	0	6	8	42	42
2B	0	6	8	49	34
2C	0	0	7	43	48
3A	5	7	33	38	15

1A) Direct costs for Messaging Fees charged by the network are too high. **1B)** Fees charged by my bank provider are too high. **1C)** Liquidity related costs for this business are too high. **1D)** Capital related costs for this business are too high. **1E)** Costs related to counterparty and liquidity limits, fails in STP and incorrect processing are too high. **2A)** There is a lack of information throughout the lifecycle of the payment. **2B)** There is a lack of enhanced data and Incomplete transaction reference data creates problems to reconcile transactions. **2C)** There is a lack of visibility of transaction related costs, i.e. who has paid which fees to whom for validation of AML/CTF, counterparty risk, liquidity reporting and credit limit. **3A)** Do you believe that Blockchain/Distributed Ledger Technology could be deployed as the basis for a new generation cross-border payment network?

Table A2.2: Percentage of respondents that strongly disagree, disagree, are undecided, agree or strongly agree with statements describing costs, information provision and technology development (Users v Providers)

Statement	Users			Providers		
	Disagree	*Undecided*	*Agree*	*Disagree*	*Undecided*	*Agree*
1A	21	31	47	11	41	47
1B	11	24	63	17	38	44
1C	6	27	65	23	14	61
1D	3	34	62	11	26	61
1E	6	9	83	23	17	58
2A	6	9	83	2	5	91
2B	6	8	85	8	8	82
2C	1	8	90	2	8	88
3A	9	36	54	23	32	44

1A) Direct costs for Messaging Fees charged by the network are too high. **1B)** Fees charged by my bank provider are too high. **1C)** Liquidity related costs for this business are too high. **1D)** Capital related costs for this business are too high. **1E)** Costs related to counterparty and liquidity limits, fails in STP and incorrect processing are too high. **2A)** There is a lack of information throughout the lifecycle of the payment. **2B)** There is a lack of enhanced data and Incomplete transaction reference data creates problems to reconcile transactions. **2C)** There is a lack of visibility of transaction related costs, i.e. who has paid which fees to whom for validation of AML/CTF, counterparty risk, liquidity reporting and credit limit. **3A)** Do you believe that Blockchain/Distributed Ledger Technology could be deployed as the basis for a new generation cross-border payment network?

Table A2.3: Percentage of respondents that strongly disagree, disagree, are undecided, agree or strongly agree with statements describing costs, information provision and technology development (World Regions)

Statement	Europe			Asia & Africa			Americas		
	Disagree	*Undecided*	*Agree*	*Disagree*	*Undecided*	*Agree*	*Disagree*	*Undecided*	*Agree*
1A	20	34	45	28	24	48	4	44	52
1B	18	29	52	16	16	68	4	40	56
1C	13	22	63	12	16	72	12	32	56
1D	6	22	70	12	24	64	0	56	44
1E	11	9	79	12	8	80	16	24	60
2A	2	6	90	12	8	80	4	12	84
2B	4	6	88	12	8	80	4	12	84
2C	2	13	84	0	4	96	0	4	96
3A	20	43	36	12	28	60	8	28	64

1A) Direct costs for Messaging Fees charged by the network are too high. **1B)** Fees charged by my bank provider are too high. **1C)** Liquidity related costs for this business are too high. **1D)** Capital related costs for this business are too high. **1E)** Costs related to counterparty and liquidity limits, fails in STP and incorrect processing are too high. **2A)** There is a lack of information throughout the lifecycle of the payment. **2B)** There is a lack of enhanced data and Incomplete transaction reference data creates problems to reconcile transactions. **2C)** There is a lack of visibility of transaction related costs, i.e. who has paid which fees to whom for validation of AML/CTF, counterparty risk, liquidity reporting and credit limit. **3A)** Do you believe that Blockchain/Distributed Ledger Technology could be deployed as the basis for a new generation cross-border payment network?

Annex 3: Contributors to Focus Groups

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Mark Hewlett - Ebury
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Jonathan Bell and Frederic Barbaix - RedCompass
Alastair Milne - Loughborough University
Payam Simko – Natwest
Kirstine Nilsson - Swedbank
Karl Turnbull and Ryan Mcauliffe - SWIFT
Marco Venturella -Earthport
John Jackson and Clare Griffiths - Bank of England
Mark Zanger- Deutsche Bundesbank
Ivana Ponzio - Intesa Sanpaolo
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