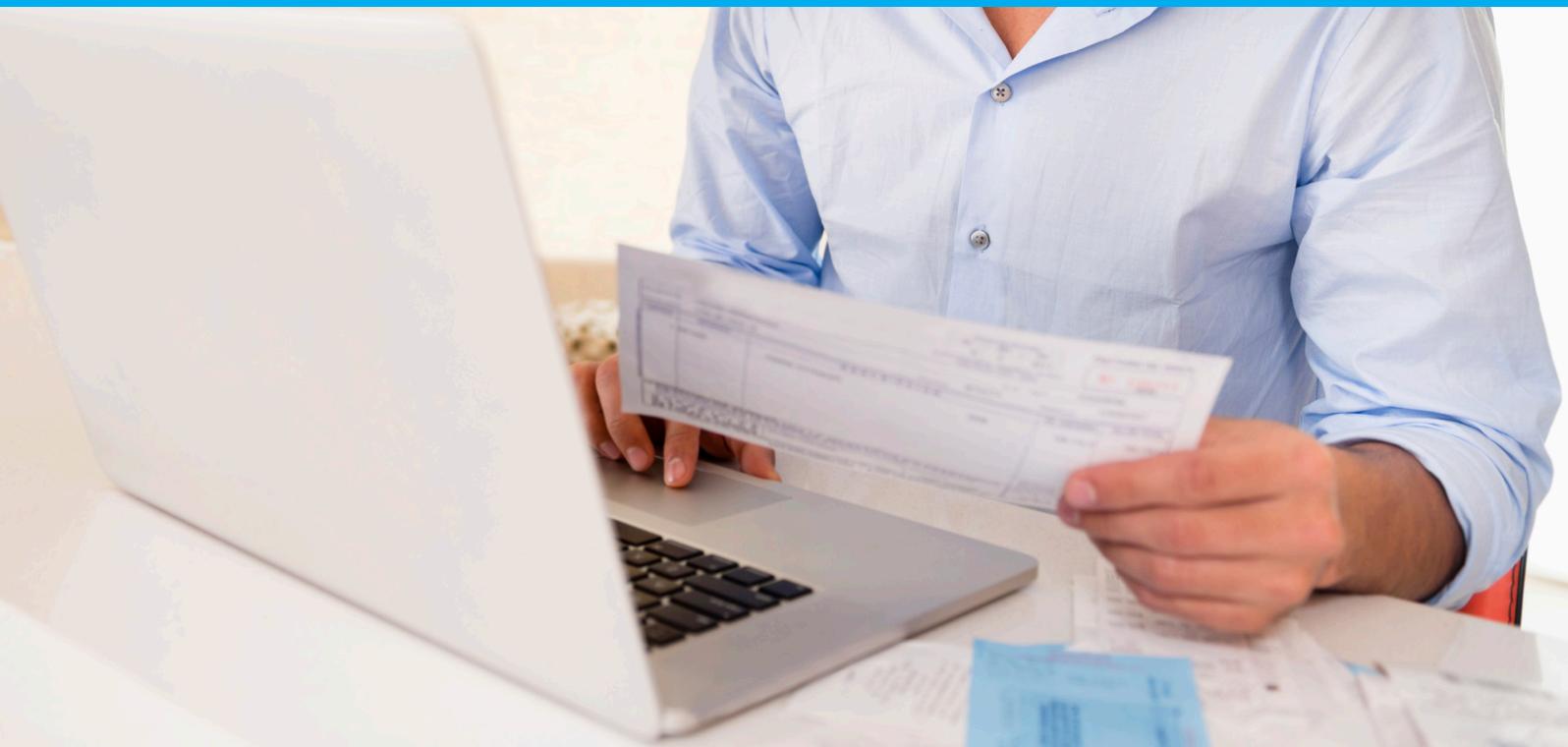

RESEARCH PAPER

Payments Now

Researching and reviewing the world of real-time payment systems

March 2015



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Author: Tim Duston.

Foreword

We have a great payment system in New Zealand. In 2012 we deployed a brand new core infrastructure called Settlement Before Interchange (SBI), which enabled a new, faster way to complete domestic payments.

Our payment systems are reliable, resilient and secure. Some might say that it's world class. Well it is – but is there an opportunity to make it even better? SBI itself is fast and SBI Participants are becoming progressively faster at sending payments into it. But it is not real-time. It is not 24/7 and it doesn't have many of the other characteristics that define real-time payment systems around the world.

There is a global trend towards customers and businesses conducting commerce around the clock with immediacy. This trend is indisputable and its rate of growth is only going to increase. This growth means we will have a widening gap between what customers and businesses require and what traditional batch deferred payment systems can deliver.

To close this gap between customer demands and payment system capabilities, a growing number of countries have deployed real-time payment systems. Most of these systems have been highly successful and have rapidly growing volumes. Other countries are working actively towards the deployment of real-time capability.

In this time of unprecedented digital change, New Zealand has an opportunity to take stock and reflect on how these shifts in technology and customer demands might impact our own payment system. At Payments NZ we have started our own 'taking stock' exercise by embarking on a strategic initiative called Payments Direction. This initiative has been set up to examine global trends and issues in order to take a view on the future of our payments ecosystem and to determine the work we will need to do to retain New Zealand's standing as a world-class payments system.

A series of discussion papers are being produced by Payments NZ to focus on trends and issues in the payments ecosystem, including hot topics such as messaging standards and real-time payments.

This document, *Payments Now*, is the first step to evaluate the opportunities that real-time payments present. There are so many different deployments of real-time payment systems around the world that we need to stand back and examine what is going on internationally so we can assess what has worked well and why.

Payments Now is a research paper. It aims to establish the global facts on real-time payments. Only once we understand the global movement towards real-time payments, can we have a properly informed discussion about what should happen here in New Zealand.

Our next discussion paper will explore New Zealand's opportunities, options and challenges regarding real-time payments. But first I would encourage you to invest time by reading this paper to become knowledgeable about the global movement towards real-time payments.



Steve Wiggins
Chief Executive, Payments NZ

Executive summary

An unprecedented revolution in internet-based information technology and digital networks has transformed the way we interact with each other, the way we purchase goods and services, and the way we receive information about the world around us.

In many respects, payment systems have struggled to keep pace with our expectations of immediacy, especially when increasingly sophisticated mobile devices offer the potential for us to transact around the clock from nearly anywhere. This has led to growing customer sentiment that if we can use technology to communicate and conduct commerce in real-time, then why can't we move money at the same speed with certainty and convenience?

There is a clear gap between meeting these customer demands and the capability of traditional batch processed deferred payment systems. Some countries have responded to this gap by implementing real-time payment (RTP) systems.

While there is some debate about how a RTP should be defined, it is generally accepted that RTP systems allow:¹

“an interbank account-to-account payment that is posted and confirmed to the originating bank within one minute”.

Payments Now is a research paper establishing a fact base on RTP around the world. The purpose of this research paper is to educate the reader on RTP's global trends and developments to a relatively in-depth level. It excludes any consideration of New Zealand's own situation. *Payments Now* is the first of two companion papers on the subject of RTP. The second paper will draw from the work in *Payments Now* and will focus on strategic opportunities and options for New Zealand in respect of RTP.

To understand the global trend towards RTP, this paper examines 15 RTP systems around the world and sets out, in detail, their features and capabilities, why and how they have evolved, and how much success they have had (Appendix 2). This paper also examines publically available literature to form a well-rounded understanding of RTP including their variants and characteristics, their benefits, challenges and risks.

The specific drivers for the deployment of RTP systems vary greatly from country to country. Often the drivers in play are a blend of responding to competition from the non-bank sector, finding new ways to reach out to the unbanked, regulatory policy, infrastructure upgrades, and establishing platforms for account-to-account mobile payments. The research undertaken shows that while there is a relatively even split between the two most common RTP establishment drivers of competition and regulation, the more recently formed RTP examples tend to be established for competitive reasons.

This paper also takes a closer look at five country case studies of RTP systems, examining their strategies and approaches, and what lessons can be learnt (Appendix 1). These five countries have very different RTP deployments. Sweden has aspirations to be a cashless society and its banks have collaborated to develop a commercial mobile person-to-person (P2P) proposition that sits on top of a new RTP infrastructure. Mexico has progressively evolved a non-real-time payment system to be a super-fast real-time batch processing system that is used in a wide range of payment scenarios. Singapore has deployed its new RTP system as part of a wider commercial strategy to retire its batch processing system and to ultimately position the country as a regional

¹ SWIFT (28 May 2014) *Latin American Regional Conference - 2014, Payment Industry Perspectives* [Powerpoint slides], page 5. Available at <http://www.slideshare.net/SWIFTcommunity/larc2014payments-industryperspectives9jun2014>

economic hub, which includes handling real-time cross-border transactions. In the United Kingdom (UK), their RTP system is not only integrated as a part of regular banking but it has pioneered the development of 'overlay' value add services that leverage the core infrastructure. Finally, in Australia real-time capability will be delivered through its New Payments Platform (NPP), which will be built from scratch as an 'ideal state' RTP infrastructure and will bring SWIFT into the frame as an RTP infrastructure provider.

One of the clear conclusions from our research is there is no uniform way to achieve RTP. Deployments around the world vary considerably. Sometimes new RTP infrastructure is built new, for example, the FAST system in Singapore and Australia's upcoming NPP. In other instances a decision is made to leverage existing infrastructure, for example, Mexico and the M-Pesa system in Kenya which is based on the existing telecom network.

The RTP infrastructure can act as a backbone for both everyday banking services and commercial overlay products and services, as is the case in the UK. Alternatively, the infrastructure could support a wide range of payments scenarios ranging from high to low value, debits and credit transactions, person-to-person (P2P) mobile payments, and other channels. Mexico and Singapore are examples of this wide range of payment scenarios. In other instances, the RTP infrastructure can be narrow and targeted in its orientation, generally focusing just on P2P mobile payments, such as in Sweden.

Most RTP systems, like Chile's TEF, are available on a 24/7 basis, while others have more limited windows of availability, such as Switzerland's SIC system which is 24/5. Settlement arrangements are similarly varied and range from deferred settlement that occurs after processing of the payment has been completed from the customer's perspective, through to having inter-participant settlement also on a real-time basis

One clear trend among the RTP systems we reviewed is the increased use of ISO 20022 payments messaging technology.

There is a growing body of evidence on the positive macroeconomic impact from RTP systems as RTP push the velocity of money to its maximum possible speed – real-time. This appears to be a factor in the decision by the Federal Reserve² to press for RTP capability to be deployed in the United States. The benefits of RTP to the economy as a whole differ to the commercial return on investment required by those investing in the RTP system. The deployment of RTP systems is easier to justify at a national level than at a private investor level. However, the continued development of mobile and B2B commercial propositions that leverage RTP infrastructure is starting to see business cases stack up for investors, who are predominantly banks.

There are challenges associated with RTP systems. These include establishing a compelling business case from the investor's perspective, responding to operational and settlement risk, managing fraud in a real-time environment, and banks building the required capabilities to be real-time institutions. These challenges are regularly being overcome. There are currently more than 18 RTP systems in operation, with that number forecast to grow to 55 systems in the next 20 years.

The global movement towards RTP systems is strong and growing. This *Payments Now* research paper is an important step in understanding RTP around the world before we start our journey to consider any role RTP might potentially have in New Zealand.

² Unless the context requires otherwise and we are referring to one of the regional Federal Reserve banks, the use of the term Federal Reserve in this paper is a reference to the Federal Reserve System.

Introduction

Traditionally, most countries have employed two main types of payment systems: a bulk exchange system for retail transactions, and a large value payment system for wholesale transactions. However, a third type of payment system is emerging to provide fast payments directly from your bank account around the clock. These payments are known as RTP. SWIFT explains the trend towards RTP as follows:³

“The move towards real-time payments has emerged in response to a number of market drivers, including customer pressure (primarily due to the increasing popularity of internet and mobile payment applications), regulation (to improve customer experience and reduce risks for the community) and also to reach unbanked populations, competition (for example, from non-bank providers) and change precipitated by infrastructure renewal projects.”

Payments Now is the first of two companion papers dealing with RTP. *Payments Now* is a research paper that has been written to examine and understand the shift in how the world is thinking about the immediacy of payments. Global momentum towards RTP is picking up, with at least 18 RTP systems in operation worldwide and several more at the development stage. With many more countries exploring how to implement a RTP system in the future, Fundtech⁴ predict that within 20 years there will be 55 countries with RTP systems in operation.

Payments Now provides a robust fact base summary of this global trend based on publically available information. This paper:

- examines the core features of RTP systems and what has underpinned their development; and
- provides an overview of selected RTP systems in operation and summarises their future development plans.

A second paper will draw on the work in *Payments Now* and will focus specifically on the options and strategic opportunities in New Zealand with respect to RTP. The New Zealand centric paper will provide the basis for consultation in order to establish a common New Zealand position on RTP. That common position will feed into our Payments Direction project.⁵

Figure 1 below shows the relationship between *Payments Now*, its companion paper, the consultation effort and the roadmap that will emerge from the Payments Direction project.

FIGURE 1 – PAYMENTS NOW AND THE WORK AHEAD



3 Section 5.1, IR 673: PAVING THE WAY FOR SWIFT2020.

4 Fundtech (September 2013) *Immediate Payments: Innovation is knocking* White Paper, page 3. Available at <http://www.fundtech.com/news/218/fundtech-whitepaper-highlights-momentum-immediate-/>

5 The Payments NZ Payments Direction initiative will, among other things, result in a consolidated view of the future payments ecosystem in New Zealand.

Defining real-time payments (RTP)

In this section we explore what is meant by the term RTP (also commonly referred to as faster payments or immediate payments). For a term that is widely used, RTP lacks a consistent and uniform definition.

The lack of uniformity occurs because different stakeholders measure the 'real-time' attribute of a payment in different ways, depending on how quickly some or all of the following five stages of the payment process are completed.

- **Authorisation:** The approval by the initiating customer's financial institution of the payment request.
- **Clearing:** The process of reconciling the payment data, transmitting the payment data between financial institutions, and calculating potential settlement positions.
- **Settlement:** The process of discharging financial obligations between two or more parties.
- **Posting:** The process of making the funds available to the beneficiary customer.
- **Notification:** The provision of information to the parties involved in the payment process (financial institutions, initiating and beneficiary customers, etc.) to confirm the status of the payment.

The stages of authorisation, clearing and posting all happen in sequential order. Notification, on the other hand, can occur at any time in the process. While notifications to customers are optional, they are a common characteristic of RTP because customer knowledge of the status of the payment is important to unlocking its real-time benefits. Speed is irrelevant if the customer does not know about it. Settlement is not customer facing and only concerns the two financial institutions. How quickly settlement is concluded has no bearing whatsoever on the measurement of 'real-time' as it does not affect the customer experience. Therefore, settlement can either occur in conjunction with clearing (real-time gross settlement), or at any later time (net deferred settlement).

SWIFT and NACHA emphasise the speed of the posting and confirmation process:⁶

"an interbank account to account payment posted, and confirmed to the originating bank, within one minute."

Other definitions, such as the ones that appear below from Accenture and Lipis & Lipis, include not only the speed of posting but also how quickly the payee can use the value received.

Accenture:⁷

"an interbank account-to-account payment that is posted and confirmed to the originating bank within one minute, so the payee can use this value instantly and the payer has confirmation of the status of the transaction."

6 GPF (2013) page14. Sourced from BostonFed *Costs and Benefits of Building Faster Payment Systems: The U.K. Experience and Implications for the United States*, October 2014, page 8. Available at <http://www.bostonfed.org/economic/current-policy-perspectives/2014/cpp1405.pdf>; SWIFT (28 May 2014) *Latin American Regional Conference - 2014, Payment Industry Perspectives* [Powerpoint slides] page 5. Available at <http://www.slideshare.net/SWIFTcommunity/larc2014payments-industryperspectives9jun2014>

7 Accenture Payment Services (2014) *Everyday Payments*. Available at <http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Everyday-Payments.pdf>

Lipis & Lipis:⁸

“a real-time payment is an account-to-account credit transfer in which funds are posted to the beneficiary’s account and confirmed to the sending bank within one minute. A real-time payment does not have to settle in real-time.”

NACHA:⁹

“an interbank account-to-account payment that is posted and confirmed to the originating bank within one minute.”

Other definitions, such as the one immediately below from the Federal Reserve, focus on the validation processes and the timeliness of notification, as well as on the availability of funds.

Federal Reserve:¹⁰

“a real-time validation process assuring the payee that the payer’s account exists and (that) it has enough funds or available credit to cover the payment; timely notification to the payer and payee that the payment has been made; and near-real-time posting/availability of funds to both the payer’s and payee’s accounts.”

Conclusion

In some ways, the term ‘real-time’ is a misnomer because actual real-time (i.e. instant) functionality is not technically feasible. Some small amount of time, such as the minute referred to above, will be required to conclude the payments process. Even the fastest RTP systems require a couple of seconds to complete processing. In several of the above definitions within a minute is used as the measure of ‘real-time’ and the examination of 15 RTP systems in Appendix 2 confirms this speed as an accepted benchmark. However, the examination of 15 RTP systems also shows that many RTP systems operate at speeds of less than 10 seconds, particularly those that have real-time account-to-account mobile payments as a core proposition. In summary, measuring the speed of an RTP should focus on the completion of all customer-facing activities required to fully complete a payment.

8 Lipis & Lipis (2014) *Global Payment System Analysis*, page 77.

9 GPF (2013) page 14. Sourced from BostonFed *Costs and Benefits of Building Faster Payment Systems: The U.K. Experience and Implications for the United States*, October 2014, page 8. Available at <http://www.bostonfed.org/economic/current-policy-perspectives/2014/cpp1405.pdf>

10 The Board of Governors of the Federal Reserve System, 2013, addresses the “need-for-speed” issue by proposing a “vision to improve the speed and efficiency of the U.S. payment system from end to end” with a definition of real-time payments, page 3. Sourced from BostonFed *Costs and Benefits of Building Faster Payment Systems: The U.K. Experience and Implications for the United States*, October 2014, page 7. Available at <http://www.bostonfed.org/economic/current-policy-perspectives/2014/cpp1405.pdf>

Characteristics

In this section we examine the characteristics of RTP systems. We begin by investigating the core and secondary characteristics of those systems and conclude by examining the preferred characteristics of RTP systems.

Core characteristics

All RTP systems share three core characteristics:

1. **Immediacy:** The transferred amount should be available to the beneficiary in real-time or near real-time.
2. **Irrevocability:** Once a payment has been initiated, it cannot be revoked.
3. **Certainty:** Both initiating and beneficiary customers know the payment has been accepted (or rejected) and completed.

These three characteristics are fundamental to any payment system being considered 'real-time'.

Secondary characteristics

In addition to the above core characteristics, there are a number of secondary characteristics that are very common to RTP systems around the world. The difference between a core and secondary characteristic is that, for each secondary characteristic, there are notable exceptions in the extent to which that characteristic is found in RTP system deployments. For example, only 11 of the 15 RTP systems examined in Appendix 2 operate on a 24/7 basis. Accordingly, 24/7 availability could not be considered a core characteristic of a RTP system even though it is often referred to as such.¹¹

There are six secondary characteristics shared across RTP systems:

1. **24/7 availability:** Payments are sent and received at all times of the day, every day of the year.
2. **Delayed settlement:** Periodic net settlement takes place between participants after the payment has been made, often 5 days a week.
3. **Rich payments messaging standards:** Dominated by the ISO 20022 payments messaging standard.
4. **Single threaded transactions:** Payments are processed as stand-alone transactions and are not batch processed.
5. **Proxy bank account identifiers:** Payers can use a proxy identifier, such as a mobile phone number or email address, to initiate a payment. Mapping systems look up the bank account number linked to that proxy identifier and funds are then routed to that bank account.
6. **Real-time notification:** Payers and payees receive real-time notification of the payment, or its rejection. For example, text messages or notifications from a mobile device or banking application.

Among the RTP systems we reviewed, there is a clear trend of progressive enhancement in the direction of these secondary characteristics. For example, RTP systems in both Mexico and Japan are expanding their operating hours towards 24/7. Several countries, such as the UK, Mexico,

¹¹ For example, in SWIFT article 'ISO 20022 and real-time domestic payments', *MI Forum Magazine 2014*, page 197. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

Poland, and South Africa, have added, or are working towards adding, proxy bank account identifiers. Many jurisdictions, such as South Africa, Switzerland, Japan, Singapore, Denmark, and Sweden, either have recently migrated towards ISO 20022 or are in the process of completing that migration. SWIFT comments on this trend as follows:¹²

“While there is industry consensus around these core characteristics, variations in implementation have emerged. For example, not all RT-RPS offer 24/7 availability (Brazil, Taiwan and Japan do not) although all systems strive to attain that goal. Notions of immediacy carry different connotations too. In Mexico, banks must post the money to the account of a beneficiary within 30 seconds. In the United Kingdom, by contrast, Faster Payments mandates two hours.

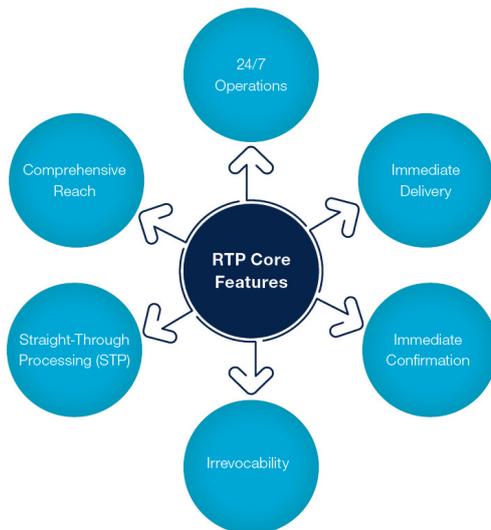
Another important difference between existing RT-RPS is their approach to liquidity and settlement risk management. The majority maintain a deferred net settlement approach, with a limited number of settlement cycles per day. Others settle each payment gross on dedicated “shadow accounts,” with the actual funding level managed through the existing RTGS system.

These (and other) differences are likely to persist for some time. But one common denominator has emerged at all the RT-RPS that are developing now: the adoption of ISO 20022 as their messaging standard. This is true of Bankgirot/SWISH in Sweden, Elixir Express in Poland and FAST in Singapore. It is also true of Nets in Denmark, which goes live in November 2014, and of the NPP in Australia, which aims to go live in late 2016 [now 2017].”

Preferred characteristics

Capgemini has examined the preferred characteristics of an ideal RTP system. These characteristics are depicted in the following diagram and are described by Capgemini as ‘RTP core features’.¹³

FIGURE 2 – PREFERRED CHARACTERISTICS (CORE FEATURES)



SOURCE: Capgemini (2014) *Real-Time Payments Systems in the United States. How Can U.S. Banks Prepare?*

12 For example, in SWIFT article 'ISO 20022 and real-time domestic payments', *MI Forum Magazine 2014*, page 197. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

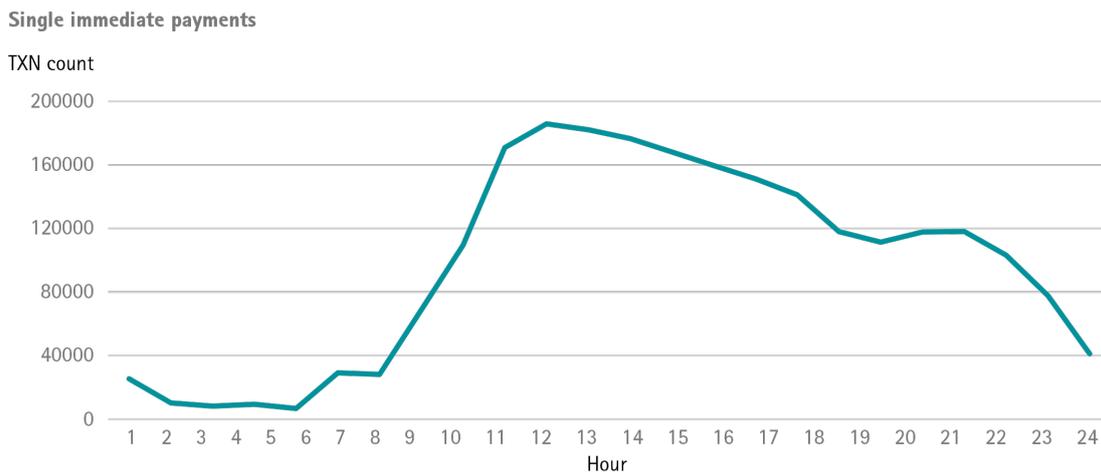
13 Capgemini (12 December 2014) *Real-Time Payments Systems in the United States. How Can U.S. Banks Prepare?*, page 5. Available at http://www.capgemini.com/resource-file-access/resource/pdf/rtp_systems_in_the_united_states_how_can_u.s._banks_prepare.pdf

Capgemini defines the core features as follows:

- **24/7 operations:** Operates at all times ensuring a continuous clearing and settlement process.
- **Immediate delivery:** Clears and settles transactions in real-time, delivering the requisite funds to the payee immediately.
- **Immediate confirmation:** Provides an instantaneous real-time message of confirmation to both the payer and the payee.
- **Irrevocability:** Makes the transactions irrevocable due to the nature of fast payments, except in the case of unauthorised use (e.g. fraudulent transactions).
- **End-to-end straight-through processing:** Helps in the significant reduction of settlement time.
- **Comprehensive reach:** Supports a range of payment channels, including mobile, to ensure a wider reach of real-time payments.

There is a degree of overlap between the features identified by Capgemini and the core and secondary characteristics outlined previously. One of these areas of overlap, 24/7 operation, deserves some comment. The notion payments could be sent and received at all times of the day, every day of the year, seems highly desirable and consistent with consumer trends and expectations. That said, data from the Faster Payments Scheme Limited in the UK suggests relatively few payments are initiated between midnight and 6am.

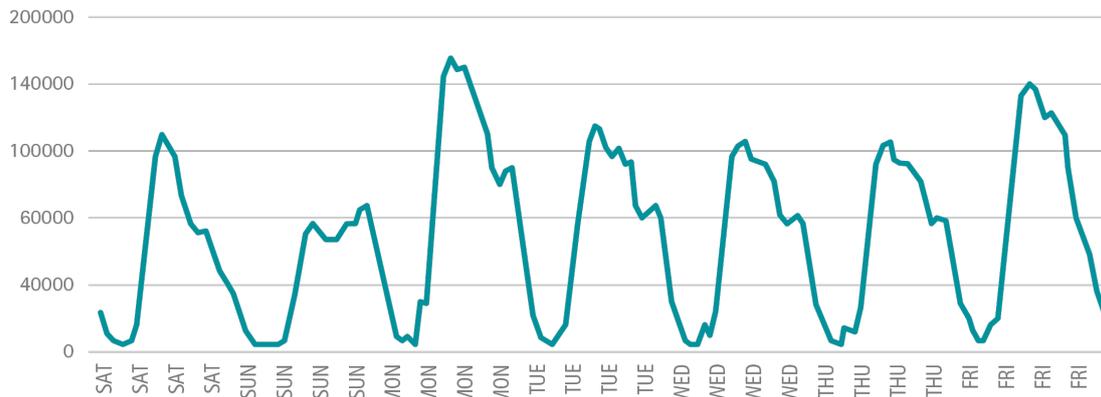
FIGURE 3 – AVERAGE HOURLY PAYMENT VOLUMES (PER DAY)



SOURCE: Accenture Payment Services (2014) *Immediate payments: seizing the customer opportunity*, page 13.

With respect to operating seven days a week, as evidenced by data from the Faster Payments Scheme Limited, volumes throughout a typical week are relatively smooth, with Sundays being the lightest volume day and Mondays and Fridays the highest volume days.

FIGURE 4 – AVERAGE DAILY PAYMENT VOLUMES



SOURCE: Accenture Payment Services (2014) *Immediate payments: seizing the customer opportunity*, page 13.

Experience in the UK indicates that operating on a 7 day basis has a more significant impact on volume flows than operating 24 hours a day (excluding the hours of midnight to 6 am). However, for those RTP systems that have aspirations to be used for cross-border transactions (such as in Singapore), being able to operate 24 hours a day is more critical, as this allows the system to operate across multiple time zones.

Conclusion

The three core characteristics of immediacy, irrevocability and certainty are present in all RTP systems. However, variations in RTP system deployments around the world mean the secondary characteristics present differently across these deployments. One common initiative among RTP systems is the move to adopt ISO 20022 as the preferred messaging standard because of the rich payments functionality this supports. The preferred characteristics articulated by Capgemini represent an ideal RTP system. Of the 15 RTP systems we reviewed (refer Appendix 2), none feature all of Capgemini’s preferred characteristics. Several feature most of the characteristics, missing only one or two. Common gaps are not having 24/7 settlement processes or not yet having a comprehensive reach across multiple payment channels.

Drivers for establishment

In this section we examine the drivers for establishing an RTP system. The drivers have been identified and collated via an extensive literature review. The original source of all of the drivers and benefits identified are cited.

TABLE 1 – RECAP OF IDENTIFIED DRIVERS UNDERPINNING THE MOVE TO RTP SYSTEMS

Drivers	Summary Comment
Immediacy in interactions	<ul style="list-style-type: none"> • Consumers and businesses increasingly expect the speed and functionality of payments to mirror the rest of their digital experiences.
The growth of mobile	<ul style="list-style-type: none"> • Commerce and social interaction is increasingly mobile and new sophisticated mobile devices have spurred new use cases for RTP.
Regulation	<ul style="list-style-type: none"> • Existing batch processing arrangements do not provide the visibility required by regulators and counterparties. • Regulators are increasingly focused on improving the timeliness of the customer experience for all customer groups. • Regulators and the public at large expect banks to play an effective 'real-time' role in reducing illegal payments activity.
Competition and commercial pressures	<ul style="list-style-type: none"> • RTP puts the bank account at the center of the banking relationship, thereby making disintermediation harder. • In response to customer demand, banks are increasingly focused on improving the timeliness of the customer experience for all customer groups. • Competition from non-banks using real-time mobile payments as a way to break into the banks' traditional payment value chain are leading banks to develop RTP platforms. • Legacy batch systems are becoming increasingly expensive to support and evolve.
Convergence	<ul style="list-style-type: none"> • The traditional distinctions between high value real-time systems and low value deferred systems is breaking down. • The costs of supporting multiple systems may prove unsustainable in the longer term. • A longer term driver of domestic payment systems becoming linked across national boundaries on a real-time basis.
Achieving the vision	<ul style="list-style-type: none"> • Flexible RTP systems are increasingly seen as playing a fundamental role in achieving the desired end state in many payment communities.

In the following paragraphs we explore each of these drivers in more detail.

The need for speed

We now live and work in a world where advances in networking and information technology have raised our expectations that there will be immediacy in nearly every interaction we have. We expect to be able to purchase goods and services, obtain news and information, and communicate with work colleagues and friends, 24/7 from nearly any location around the world.

Against that backdrop, questions are increasingly being raised as to why payment systems have not kept pace with this trend:

"New fiber optic wires can carry a two-hour movie in 31 millionths of a second. Hedge funds already make trades in a fraction of that time. And when you pay a bill online, money disappears from your account at high velocity.

*So why does money take so long to appear in your account? Why, when you want to move cash from one account to another, is it faster to walk it there - even if it's a really long walk?"*¹⁴

There is currently a gap between the 'on demand' nature of commerce, the lifestyles of 'digital citizens' and the capabilities of many of the payment systems in use around the world:

*"As commerce around the world becomes a 24/7 real-time reality, driven largely by digital technology, there is a strong need for payment mechanisms to move in harmony with this new world. The fundamental requirement is to be able to move money from one account to another immediately, with certainty and convenience and at low cost to all stakeholders. Existing payment infrastructures do not currently have this capability and most are not compatible with the online and mobile channels."*¹⁵

*"We conducted a research study that interviewed 2,200 consumers and 500 businesses of all sizes about what they valued most from payments services. More than 70 per cent of both consumers and businesses said making funds available from within a few seconds to up to an hour was the most desirable outcome. Where users of payment services are managing their accounts on a timetable close to real-time, they want to know what money in their account is available to spend at any particular moment. Real-time information is obviously key to delivering that."*¹⁶

Perhaps the most significant influence on the demand for RTP has been the uptake and sophistication of mobile devices. The proliferation of smartphones and tablets not only lies behind the growth in mobile commerce but also in organisations adopting new ways of working on a B2B basis.

"The mobile P2P case is often cited as the impetus for a number of recent developments in real-time systems, such as SPEI in Mexico and BIR/PRT in Sweden. Though it is just a channel, mobile enables new use cases for real-time payments and can accelerate the adoption of real-time payment services, particularly among younger consumers.

Beyond mobile, there are a number of products and services made possible through real-time platforms such as corporate, B2B, and consumer bill payments, and RT can also reduce the cost of cash and cheque processing. ...

According to the GPSA survey of payment systems, P2P payments are the most widely cited use case for real-time payments. However, a number of systems have reported that there is huge potential in the B2B space. Mobile is not only a useful channel, but

14 Steverman, B. (31 October 2014) 'If Everything Moves at the Speed of Light, Why Is My Money So Slow?', *Bloomberg Business*. Available at <http://www.bloomberg.com/news/2014-10-30/if-everything-moves-at-the-speed-of-light-why-is-my-money-so-slow-.html?hootPostID=dffa04ee1bb97efcbd2f4598265408da>

15 Patel, P. (2014) 'The cascading effect of real-time payments', *Global move towards real-time payment systems*, Vocalink, page 13. Available at http://www.bankingtech.com/wp-content/blogs.dir/94/files/2014/04/VocaLink_Supplement_low_res_Complete.pdf

16 Rodriguez, S. (a senior vice president, payments industry relations, for the Federal Reserve System), (2014) 'The retail payments revolution', *SWIFT MI Forum Magazine 2014*, page 125. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

real-time payment systems and mobile payments are symbiotic. Mobile devices will accelerate the adoption of real-time payment services, particularly among younger consumers.”¹⁷

Responding to regulation, competition and commercial pressures

While there is certainly ample evidence RTP systems are a logical extension of the new ‘on demand’ world and necessary for that world to evolve in a way that meets consumer expectations, RTP capability also helps financial institutions address a range of regulatory, competitive and commercial pressures. In relation to such pressures, an RTP system helps financial institutions respond to:

- **The need for increased visibility in payments processes.** Distra notes that *“The existing batch-processing systems that most of the world’s Tier One banks use provide only limited insight into payments and have especially poor visibility of individual payments as they occur. As a result, a bank’s ability to respond to a particular payment is severely reduced until batch processing is completed. In a global sense, banks are not completely aware of what is happening within their payments division until 24 hours after the event – a position that customers, regulators and even other financial institutions are now finding unacceptable.”¹⁸*
- **Changing regulatory settings.** Distra comments that *“...regulators responded to the persistent demand from consumer bodies and corporate customers to reduce the three-day delay before certain types of payments cleared to their accounts. The UK Office of Fair Trading agreed and the banking sector has been forced to introduce a faster payments scheme.”¹⁹*
- **The rise of competition from the non-bank sector.** Distra points out that *“Major retailers, third-party processors and non-traditional players such as telecommunications companies, online auctioneers and micropayment merchants, are encroaching on banks’ traditional trading territories as they seek ways to break into the payment value chain. These new players are better placed to adopt innovative technologies – such as real-time payments processing – to introduce new and more competitive products and services.”²⁰*
- **The need for improved cost management.** Distra comments that *“...as decades-old mainframe computer systems reach or exceed their use-by dates and maintenance costs – further fuelled by the rarity of the required legacy skills – spiral upwards, banking institutions have been forced to look closely at reliable, cost-effective ways to replace them.”²¹*
- **A growing expectation banks can play an effective role in reducing fraud and preventing money laundering.** Distra notes that *“Tracking and preventing criminal activity such as fraud and money laundering requires real-time payments processing facilitated by technology that can provide real-time alerts, information and response.”²²*

Our examination of 15 RTP systems around the world showed a near even split between regulatory and competition drivers being the primary catalyst for establishing an RTP system. Interestingly, there is a clear trend that recent RTP system deployments have taken place in response to competition, whereas older more established RTP systems have been implemented for regulatory reasons, with Australia being the notable exception. (Refer Appendix 2 ‘Drivers for Establishment’ for details.)

¹⁷ Lipis and Lipis (2014), *Global Payment System Analysis*. (Not available online)

¹⁸ Distra, *Real-time payments processing. Reshaping the payments industry landscape*, page 6. Available at http://h21007.www2.hp.com/portal/download/product/4807/Distra%20RTPP%20Report-screen_1201240358045.pdf

¹⁹ Ibid

²⁰ Ibid

²¹ Ibid

²² Ibid

Convergence

Long accepted distinctions between different payment systems are beginning to break down, especially as regulators and consumers push for real-time capability. Over time it may not be cost effective for organisations to support multiple overlapping payment systems.

*"[W]e are seeing the distinction between HVPs settling real-time and LVPs on a deferred net basis disappearing extremely quickly. A lot of LVPs are highly urgent, even when they are retail in origin, because they are being used to buy a car or a house. We also see a lot of HVPs settling through conventional ACH channels, because they are not treated as urgent."*²³

Bergman believes having three systems, one high value, one low value batch system, and one RTP system, is unsustainable. This leads to two potential pathways: a planned migration and consolidation of payment systems (such as in Singapore), or payment system competition and volume migration leading to batch systems losing critical mass (such as in Mexico and as is starting to occur in the UK.) Bergman comments:²⁴

"What we do not need is three different systems – a central bank RTGS, an ACH and a third system with multiple clearing cycles - to solve the same problem. In the long run, operating three separate systems, each achieving real-time for a different group of customers or payments, will not be cost-efficient. There will need to be consolidation between the systems."

A logical extension of the convergence that is occurring in domestic payment systems towards real-time is that, in the long-term, we will see RTP systems linking across national boundaries to conduct cross-border transactions. While some time away yet, some RTP systems are already positioning themselves for this end-point by building multi-currency and cross-border capabilities, notably in Mexico and Singapore.

*"As more countries adopt real-time payments it is only a matter of time before we see the birth of real-time cross-border payments. This is particularly true of instances where banks become members of multiple schemes. To realise such a vision would require a real-time cross-border connection between banks and a clearing and settlement provider managing exposures and liabilities. It would be a natural evolution for a domestic real-time payments clearing provider to promote themselves to a pan-regional level, bringing with them the principles of domestic clearing and settlement to a regional stage. Real-time payments coupled with a 24x7 service window could help improve corporate cash flow, and open up trading opportunities across multiple time zones."*²⁵

23 Storm, R. (director, EBA Clearing), (2014) 'The retail payments revolution', SWIFT MI Forum Magazine 2014, Page 117. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

24 Bergman, H. (senior manager, market and infrastructure at SEB Stockholm), (2014) 'The retail payments revolution', SWIFT MI Forum Magazine 2014, page 121. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

25 Ali, I. (19 August 2013) *The emergence of real-time payments: A global comparison*. Available at <http://www.bobsguide.com/cgi-bin/guide/newsExtras.pl?ID=bg&action=print&seq=56961>

Achieving the vision

RTP systems can play an instrumental role in achieving the vision set out by a particular payments community. While that vision will vary across different communities and national boundaries, BNY Mellon has articulated one possible vision for world payments based on seven attributes:²⁶

“An ‘end-state’ view of the world of payments – a goal for the industry to aim for – depicts a rich landscape of capability and added value, underpinned by technology and actualised through high levels of market adoption. It is likely to show:

- *increasing alignment in the capabilities and expectations of retail/consumer and commercial/corporate end-clients,*
- *high levels of integration in global settlement and clearing systems,*
- *platform agnostic channels allowing maximum access and flexibility for end-clients,*
- *real-time delivery,*
- *information-rich delivery based on sophisticated analytics,*
- *effective leveraging of open source technology and ‘big data’, and*
- *enhanced visibility in response to more uniform regulatory requirements.”*

Having a RTP system with flexibility will be key to achieving this vision and to realising each of the seven attributes outlined above

Conclusion

The trend towards RTP systems is being driven from multiple sources. Perhaps the most significant influence is the pressure for immediacy – ‘the need for speed’ – consumers, businesses, and regulators all want more from their payment system and they increasingly want that in real-time. While the primary driver for RTP systems being established is evenly split between regulation and competition, most of the recently launched RTP systems have come about due to competition. The drivers for establishing RTP systems appear to be equally divided between ‘problem definition’ (what is today’s problem we wish to solve) and ‘opportunity definition’ (what would we like to be doing tomorrow) reasons.

²⁶ BNY Mellon (September 2014) *Global Payments 2020: Transformation and Convergence*, page 21. Available at <https://www.bnymellon.com/global-assets/pdf/our-thinking/business-insights/global-payments-2020-transformation-and-convergence.pdf>

Benefits

In this section we examine the benefits of RTP systems. The benefits have been identified and collated via an extensive literature review. The original source of all of the drivers and benefits identified are cited.

TABLE 2 – REPORTED BENEFITS OF RTP SYSTEMS

Stakeholder	Summary benefit
Financial institutions	<ul style="list-style-type: none"> • Bank account becomes the centre of the payment relationship. • RTP act as the foundation for value-add products and services provided as an overlay on top of the core RTP infrastructure. • Better management of costs and achievement of business objectives. • Better at meeting expectations about detecting and preventing illegal payments activity.
Consumers and businesses	<ul style="list-style-type: none"> • Immediate confirmation of payment. • Increased confidence in the integrity of the payments system. • Better budgetary control. • Immediate availability of funds. • Convenient payment methods, e.g. using mobile phone numbers as bank account proxies. • Receipt of more relevant product and service offerings. • An alternative and more cost effective option for online shopping payments and in-store payments (both POS and non-POS).

In the following paragraphs we comment more fully on the above benefits.

Financial institutions

The benefits experienced by financial institutions, and especially banks, arise because of the nature of account-to-account payments, where *‘real-time service pushes the bank account into the center of the payment relationship.’*²⁷ This provides the foundation for the bank’s relationship with their customer, upon which they can offer value-add products and services. Conversely, if the bank account is not at the centre of the payment relationship, disintermediation and fragmentation is more likely.

For banks, one of the most significant advantages is the potential to develop innovative high-value add products and services off the back of the core RTP infrastructure. These products and services are often referred to as ‘overlays’ and they can be a key factor in swinging the business case for establishing an RTP system from negative to positive²⁸. VocaLink, an operator of RTP systems, describes this situation and how it is evolving in the UK.²⁹

27 NACHA (October 2013) *What Will the Role of Bank Accounts Be as Payments Evolve?* Available at <https://www.nacha.org/news/nacha-s-global-payments-forum-announces-release-white-paper-what-will-role-bank-accounts-be>

28 The Federal Reserve, USA (3 June 2014) *FRFS Faster Payments Roundtable*, page 61. Available at https://fedpaymentsimprovement.org/wp-content/uploads/faster_payments_roundtable.pdf

29 VocaLink, *The benefits of real-time payments*. Available at <http://immediatepayments.vocalink.com/Benefits>

“The underlying infrastructure enables banks to launch game-changing products and services that provide real customer value and position the banks at the centre of the payment process. The latter is extremely important as many non-banks are beginning to extract great value from the payments process and more importantly the customer relationship. . . . The underlying real-time infrastructure needs to be designed in a way that is conducive to the development of new services that create value for end-users.

...

The real value resides within the development of overlay services to end-users such as digital payments initiation services. It is these services that have the propensity to generate lucrative revenues for banks, in particular the person-to-business propositions.”

Because RTP systems are based on modern programming languages, use open standards systems, and run on modern hardware, financial institutions will be better placed to manage costs, to improve profitability and to meet business objectives.³⁰

Given the growing emphasis on preventing fraud and money laundering activities, RTP systems better position financial institutions to respond to unusual or illegal payments activity as it happens. This will enable that activity to be suspended until further investigation can be completed, potentially reducing illegal payments activity earlier than would have been the case with batched deferred payment systems.³¹

Consumers and businesses

RTP systems will allow consumers and businesses to experience immediate confirmation of payments, the confidence that comes from the knowledge that payment is irrevocable, better budgetary control, and immediate use of funds.³²

Consumers will benefit from the receipt of services that are more relevant to their circumstances and which better reflect their expectations about the value of the customer relationship. Businesses can leverage RTP to improve their proposition to consumers by offering services or goods in shorter timeframes. For example, RTP systems permit corporates to bundle offerings around ‘consequence payments’. Imran Ali notes:³³

“Quicker payments have greater value as they trigger quicker consequences. A prime example is online purchasing of goods. The goods are only released when payment is received, so a real-time payment transaction enables a corporate to dispatch their goods either the same day or the next day, instead of a few days later. . . .

Although these advantages have also become possible via card payments, real-time payments are cheaper for merchants, allow closer budgetary control for the consumer (as they are made directly from the bank account), and have less risk attached. The integration of online banking and real-time payments is key in enabling consumers to pay for goods from their bank account.”

30 Distra, *Real-time payments processing. Reshaping the payments industry landscape*, page 10. Available at http://h21007.www2.hp.com/portal/download/product/4807/Distra%20RTPP%20Report-screen_1201240358045.pdf

31 Ibid

32 Accenture Payment Services (2014) *Immediate payments: seizing the customer opportunity*, page 10. Available at <http://www.accenture.com/SiteCollectionDocuments/financial-services/accenture-immediate-payments.pdf>

33 Ali, I. (19 August 2013) *The emergence of real-time payments: A global comparison*. Available at <http://www.bobsguide.com/cgi-bin/guide/newsExtras.pl?ID=bg&action=print&seq=56961>

Developing RTP capabilities opens the possibility for account-to-account payments to be used as an online payment option and would compete for 'card not present' transaction volumes, such as online shopping. In addition, as RTP becomes more established, there are increasing numbers of in-store or point of sale use scenarios for RTP (for example, the UK's ZAPP³⁴).

Some RTP systems focus on adding customer convenience as a key proposition; for example, adding the ability to make a payment to a mobile phone number instead of a bank account number. The RTP system then maps the destination mobile phone number to the correct bank account.

Conclusion

The benefits of RTP systems will allow financial institutions, and especially banks, to position their enterprise so their relationship with their customers is centered on their bank account. Correspondingly, consumers and business can expect a payments system that is better suited to their needs and provides immediate access to payments. In the case of businesses, the real-time system can be leveraged to provide consumers with improved product offerings, especially in areas where timing and consequence are important. Account-to-account RTP systems can, and will, increasingly compete directly with card payments both in-store and online.

34 Refer to video at <http://www.zapp.co.uk>

Macroeconomic impact

In this section we examine the macroeconomic impacts associated with RTP systems.

The principal macroeconomic impact arises from the increase in the velocity of money that occurs when payments happen in real-time. Put simply, the faster the velocity of money the better it is for an economy. Money that can be moved at a high velocity can work harder in an economy because it can be used sooner and/or recycled more frequently. RTP, by definition, makes the velocity of money as fast as practically possible.

Kris Kubiena of VocaLink describes the velocity of money impacts as follows:³⁵

“At a macro level, the introduction of real-time payments offers tangible benefits to a national economy through increasing liquidity and efficiency of the payments system, which in turn will support GDP growth. These benefits will have a particularly positive impact on government (in the form of increased taxes and lower costs to the treasury or finance ministry), but will also have applicable benefits to central banks and other payment industry stakeholders.

The most pronounced benefit to an economy is likely to be the impact of increasing the velocity of money. In simple terms, this means that by moving to real-time payments from batch systems, money can be used to make a greater number of purchases or other transactions within the same elapsed timeframe; effectively, the productivity of money increases. The scale of the benefit will largely depend on the existing infrastructure and speed of payments. In Australia, where there is currently no central payments infrastructure and electronic transactions make funds available the following day, an analysis undertaken in 2008 by the Centre for economics and Business research (CeBr) found that the implementation of a real-time service could positively impact GDP by as much as 1%.

In countries where an efficient central clearing and settlement function already exists, the economic benefits will be less dramatic. Nevertheless, even where there is a highly efficient batch-based payment solution, there are undoubtedly still benefits that will be realised through a higher velocity of money and less reliance upon cash (and a reduction in the crime and security issues associated with cash handling). There is also an increased transparency across the economy, as more transactions move from the ‘grey’ economy to the ‘white’ economy.”

Sean Rodriguez references this macroeconomic impact and notes it is a material driver behind the Federal Reserve's push for RTP capability to be established in the United States:³⁶

“The research study we conducted with McKinsey looked at the wider economic impact of real-time retail payment systems in other countries. We all believe, without being able to put a definite number on it, that there will be an economic benefit. Almost by definition, gross GDP will be boosted by an increased velocity of money. Our best guess is that there will be a 0.2-0.5 per cent increase in GDP as a result of an increase in the volume of transactions. We need to do more work on the wider economic impact of faster payments, but it is a big part of our reasoning for moving forward on real-time retail payment systems.”

35 Kubiena, K. (Proposition Delivery Director) VocaLink. ‘The benefits of real-time payments’, *Global move towards real-time payments systems*, page 17. Available at http://www.bankingtech.com/wp-content/blogs.dir/94/files/2014/04/VocaLink_Supplement_low_res_Complete.pdf

36 Rodriguez, S. (a senior vice president, payments industry relations, for the Federal Reserve System) (2014) ‘The retail payments revolution’, *SWIFT MI Forum Magazine 2014*, page 115. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

In the same article, Roger Storm, Director of EBA Clearing, also references the macroeconomic impacts but instead links these benefits with the change in consumer behaviour made possible by RTP systems:³⁷

“Despite relatively low rates of economic growth, and reduced levels of trading, payments traffic is growing at 5-6 per cent a year. More transactions are occurring even if the average value is lower. It reflects a change in consumer behaviour, and growing use of the Internet to buy goods and services, and it is boosting economic growth rates.”

From a public policy perspective, these macroeconomic impacts would appear to make the deployment of an RTP system very attractive. However, it is not normally a government agency that is making the investment to develop a RTP system. In most cases real-time capability requires investment by banks and potentially by clearing houses (funded either directly by banks, or through fees paid by banks).

The most robust examination of the macroeconomic costs and benefits of building an RTP system was conducted by the Federal Reserve Bank of Boston, which undertook a detailed assessment of the UK's Faster Payments Service (FPS) and then applied these findings to the United States.³⁸ The authors concluded that, from a macroeconomic perspective, the FPS would require a per capita annual benefit of just £2 p.a. over 7 years (2008-2015) to amortise the absolute maximum collective and individual total costs associated with establishing and maintaining the service. That per capita annual benefit was on the basis 63 million people live in the UK and was calculated at a discount rate of 3%.

The Federal Reserve Bank of Boston analysis assumed the direct revenue from the use of the FPS to date had been zero because users do not pay for each transaction. It also established there were three main cost components associated with the FPS:

1. **The installation cost of constructing, deploying, and maintaining the central FPS infrastructure:** The costs to UK banks of building, installing, and operating the FPS for the initial seven year contract (2008–2015) was approximately £200 million, of which £40–£50 million was paid up front by the 12 participating banks to build and launch FPS (excludes individual bank costs).
2. **The connection cost to each individual bank of adopting new technology and capital to access the FPS:** Each bank's initial investment cost to connect to the FPS ranged from hundreds of thousands of pounds up to a maximum of £50 million. Each bank's costs varied depending on their existing capabilities and the extent of the changes each bank elected to include within the scope of its FPS project.
3. **The transfer costs of possible reductions in bank revenue arising from shifting volume from other payment services to the FPS:** While it is possible there could be a revenue loss from the move away from existing payment methods to the FPS, the data suggests the revenue effects from substitution have been small so far. The most significant payments volume reduction and migration to FPS was in cheques.

On the revenue impacts, the Federal Reserve Bank of Boston believes there is no lost revenue from capital floats when volumes move from slower batch systems to an RTP system. This is on the basis there is no bank revenue from capital floats in the first place (which counters a common public misconception of banks profiting from transactions while they are going through slower payment systems). The authors note:³⁹

37 Storm, R. (Director of EBA Clearing). (2014) 'The retail payments revolution', SWIFT *MI Forum Magazine 2014*, page 129. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

38 Greene, C., Rysman, M., Schuh, S. and Shy, O. (October 2014) *Costs and Benefits of Building Faster Payment Systems: The U.K. Experience and Implications for the United States*, Federal Reserve Bank of Boston. Available at <http://www.bostonfed.org/economic/current-policy-perspectives/2014/cpp1405.htm>

39 Ibid, page 34.

“the debiting and crediting of customer bank accounts takes place on the same day so there is no float income for banks generated by either of these payment instruments.”

Further, we note VocaLink (the operator of the RTP system in the UK and Singapore) reports the cost of constructing Singapore’s new RTP system was substantially lower due to the experience gained with the FPS in the UK.

While the Federal Reserve Bank of Boston’s study indicates it would take only a very minor per capita benefit to recoup the costs of an RTP system, the problem is that the upfront investments have to be made with private money whereas the macroeconomic benefits accrue to the wider economy. On this point, The Clearing House (TCH), in response to consultation by the Federal Reserve, makes the observation that:⁴⁰

“Simply put, payment system providers will not invest in a payment system without the prospect of reasonable return on their investments. ... TCH believes that the ability for all providers to earn an a [sic] reasonable return on investment is not merely a way to justify funding; it is a design criterion that needs to be addressed at every stage of planning and development.”

On this issue, the Federal Reserve Bank of Boston contends there is some revenue optimism resulting from RTP systems, even if it is not from direct fee-per-transaction revenue:⁴¹

“...banks have borne zero marginal cost (the cost of making one additional FPS transaction). This means that if banks were to charge end users per transaction fees, the basis of the fee could not be marginal cost, but rather ‘demand’ or ‘utility’.”

Looking laterally at the investment required to establish a new RTP infrastructure, there may be a case for investigating alternative funding approaches (other than just bank funding), such public/private funding or third party capital investment.

In the future, banks will have to decide whether to charge users nominal fees to cover their initial investment and operating cost, whether to cross-subsidise an RTP service, or whether to focus on leveraging the RTP infrastructure to unlock new value propositions (or some mix of all). VocaLink has already questioned banks on their vision for future revenue and the response received has been as follows:⁴²

“Two-thirds of banks interviewed were very positive that Faster Payments could deliver new revenue streams, with potential revenues identified in the business-to-consumer segment reaching £2.9 billion by 2018 and £1.9 billion in the business-to-business space.”

This argument is further supported by the Federal Reserve’s business case outcomes for establishing an RTP system in the United States, which saw a negative to neutral business case for banks building the core RTP system turn into a positive business case once value-add services (that leverage the RTP infrastructure) were taken into account.⁴³ Those business case outcomes are discussed in more detail in the section dealing with challenges and risks.

40 The Clearing House (3 December 2013) *U.S. Payment System: Recommendations for Safe Evolution and Future Improvements*, section C. Available at <https://fedpaymentsimprovement.org/wp-content/uploads/2013/12/Response-The-Clearing-House-120313.pdf>

41 Greene, C., Rysman, M., Schuh, S. and Shy, O. (October 2014) *Costs and Benefits of Building Faster Payment Systems: The U.K. Experience and Implications for the United States*, Federal Reserve Bank of Boston. Available at <http://www.bostonfed.org/economic/current-policy-perspectives/2014/cpp1405.htm>

42 Ibid, page 38.

43 The Federal Reserve, USA (3 June 2014) *FRFS Faster Payments Roundtable*, page 61. Available at https://fedpaymentsimprovement.org/wp-content/uploads/faster_payments_roundtable.pdf

Conclusion

While there may be compelling macroeconomic benefits from establishing a RTP capability, largely relating to increasing the velocity of money, the case is less clear for banks and other financial institutions who must meet the upfront development and ongoing operating costs. For banks, the cost benefit analysis seems to be more dependent on additional features, overlay products and services, and other commercialised innovative uses of the core RTP infrastructure. In jurisdictions like the UK, these overlays have been important in driving both scheme economics and customer uptake.

Design considerations

For the purpose of understanding the different approaches that have been taken around the world, we have researched the main design considerations for RTP systems. The three high level design considerations relate to:

- **Infrastructure:** whether to leverage existing infrastructure or build new infrastructure.
- **Orientation:** what payment types and scenarios the infrastructure aims to support and how the system should be oriented to achieve that.
- **Settlement:** whether settlement should happen in real-time or whether settlement should be deferred.

At the outset it is worth noting that RTP systems are remarkably diverse and varied depending on how infrastructure, orientation and settlement are brought together:⁴⁴

"...the many flavours of fast payments as they are being implemented in various countries include Person-to-Person (P2P), Business-to-Business (B2B), Person-to-Business (P2B) and Business-to-Person (B2P) as well as government payments. They can be initiated online, on a mobile phone or tablet, by batch transmission of payment instructions to the originator's bank or clearing house or through some other form of electronic communication. The payments can be credits or direct debits. And, while posting and confirmation takes place in a 'fast' environment, settlement may be just as fast as posting or be delayed. Indeed, some of the flavours of fast include fast batch processing and settlement. Because of local practices, priorities and privacy concerns, some fast payment systems include the ability to pay a receiver using an alternate identifier, in other words, something other than the bank account number. This is especially true in initiatives that are focused on facilitating account-to-account mobile payments."

Infrastructure

Around the world, the approach taken to date to develop the core RTP infrastructure generally falls into one of two broad categories:

- evolve existing infrastructure; or
- develop a new special purpose infrastructure.

On occasion, the distinction between these two categories is blurred when new infrastructure components are built on top of existing systems and capabilities.⁴⁵

In looking at infrastructure we have drawn on recent relevant work by the Federal Reserve, who are taking a strong leadership role in advocating for the development of a real-time account-to-account RTP system.

The Federal Reserve has developed a framework setting out nine potential design options for the RTP infrastructure, broken down into three categories:

44 Clear2Pay (June 2014) *Flavours of fast. A trip around the world in immediate payments*, page 12. Available at <http://www.asset.es/Documentos/2014/RI/Clear2Pay-Flavours-of-Fast-Final.pdf>

45 The Federal Reserve, USA (3 June 2014) *FRFS Faster Payments Roundtable*, page 35. Available at https://fedpaymentsimprovement.org/wp-content/uploads/faster_payments_roundtable.pdf

- Evolve existing payments infrastructure.
- Leverage emerging payments infrastructure.
- Build new payments infrastructure.

The Federal Reserve's framework is set out below in Figure 5.

FIGURE 5 – DESIGN OPTIONS FOR RTP INFRASTRUCTURE

Evolve existing payments infrastructure ¹	Leverage emerging payments infrastructure	Build new payments infrastructure ¹
<ul style="list-style-type: none"> ▪ Evolve ACH infrastructure <hr/> <ul style="list-style-type: none"> ▪ Evolve PIN-ATM/debit infrastructure <hr/> <ul style="list-style-type: none"> ▪ Evolve wire infrastructure <hr/> <ul style="list-style-type: none"> ▪ Evolve check infrastructure 	<ul style="list-style-type: none"> ▪ Leverage telecom infrastructure <hr/> <ul style="list-style-type: none"> ▪ Leverage distributed IP architecture <hr/> <ul style="list-style-type: none"> ▪ Leverage digital value transfer vehicle 	<ul style="list-style-type: none"> ▪ Build new infrastructure for real time payments, potentially leveraging technical components of legacy platforms <hr/> <ul style="list-style-type: none"> ▪ Build new network switch to link together limited-participation networks

¹ Evolve existing and build new can often overlap depending on how much "new" is added onto legacy infrastructure

SOURCE: The Federal Reserve (3 June 2014) *FRFS Faster Payments Roundtable*, page 35.

Out of the options above, the Federal Reserve produced the following short list of the most feasible options for evaluation, with one of those options comprising three sub options:⁴⁶

- **“Evolve ACH** to provide increased batch clearing windows (considered for comparison purposes, but not fully evaluated)
- **Evolve ATM/PIN debit infrastructure** to leverage existing real-time functionality
- **Direct clearing between financial institutions using common protocols and public IP networks** in a distributed architecture
- **Build new infrastructure** to support faster payments. The [three] variants [evaluated for building a new infrastructure] include:
 - a. Build new single-item clearing infrastructure that leverages legacy infrastructures (ACH, wire and check systems) for settlement
 - b. Build new clearing and settlement platform for retail payments (excludes systemically important payments)
 - c. Build new clearing and settlement platform for all payments (includes systemically important payments).”

The Federal Reserve's assessment of those options it fully evaluated was completed against a set of criteria tailored to reflect the circumstances prevailing in the United States. Their payments landscape is characterised by:

- comparatively high usage of cheques (checks) and cash;
- comparatively slow batch deferred payments;
- complex networks with thousands of institutions participating;

⁴⁶ The Federal Reserve, USA (3 June 2014) *FRFS Faster Payments Roundtable*, page 36. Available at https://fedpaymentsimprovement.org/wp-content/uploads/faster_payments_roundtable.pdf

- recent history of slow and drawn out infrastructure reform, development and renewal;
- increasing customer (corporate and consumer) and regulatory frustration at the speed of batch payments.

That said, the Federal Reserve's findings on the relative merits and drawbacks of each option are very informative and many of these findings can be applied to other countries. The Federal Reserve's assessment of the trade-off each option involves appear below:⁴⁷

- **“Evolve ACH** may be quickest to implement with the fewest required changes. However, it only achieves near real-time, not real-time, notification and clearing.
- **Evolve ATM/PIN debit infrastructure** has existing real-time capabilities but presents challenges with aligning networks, integrating corporate cash management systems at financial institutions, expanding credit capability and changing the economic model.
- **Direct clearing over public IP networks** leverages existing, low-cost communications networks used by millions worldwide, but assuring stakeholders of the safety of the system will be challenging, even if the required security exists.
- **Build new infrastructure (variation a)** may be able to meet the needs for real-time in the target use cases in a reasonable timeframe, but integration with legacy settlement constrains the flexibility of the design.
- **Build completely new infrastructure (variations b and c combined)** offers the most flexibility to meet future needs, but cost and time to implement may make this challenging to pursue.”

The Federal Reserve concluded *“to meet the needs of targeted use cases, the options assessment suggests that building new infrastructure is the optimal solution.”*⁴⁸

The findings of the Federal Reserve's business case analysis are set out in the challenges and risks section of this report.

Orientation

Irrespective of the design choices made regarding infrastructure, the resulting RTP system can take one of three possible orientations. The system can be configured so that:

1. The core infrastructure acts as a backbone in two ways: it is integrated with everyday banking channels, and it acts as a platform for overlay services and products to be developed, either by individual commercial entities or via collective initiatives within the payments community. Overlay services have been critical to the FPS in the UK and are seen as similarly important to the launch of the NPP in Australia in 2017.
2. The core infrastructure caters for a very wide range of payment types and scenarios, which might include hybrid low/high value payments, as has happened in Mexico, or extend to both debits and credits, as is the case in Singapore.
3. It responds only to targeted use scenarios, usually specifically for mobile phone payments that are predominantly P2P. Several recent RTP systems are in this category, and they all have aspirations to broaden the payment types using the core infrastructure, for example, Poland, Sweden, Denmark, India and Kenya.

It is important to comment briefly on the significance of the overlay services mentioned above. ‘Overlay’ is a term used to describe a payment service that connects to and uses the core RTP

47 The Federal Reserve, USA (3 June 2014) *FRFS Faster Payments Roundtable*, page 52. Available at https://fedpaymentsimprovement.org/wp-content/uploads/faster_payments_roundtable.pdf

48 Ibid

infrastructure, and adds greater functionality or service to users. These overlay services are likely to be tailored to particular contexts and/or types of customers. Because of their potential for delivering enhanced value propositions and revenue generation, overlay services are often key to the business case for an RTP system. This is especially true when the overlay services are packaged with information from smart payments messaging, such as that enabled by ISO 20022.

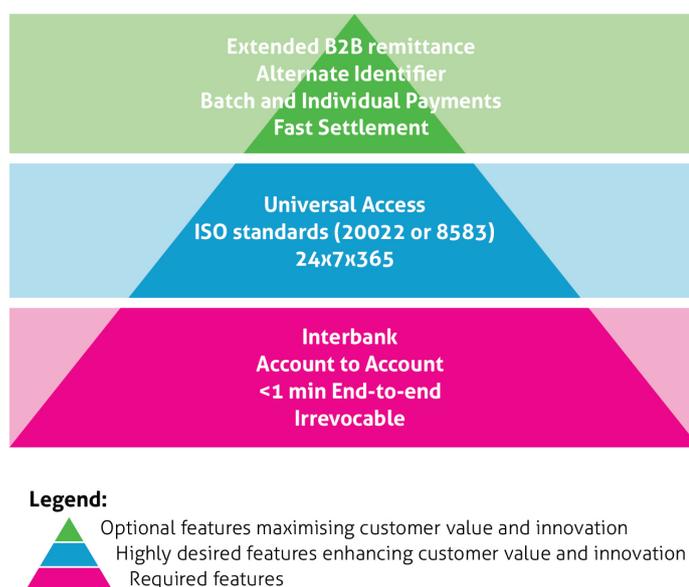
An RTP system may be orientated so it straddles more than one of the above configurations. Alternatively, there might be aspirations for the system to evolve, say, from responding only to targeted use scenarios to catering for a wide range of payment types and scenarios.

The following factors are likely to be central considerations in evaluating which of the above three orientations would be most appropriate:

- What is the evolution path for, and how easy would be it to evolve, the RTP system?
- Is the infrastructure and core functionality of the RTP system capable of being used as the backbone for different innovations over time (including those not currently foreseen)?
- How easy would be it for both individual providers and the collective payments community to evolve their products and services?
- How easy would it be to add new functionality to the core infrastructure either by upgrading the core infrastructure or by increasing functionality by adding modules?
- How straightforward is it to broaden the types of payments or payment scenarios the RTP infrastructure can accommodate? (This is frequently important for gaining a critical mass of transaction volumes).

Irrespective of the initial orientation of the RTP system, there will be an eventual need for that system to be able to evolve, especially where there are calls for it to act as an innovation platform. An RTP system's capabilities can be assessed by where that system is positioned on the innovation index pyramid is shown in Figure 6.⁴⁹

FIGURE 6 – FAST PAYMENT INNOVATION INDEX



SOURCE: Clear2Pay (June 2014) *Flavours of fast. A trip around the world in immediate payments.*

49 Clear2Pay (June 2014) *Flavours of fast. A trip around the world in immediate payments*, page 13. Available at <http://www.asset.es/Documentos/2014/RI/Clear2Pay-Flavours-of-Fast-Final.pdf>

Generally, most RTP systems examined have either recently improved their system's capabilities or have improvement plans (or both). Most of these improvements will move them higher up on the above innovation index. For example:

- Japan and Mexico have moved/are moving towards 24/7.
- The UK has recently added "alternative identifiers".
- Japan, Switzerland and South Africa are migrating to ISO 20022.

Settlement

In relation to settlement, consistent with the considerable variation in RTP systems that exist in the market place, there is a wide range of practices and options. In general terms there is no direct relationship between the speed the customer experiences in an RTP and the speed with which settlement occurs between financial institutions.

In some instances, inter-participant settlement is on the critical path for a customer to receive an RTP. In other instances, the RTP system uses deferred settlement, which occurs after the processing of the payment has been completed from the customer perspective, including making the funds available to the beneficiary customer. That deferral introduces some level of settlement risk. There are a range of tools that can be used to manage that risk, including lodging collateral at the central bank.

Appendix 2, which contains a review of 15 RTP systems from around the world, includes a section on inter-participant settlement. Readers should consult that material for further information on settlement options.

Challenges

In this section we examine what has been cited in literature as the main challenges associated with establishing an RTP system.

Challenges

One of the most widely referenced challenges relates to establishing a compelling business case for building a new RTP system. The introduction of an RTP system involves known cost outlays but gives rise to benefits that are more difficult to quantify in immediate financial terms.

The Federal Reserve recently conducted a significant exercise to identify its preferred option for an RTP system and to establish an accompanying business case. The business case was profit contribution negative to neutral until additional value-add (non-core) services were included. With the inclusion of non-core services (such as overlay services), the business case was considered profit contribution positive. The Federal Reserve noted that:⁵⁰

“The business case through 2025 for implementing a faster payments solution for the primary use cases is profit contribution net neutral to negative.

- *Target transaction pool is expected to grow to 4.1B - 7.5B annual transactions by 2025.*
- *End users would realize a cumulative \$2-7B in avoided costs and economic value / social good by 2025,*
- *While financial institutions would achieve ~\$1B cumulative incremental profit by 2025.*
- *Top down estimate of implementation costs for faster payments is \$4-7B, and would be frontloaded.*
- *When additional features (e.g., enriched information for e-invoicing) are considered or the time horizon is extended, the business case becomes positive.*
- *Latent demand and additional uses were not sized, but would also improve the business case.”*

The challenges in establishing a compelling business case also featured in a recent panel discussion published in SWIFT's MI Forum 2014 magazine.⁵¹ Some panellists queried whether an RTP system is required, given the efficiency of existing payment systems and the reluctance of consumers to pay for a real-time service (there is often a difference between what consumers want and what they are prepared to pay for). Even where financial institutions have decided to embrace a real-time future, panellists raised concerns about the costs involved in designing and deploying RTP systems.

Bergman: *“It is not just the cost of the investment. You have also to take into account the cost of processing payments around the clock. We think payments systems work quite well already. Society wants information as a whole to be processed faster, and that makes sense. But speeding payments up may be an unnecessary luxury. If you ask the man or woman in the street if they want faster payments, they say that of course they do, and their experience of technology in other aspects of their lives plus*

50 The Federal Reserve, USA (3 June 2014) *FRFS Faster Payments Roundtable*, page 61. Available at https://fedpaymentsimprovement.org/wp-content/uploads/faster_payments_roundtable.pdf

51 SWIFT (2014) 'The retail payments revolution', *MI Forum Magazine 2014*, page 114. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

competition between banks has encouraged them to think that. But if you ask them whether they need faster payments, and whether they would be prepared to pay extra for the service, they say they would expect their bank to deliver extra value in return for the fee. The calculation to be made is what proportion of payments would benefit from settlement in real-time, as opposed to settlement the same day. In the vast majority of retail payments, a guarantee that the payment is secure is enough. So the business case for a bank to invest in upgrading its systems to cope with RT-RPS is not always that strong .”⁵²

Lipis: *“Real-time versus secure same-day payment may be optional now, but the future belongs to those that have a real-time capacity. The future is not that far off, either. Demands are changing rapidly. There is of course distinction between what people want, and what they are willing to pay for. We recently completed a study of 46 different ACHs in 31 countries around the world. Among the things we monitored was the price banks charged to consumers for posting payments at various speeds, and the prices ACHs charge to banks for settling trades at various speeds. Unsurprisingly, we found banks generally charge higher prices for faster payments. A more surprising finding was that faster payment need not cost a bank more than slower payment. In fact, faster payments cost banks less on average in terms of what they pay infrastructures to move payments between accounts. But passing payments between banks is not the real challenge. The real challenge is the cost to each bank of putting in place the systems to confirm and post payments in real-time. Multiplied across thousands of banks, the investment would cost billions of dollars. The aggregate cost to the industry of moving to RT-RPS is much higher than the cost of building RT-RPS infrastructures in each country .”⁵³*

More specifically, establishing a compelling business case for a RTP system would appear to hinge on:

- The operational capability of financial institutions to process account-to-account transactions on a real-time basis.
- Obtaining a critical mass of RTP volumes to justify the investment.
- Making RTP ubiquitous in terms of the financial institutions offering the service to customers.

Immediately below we comment further on each of these factors.

Capability of financial institutions

The successful deployment of RTP systems will require financial institutions to make the capability shift to a 24/7 processing environment. Imran Ali describes this as follows:⁵⁴

“...challenges for banks, foremost among them being the overlaying of single real-time payments on to an existing batch processing infrastructure. Back end systems operate in batches for increased efficiency and reduced cost. Processing single payments presents a cost issue and this applies right across the infrastructure, from channel to payment processor, including general ledger, sanctions and anti-money laundering (AML) systems, reporting databases, customer accounts payable/receivable (A/P and A/R) and reconciliation.”

52 Ibid, page 119.

53 Ibid, page 120.

54 Ali, I. (19 August 2013) *The emergence of real-time payments: A global comparison.*

Critical mass of RTP volumes

Payment systems are networks and any investment in a RTP system requires a sufficient volume of payments to make that investment worthwhile. RTP systems in countries such as Poland, South Africa, and to a degree Brazil, have struggled to obtain a critical mass of volumes. The panel discussion published in SWIFT's MI Forum 2014 magazine highlighted the link between the business case for investment in RTP systems and payment volumes as a key to success:⁵⁵

Storm: *"The critical volumes need to migrate to real-time to motivate investment in an RT-RPS. The banks need to find larger communities and larger volumes to build the business case for it. It will be necessary to re-segment the market, to attract card volumes in particular."*

Ubiquity of offering

From a customer perspective, the value of any RTP system is greatly enhanced if that system is ubiquitous so customers can make RTP payments to any other customer, regardless of who they bank with. Ubiquity (or the absence of blind spots) increases the network effect of the payment system and has a direct correlation to widespread customer adoption, creating a 'virtuous cycle'. We could not identify any examples in the world of a bilateral pair, or sub-set of banks, creating an RTP system with any viable critical mass of transactions. Also, while many banks offer real-time capability for on-us transactions between customers of the same bank, the lack of ubiquity between financial institutions will always mean that banks can only ever reach a small segment of transactions.

Lipis: *"Ubiquity is essential. A successful RT-RPS has to be available to all the banks in a market. Some of the real-time systems in some markets have experienced lacklustre adoption rates because they are not available to all banks in that market."*⁵⁶

55 SWIFT (2014) 'The retail payments revolution', *MI Forum Magazine 2014*, page 114. Available at http://www.swift.com/assets/swift_com/documents/about_swift/Sibos2014_MI_magazine.pdf

56 Ibid, page 123.

Risks

In this section we examine the risks cited in the literature that need to be managed in the operation of RTP systems.

The risks associated with RTP systems are not unique and occur in all other payment system types, albeit RTP systems have different risk profiles due to the immediacy of 'real-time'. There are three main risks:

1. Risk of payments fraud.
2. Operational disruption risk.
3. Counter-party settlement risk.

Detecting and preventing payment fraud

The risk of fraudulent use of account-to-account payments exists today. However, in an RTP system, funds are posted in real-time and are immediately available to re-use, to move the funds via another payment instruction, or to be converted into cash. A move to an RTP system will require fraud prevention, detection, and remediation countermeasures to also move into a real-time environment (in a similar way to cards but without chargebacks) and this has inevitable costs. Chris Skinner from the Financial Services Club opines that this is a positive development:⁵⁷

"Surely, if we are moving to a real-time world of banking where millions or even billions of dollars of funds can be transacted, cleared and settled in real-time, we will then also move to a real-time world where everything will be connected, integrated and collocated. This makes sense as everything from the regulatory viewpoint to the banks own fraud analytics engines will be working in real-time and in harmony together, to track, trade, transact, clear and settle everything in real-time."

If fraudulent real-time transactions are not mitigated in real-time, there is a very limited post-transaction window for the parties to the transaction to cooperate and recover fraudulent funds. However, with the global trend of speeding up traditional batch systems, this risk is also present in traditional batch systems as they process and post transactions faster, albeit not in real-time.

Operational risk and the immediate impact of system disruptions

When it comes to operational risks, deferred batch systems have the luxury of having more time. This window of time provides the opportunity to resolve processing delays without customers being aware there has been a disruption. However, as RTP are instant, any outage will immediately be noticeable and will result in customer service disruption. Imran Ali notes:⁵⁸

"There is increased operational overhead also, as 24x7 coverage is required outside of traditional payment operating hours. Although real-time payments are straight-through processing (STP) automated, so there is no repair function, an outage can have serious consequences. Being unavailable for a few minutes can cause several hundred payments to fail and the consequences of any downtime becomes even more serious."

57 Skinner, C (29 January 2013) *Real-time means now, and don't you forget it*, Financial Services Club [Blog]. Available at <http://thefinanser.co.uk/fsclub/2013/01/real-time-means-now-and-dont-you-forget-it.html>

58 Ali, I. (19 August 2013) *The emergence of real-time payments: A global comparison*.

Counter-party settlement risks

In an RTP system that has net deferred settlement, the beneficiary customer typically has access to the value of payments received before that payment's financial obligations are settled between the respective financial institutions. This creates counter-party settlement risk. That said, as RTP systems are most commonly used for individual retail payments, the total values involved are not as systemically important (by the standards of wholesale payments). For those RTP systems that have settlement risk exposures (Switzerland, Poland, Japan and Brazil do not), the settlement risk is often actively managed or mitigated. There are a range of mitigation approaches used including limiting transactions to the available funds in dedicated accounts (e.g. escrow accounts or central bank "prefunded" accounts), holding collateral, netting algorithms, frequent intra-day settlements, having default loss allocation mechanisms, etc.

Conclusions

On the basis of the research we have completed we offer ten conclusions:

1. The definition of RTP depends on whether we look at the payment from the perspective of the financial institution, the payment system provider, the regulator, or the customer.
2. The term 'real-time' is a bit of a misnomer because actual real-time functionality is not technically feasible. Measuring the speed of an RTP should focus on the completion of all customer-facing activities required to fully complete a payment between two parties.
3. All real-time systems have three core characteristics (immediacy, irrevocability and certainty) and within a minute is generally accepted as the measure of 'real-time'.
4. There is no uniform way to achieve RTP and deployments around the world vary considerably. The RTP infrastructure can act as a backbone for both everyday banking services and commercial overlay products and services, as is the case in the UK. Alternatively, the infrastructure could support a wide range of payments scenarios, ranging from high to low value, debits and credits, mobile and other channels. In other instances, the RTP infrastructure can be narrow in its orientation, generally focusing on P2P mobile payments.
5. One common trend among RTP systems is the move to adopt ISO 20022 as the preferred payments messaging standard because of the rich payments functionality this supports.
6. There are a number of drivers behind the trend towards RTP systems, with the most significant being consumers, businesses, and some regulators' 'need for speed' in demanding their payments and access to money to be in real-time. Other drivers include regulatory pressure, and responding to increasing competition from technically savvy non-bank sectors.
7. RTP systems allow financial institutions, and especially banks, to reposition their enterprise to meet customer demands and unlock new value propositions and revenue opportunities.
8. Establishing an RTP capability carries a positive macroeconomic impact relating to increasing the velocity of money. While that is good for the economy as a whole, the business case for RTP systems is less clear for banks and other financial institutions who must meet the upfront development and ongoing operating costs.
9. For banks, the cost benefit analysis seems to be more dependent on additional features, overlay products and services, and other commercialised innovative uses of the core RTP infrastructure. These overlay products and services help obtain a critical mass of RTP volumes to justify the investment. In jurisdictions like the UK, these overlays have been important in driving both scheme economics and customer uptake.
10. The risks associated with RTP systems are not unique and occur in all other payment system types, albeit RTP systems have different risk profiles due to the immediacy of 'real-time'. The main risks arise from the possibility of payment fraud, a reduced window to manage operational disruption, and the need for new approaches to handle settlement with counter-parties.

Appendix 1: Five brief country case studies

In this appendix we present five brief country case studies of selected RTP systems. The five countries are:

1. **Sweden (BiR):** With aspirations to be a cashless society, banks have collaborated to develop a collective mobile P2P proposition that sits on top of a new RTP infrastructure.
2. **Mexico (SPEI):** Through continual improvement and evolution, SPEI processes batches every 5 seconds and is used in a wide range of payment scenarios.
3. **Singapore (FAST):** As part of a holistic payment systems master plan, FAST has a wide range of capabilities and is designed to allow the retirement of their batch deferred payment system.
4. **UK (Faster Payments System):** Not only is the FPS integrated as a part of regular banking but it pioneered the development of 'overlay' value add services that leverage the core infrastructure.
5. **Australia (New Payments Platform):** Closely aligned to the UK's FPS, Australia's NPP will be built from scratch as an 'ideal state' RTP infrastructure and will bring SWIFT into the frame as an RTP infrastructure provider.

Table 1 summarises each of the case studies.

TABLE 1 – COUNTRY CASE STUDY SUMMARY

Country	Point of difference	What's special?	Catalyst	Strategic approach	Lessons
Sweden (BiR)	Extremely low levels of cash and highly electronic society.	All banks use and promote the same mobile P2P application, leverages the RTP infrastructure, and allows very rapid customer uptake.	Commercial	Collaboration	<ul style="list-style-type: none"> • Collaboration is key. • Alignment between banking sector and regulator is required. • Mobile account-to-account payments can be successful using RTP infrastructures. • RTP infrastructures can be separated from 'overlay' services.

Country	Point of difference	What's special?	Catalyst	Strategic approach	Lessons
Mexico (SPEI)	Central bank is driving change and operates a near real-time batch system.	Payments are processed in mini batches every 5 seconds. System is under continuous improvement to either increase speed, enhance existing functionality, or add new functionality.	Central bank leadership	Continuous evolution and improvement.	<ul style="list-style-type: none"> • A 'big bang' approach is not always necessary. • Continuous improvement can develop RTP capability overtime. • RTP can be achieved using batch processes. • RTP does not have to be only synonymous with P2P mobile payments. • RTP can be used in a wide range of scenarios.
Singapore (FAST)	Designed to fully replace the batch deferred payment system.	Broad payments usage, ranging from higher value transactions, debit and credit, P2P and mobile payments.	Commercial	Ambition to use payments to enable and develop regional economic hub.	<ul style="list-style-type: none"> • RTP should be considered in the context of all payment systems and how they fit together. • Batch deferred payment processing can be replaced. • Both debits and credits can be real-time.
UK (FPS)	Implemented by regulatory mandate.	Integrated with bank channels, banks and other financial institutions have developed new 'overlay' propositions to leverage infrastructure. Governed by a separate non-profit company.	Regulatory mandate	Build and promote infrastructure and develop overlay services to drive usage.	<ul style="list-style-type: none"> • Integration with banks' internet and mobile banking applications is key. • Developing overlay propositions adds value and revenue potential, and drives usage and volumes.
Australia (NPP)	To be implemented by regulatory mandate. SWIFT's first entry into RTP. Will be settled on a RTGS basis.	'Big bang' implementation. Established a separate company to oversee implementation and to govern operation.	Regulatory mandate	Do it once and do it right.	<ul style="list-style-type: none"> • Regulatory intervention sometimes required. • SWIFT is now an RTP infrastructure option. • NPP is the tipping point for RTP being a global movement.

The case studies appear in full on the following pages. The material for each study is based on more detailed information presented in Appendix 2, which examines 15 RTP systems in some depth.

Sweden - BiR

How did Sweden's RTP system come about and what is its ownership structure?

Sweden's RTP system came about as a result of commercial collaboration. The banked owned clearing house, BiR, owns and operates the core infrastructure. The Swish overlay service is a bank owned joint venture.

What sets Sweden's RTP system apart from the rest of the world?

Sweden is heading towards being a cashless society. Mobile payments, using an account-to-account real-time infrastructure, is seen as key to achieving this aspiration. All critical success factors for mobile payment's adoption have been covered off, including a fully banked society, low cash and cheque usage, high electronic payments rates, high smart-phone ownership, high levels of industry collaboration, and strong alignment between regulatory and banking sector goals resulting in a coordinated approach.

What is special about Sweden's RTP system?

Its core infrastructure, BiR, is world leading but has a relatively standard set of features (other than being very fast at less than 2 seconds and having a RTGS capability). However, what is special about Sweden's RTP is that six banks have collaborated to develop a single mobile payment application, Swish, to leverage the core infrastructure. Swish can enable mobile device to mobile device payments, which are mapped between the correct bank accounts. The fact all banks use and promote the same mobile application illustrates a highly collaborative approach that has allowed Swish to have a very rapid customer uptake.

What is Sweden's strategic approach?

Collaborate. Sweden has harnessed that climate of collaboration (both within the payments community, and between the payments community and the regulator) to:

- Develop concurrently two separate but inter-related components: the BiR core infrastructure and the Swish 'overlay' proposition.
- Develop commercial propositions that are aligned with regulatory goals.
- Keep its options open, particularly in regards to how the BiR infrastructure can be used in the future.

What lessons can be learned from Sweden?

- Collaboration and alignment between the banking sector and the regulator greatly aids development and deployment.
- Mobile account-to-account payments can be successful using RTP infrastructures.
- RTP infrastructures can be separated from value-add customer propositions or 'overlay' services.

Mexico - SPEI

How did Mexico's RTP system come about and what is its ownership structure?

Owned and operated by the central bank, SPEI was transformed incrementally over time from a high value settlement system into an RTP system.

What sets Mexico's RTP system apart from the rest of the world?

Mexico has achieved its RTP capability through an entirely different approach to the rest of the world and the result has been transformational. Over 60% of electronic payments, excluding cards, are now RTP and that percentage is increasing rapidly. A wide range of payments use SPEI, ranging from salaries, bill payments, and mobile account-to-account payments. The adoption rate and breadth of usage puts the future proposition of Mexico's existing batch system in question. The central bank, which owns SPEI, has driven the behaviour, continual improvement and the current drive towards mobile payments. The central bank has also led a programme to migrate all government payments into SPEI, including government salaries and benefits.

What is special about Mexico's RTP system?

SPEI processes batches of payments that, in profile are not dissimilar to older-styled batch systems but they are processed very frequently in mini batches, for example, every 5 seconds. SPEI has been under continuous improvement to either increase speed, enhance system capability, or add new functionality. This has seen processing speeds decrease incrementally from 30 minutes down to 5 seconds. SPEI has made improvements such as expanding operating hours to be 23/7 and having a 5 second processing speed specifically to become a viable platform for real-time account-to-account mobile payments.

What is Mexico's strategic approach?

- Keep evolving.
- Keep improving.
- Keep costs down.
- Keep expanding SPEI's use scenarios (e.g. migrating government payments and developing P2P mobile payments capability were worked on concurrently).
- Use RTP to help reduce the unbanked population and improve national economic efficiency.

What key lessons can be learned from Mexico?

- A 'big bang' approach is not always necessary.
- Making continuous improvements to an existing system can deliver RTP capability.
- RTP can be achieved using batch processes.
- RTP does not have to be only synonymous with P2P mobile payments.
- RTP can be used in a wide range of payment scenarios.

Singapore – FAST

How did Singapore's RTP system come about and what is its ownership structure?

Singapore's FAST system was established as a result of a commercial collaborative strategy (with central bank support) based on a drive for regional cutting edge payments capability. FAST is owned by the Association of Banks in Singapore and is operated by VocaLink.

What sets Singapore's RTP system apart from the rest of the world?

From its inception, FAST was designed to ultimately fully replace the batch deferred payment system. To help achieve this, FAST is one of the few RTP systems to process real-time debit transactions. While RTP systems in other countries effectively compete for volumes against other existing payment systems, Singapore has a holistic strategy for all of its payment systems, with their FAST system playing a central role. FAST is also being developed with multi-currency and cross-border capabilities to assist Singapore in its drive to become a regional hub for commerce and enterprise.

What is special about Singapore's RTP system?

FAST is designed to give Singapore a competitive edge in their national endeavours to realise aspirations to become the leading economic hub in the region. FAST has broad payments usage ranging from higher value transactions, debit and credit, P2P, mobile payments and, in due course, cross-border and multiple currencies. This has primarily been driven by the collective strategy of Singaporean banks.

What is Singapore's strategic approach?

- Be ambitious and use payments as a key enabler to become a powerful regional economic hub.
- Have a holistic strategy across all payment systems and how they fit together.
- Be clear about what the desired end point is.

What key lessons can be learned from Singapore?

- Alignment of banking sector and regulatory objectives greatly aids development and deployment.
- RTP should be considered within the wider context of all payment systems and how they fit together in both the short and long term.
- Traditional batch deferred payment processing can be replaced altogether by RTP.
- Both debits and credits can be real-time.

UK - FPS

How did the UK's RTP system come about and what is its ownership structure?

The Faster Payment Service Scheme (FPS) was implemented as the industry's response to a regulatory mandate to improve clearing speeds. The scheme is owned by a non-profit membership based company vehicle and is operated by VocaLink

What sets the UK's RTP system apart from the rest of the world?

The fact that FPS was implemented as a result of a regulatory mandate. FPS pioneered the core infrastructure and overlay services framework, so FPS's core infrastructure is used not only in everyday banking but also by 'overlay' commercial propositions that leverage the core infrastructure. FPS is well established and growing quickly, in part due to the increasing numbers of overlay products, e.g. paym, zapp, pingit, and others.

What is special about UK's RTP system?

From an infrastructure perspective, FPS is integrated with banks' existing channels, i.e. it forms a part of every day banking. However, banks and other financial institutions are developing new channels or 'overlay' propositions to also leverage the infrastructure. Also, a separate non-profit company has been established to govern FPS.

What is UK's strategic approach?

- Build the core infrastructure.
- Promote it.
- Develop new overlay services to drive usage.

What key lessons can be learned from UK?

- Integration with banks' internet and mobile banking applications is key to driving volumes.
- Developing overlay propositions either collectively (such as paym) or individually (such as pingit by Barclays) adds significant amounts of value and revenue potential, and drives further usage and volumes.

Australia – NPP

How is Australia's RTP system coming about and what will its ownership structure be?

The NPP is being developed as a result of a regulatory mandate. NPP will be owned by NPP Australia Ltd, which has 12 financial institution shareholders. SWIFT will be the primary system operator.

What sets Australia's RTP system apart from the rest of the world?

The fact that NPP is being developed as a result of a regulatory mandate. SWIFT will be the main provider of the infrastructure, which is SWIFT's first entry into RTP. NPP will be settled on a RTGS basis. Other than in respect of settlement, the NPP closely mirrors the FPS deployed in the UK.

What is special about Australia's RTP system?

NPP is taking a 'big bang' implementation approach. NPP will join a small group of RTP systems that settle each payment on an RTGS basis, putting the central bank on the critical path for processing each and every transaction. The NPP will develop a basic infrastructure for RTP upon which overlay services can be developed. The process of mandating and establishing the NPP has contributed to and has been a factor in the realignment of how the Australian payments industry is organised, structured and governed. A separate company, NPP Australia Ltd, has been established to oversee the implementation of the NPP and to govern it. A competitive tender process was used to select SWIFT, who will develop real-time messaging capability to deliver the system. This will sit on top of FileAct Y-Copy (which is widely used around the world including in New Zealand's Settlement Before Interchange system).

What is Australia's strategic approach?

- Build it once and do it properly.
- Deliver the ideal state core infrastructure capability first time.

What key lessons can be learned from Australia?

- Regulatory intervention is sometimes required to establish RTP capability.
- SWIFT is evolving to become a RTP infrastructure option.
- NPP is seen as the tipping point for RTP shifting from being an emerging trend to being more of a global movement.

Conclusion

These five country case studies are notable for the successes that have been achieved in RTP despite the systems having been developed in a variety of different ways and with a variety of different end points in mind.

Irrespective of what spurs the development of an RTP system, the relationship and alignment between the regulator and the payments community has a significant bearing on establishing RTP. For example, in Singapore and Sweden there is mutual alignment between the regulator's and banking community's goals, whereas in Mexico the central bank is leading the way themselves. In the UK and Australia, the payments community has/is establishing RTP following regulatory mandates (forced alignment). Also notable is how Mexico, Singapore and Sweden are using RTP as a tool to help achieve both national and commercial goals at the same time.

In all cases, a critical success factor is having high levels of RTP integration with every day banking channels, which shifts RTP from being a special feature to being a part of normal expectations. In turn, this helps drive volumes. Accordingly, RTP must be seen as a vehicle to help banks achieve their strategic outcomes.

Finally, the introduction of RTP systems has an impact on other payment systems. Across the world, RTP has a successful track record of attracting volumes from these other systems. There are two general approaches that might play out over the long term:

- Competition between payment systems, potentially ending in RTP systems forcing the retirement of traditional batch systems; or
- The second approach, of which Singapore is the best example, where RTP forms a part of holistic strategy across all national payment systems, which includes planned consolidation.

A third alternative approach, which has not been taken by any country yet, is evolving their batch system to have real-time capability so that 100% of existing volumes become real-time, thereby avoiding the process of volumes migrating, and avoiding the ultimate need for the consolidation of payment systems.

Appendix 2: Examination of selected RTP systems from around the world

This appendix examines in detail the RTP systems in 15 countries. The material in this appendix includes details on:

1. systems, owners and operators;
2. drivers for establishment;
3. summary system descriptions;
4. system core features;
5. system speed and certainty;
6. target usage and customer access;
7. system track record;
8. inter-participant settlement; and
9. previous and upcoming development plans.

There are four other countries with RTP systems that have not been examined in detail due to being less useful examples to examine or not having enough publically available information to provide a meaningful analysis (or both). The four countries are:

- China
- Columbia
- Nigeria
- Taiwan

Columbia

Columbia has built a real-time system, ACH Directo, which has yet to be put into service. The clearing house 'ACH Colombia' has developed a real-time account-to-account solution that effects the transfer of funds in less than 10 seconds. The system is based on a proprietary data standard and not the NACHA-M standard used by the batch system. The technical platform is in place but ACH Colombia has struggled to get its members to begin using it. As of March 2014, only 4 banks out of 19 have agreed to go live on the system.

China

The Internet Banking Payment System (IBPS) was established by China National Clearing Centre in 2010. It is available 24/7 and is primarily used for P2P payments. IBPS takes 20 seconds to process. It has a transaction value cap of RMB50,000. It is migrating to ISO 20022 messaging standards. IBPS has been growing ~80% p.a. in both volume and value, but it remains a relatively small part of China's overall electronic payments environment. Expectations are it will continue to grow quickly and that it will provide the backbone for market innovation.

Nigeria

The Nigerian Interbank Settlement System (NIBSS) is a bank-owned clearing house and it recently developed NIBSS Instant Payment (NIP) to allow customers to originate electronic credit transfers 24/7 without going to a bank branch. The main goal of NIP is to promote financial inclusion. NIBSS and the central bank are currently working together to set up a nationwide network for online banking and secure networking to reach the unbanked. Same-day settlement takes place twice daily and has grand netting across multiple payment systems. NIP payments take less than 10 seconds.

Taiwan

The Financial Information Service Co (FISC) clearing house operates the Interbank Remittance System for real-time account-to-account credits. The system operates 10 hours a day, 5 days a week. It takes less than 10 seconds to process and is constrained by central bank settlement system operating hours. Multilateral gross settlement occurs in real-time. FISC also operates a separate mobile banking sharing center and acts as a link between mobile network operators (MNOs) and banks to conduct real-time account-to-account transfers, pay bills, and make e-commerce transactions using a special mobile banking card or money loaded on to a 3G SIM card.

The remainder of this appendix presents the detailed 15 country RTP evaluation and the web based reference material we relied on.

RTP systems, owners and operators

- There are several different ownership and operating models.
- In 10 of the 15 studied systems, incumbent financial institutions and banks own the RTP infrastructure via jointly owned associations, clearing houses or specialist companies (excluding Denmark, Kenya and 3 cases where the central bank owns the system).
- Central bank ownership can be found in Mexico, India and South Korea.
- There are 7 instances of an existing clearing house evolving into also providing RTP infrastructure and services.
- There are also 7 instances of separation between the owners and the operators. Clearing house owned systems (excluding Poland) make up most of the examples where the owner and operator are not separated.
- The rate of new RTP systems is increasing over time. Among the 15 systems reviewed:
 - 2 have been established for several decades (Japan 1973 and Switzerland 1980s).
 - 3 were established between 2000 and 2005 (Mexico, South Korea and Brazil).
 - 4 were established between 2006 and 2010 (Chile, Kenya, South Africa and the UK).
 - 5 were established after 2011 (Denmark, Poland, Singapore, and Sweden, with Australia scheduled for implementation in 2017).

Country	System name	Owner	Operator	Established
Australia	New Payments Platform (NPP)	Specialist Company: NPP Australia Ltd - owned by 12 financial institutions.	SWIFT	Target 2017
Brazil	SITRAF (Funds Transfer System)	Clearing House: Camara Interbancaria de Pagamentos (CIP) - a non-profit association owned by banks.	CIP	2002
Chile	Transferencias en Línea (TEF)	Clearing House: Centro de Compensacion Automatizado (CCA) - owned by banks.	CCA	2008
Denmark	RealTime24/7	Clearing House: Nets Ltd - owned by a private equity fund.	Nets, who process virtually all of Denmark's payments.	2014
India	Immediate Payment Services (IMPS)	Central Bank	National Payments Corporation of India (NPCI). Leverages ATM and EFT networks.	2010
Japan	Zengin-Net	Specialist Company: Zengin-Net Corp (est. 2010 taking over from the Bankers' Association) - now owned by banks	Zengin-Net Corporation. Specialist owner/operator vehicle for real-time payments.	1973
Kenya	M-PESA	Mobile Network Operators: Safaricom - owned by Vodafone.	Safaricom	2007

Country	System name	Owner	Operator	Established
Mexico	Interbank Electronic Payment System (SPEI, which stands for 'Sistema De Pagos Electronicos Interbancarios').	Central Bank	Central Bank	2004
Poland	Express ELIXIR	Clearing House: Krajowa Izba Rozliczeniowa S.A. (KIR) - owned by banks.	Operated by Capgemini (following a competitive tender).	2012
Singapore	Fast and Secure Transfers (FAST), also called G3.	Association: Association of banks in Singapore.	VocaLink: who provide many other payment processing infrastructures and services.	March 2014
South Africa	Real-Time Clearing (RTC)	Clearing House: BankServ - owned by 5 banks.	BankServ: who provide many other payment processing infrastructures and services.	2006
South Korea	Electronic Banking System (EBS)	Clearing House: Korea Financial Telecommunications and Clearing Institute (KFTC) - non-profit, bank owned.	KFTC, who provide virtually all Korean payments processing.	2001
Sweden	BiR Real-time Payments System (marketed as Swish)	Split: Clearing House & Bank Joint Venture: Clearing House Bankgirot (bank owned) operates infrastructure & Swish (a bank JV) owns the customer facing application.	Bankgirot infrastructure (who provide many other payment processing infrastructures and services) and Swish (application).	2012
Switzerland	Swiss Interbank Clearing (SIC)	Central Bank	SIX Group (Financial Information Services Ltd), owned by 160 banks and who provide all other payment processing infrastructures and services in Switzerland.	1980s
UK	Faster Payments Service (FPS)	Specialist Company: Faster Payments Scheme Ltd - a non-profit membership based ownership vehicle for RTP	VocaLink, who provide many other payment processing infrastructures and services.	2008

RTP system description summary

The only commonality between the following systems is that they are real-time (or near real-time). Beyond this, no two systems are the same. Their differences can be expressed in terms of the following variables: settlement, customer availability, customer access channels, low value/hybrid, age, establishment

catalyst, degree of collaboration and collective motivation, environmental and societal drivers, regulatory versus commercial imperatives, degree of competition from non-banks, and system functionality. Depending on the system, these variables produce a wide range of uptake/success scenarios.

Country	Summarised description of each RTP system
Australia	The New Payments Platform (NPP) is being established in response to a Reserve Bank of Australia mandate. NPP Australia Ltd was formed in late 2014 and has 12 founding financial institutions. Following a competitive tender, SWIFT was selected as the operator. The NPP will be designed so a range of innovative modular 'overlays' can be developed on top of the core infrastructure. Real-time messaging will occur 24/7 between participants and customer proxy identifiers such as mobile numbers can be used instead of bank account numbers. Each payment will be 'line by line' settled between participants at the central bank. Rich information will be conveyed by the ISO 20022 payments messaging standard.
Brazil	In response to central bank concerns regarding liquidity and settlement risk, CIP, in conjunction with the Brazilian banks, introduced the Sitraf system. Sitraf is a near-real-time settlement system via a wire-like infrastructure. It is a hybrid low and high value system but is skewed towards high value transactions. It is available to customers 10.5 hours a day, 5 days a week. It has a complicated inter-participant settlement arrangement which is both RTGS and net deferred, and settles every 5 minutes. Settlements use a complicated settlement algorithm that requires close liquidity management, which has been cited as one of the reasons for banks resisting its use. For its age (established 2002), it has achieved comparatively low volumes, usage and impact in the low value transactions segment.
Chile	Introduced in response to a central bank mandate to remove settlement risk and reduce liquidity floats, TEF has been one of the most successful RTP systems in the world. Its volumes surpass the inferior batch deferred system and it accounts for 60% of all electronic credits and is growing at 20% p.a. Deployed in 2008, after only a total of 3 months development and testing, it is used in a wide range of payment scenarios. It provides a robust platform on top of which local banks innovate and provide products and services. Available 24/7, its participants settle twice each business day on a net deferred basis.
Denmark	RealTime24/7 is owned and operated by Nets (owned by a private equity firm), who process virtually all domestic payments. It was established in December 2014 in direct response to a mobile network operator joint venture to establish a mobile wallet. It is initially targeting mobile phone based account-to-account P2P payments but is expected to expand how it is used in other payment scenarios in the future. It has favourable conditions with a fully banked, low cash and high electronic payments national environment.
India	Established by the central bank in 2012 to target India's large unbanked population, the Immediate Payment Service leverages the established ATM and POS network. Users have to register to obtain a Mobile Money Identifier to link their phone number to their bank account (or a stored value account). While volumes to date are low, indications of future high growth are showing with over 58 million users so far.
Japan	Ahead of its time when established in 1973, the Zengin system has become a mature hybrid low/high value system. While significant volumes and values go through the system due to it being the settlement system for four other payment systems, given its age and highly electronic society, Zengin has had relatively low levels of real-time electronic credit usage. This is partly due to being available only 10 hours a day, 5 days a week and Japan having high amounts of mobile payments using other payment systems, particularly NFC. An ambitious set of changes are planned to re-modernise the system.

Country	Summarised description of each RTP system
Kenya	M-PESA was established by Vodafone via its Kenyan subsidiary, Safaricom. It has been wildly successful and has now expanded to several other African countries, Eastern Europe, India, and several other countries. M-PESA has had a profound effect on the Kenyan economy and has been credited for raising the banked population from 40% to 60% within 5 years. To a degree, it has effectively displaced banks as the defacto financial services provider. Funds are held in trust accounts at banks who then settle as required. By volume, in Kenya alone, each day it has more transactions than Western Union's global volumes. With 17 million users, M-PESA turns over \$1Bn USD each month, and 43% of all of Kenya's GDP passes through the system. Customers register an M-PESA account with their mobile phone provider (or with other providers). A customer's phone number is the M-PESA identifier for making or receiving payments.
Mexico	The original system was an RTGS high value system. The progressive Mexican central bank then evolved the RTGS system to establish real-time retail payment systems as a part of their wholesale settlement services functionality. SPEI is unique as it is not only a hybrid wholesale/retail system, but it is the only genuine batch processed real-time system. Today, a batch is settled when it collects 300 payments, or every 20 seconds (whichever comes first). A series of incremental changes have been made to the system to speed up its cycle and performance, with multilateral net settlement cycles originally taking place every 30 minutes, then 10 minutes, then 5 minutes, and now in 20 second settlement cycles. Currently, changes are being implemented to increase capacity and settle batches every 5 seconds in order to facilitate real-time mobile payments. The SPEI system's volumes are growing 90% p.a. The high growth is attributable to migration from other payment instruments because of SPEI's superior speed, bank promotion, ease of customer use and regulatory support (e.g. all public payrolls are paid via SPEI), and also due to reduction in the unbanked population. Now, 65% of all electronic credit payments are made via SPEI. SPEI is fully integrated with bank provided products and services. Customers access SPEI via their normal banking channels and internet banking mobile applications.
Poland	The Polish clearing house, KIR S.A., developed a premium, real-time payments service around their legacy ELIXIR ACH system. The system is operated by Capgemini following a competitive tender. Express ELIXIR was established in response to the popularity of payments services such as bill payments and ecommerce transactions offered by non-bank third party processors. Regulatory pressure also led to its establishment in June 2012. The system focuses on mobile payments, and can use mobile number proxy identifiers that are mapped to bank accounts. Each transaction is settled line by line, in real-time at the central bank, 24/7. Rich transactional information is conveyed, supported by the ISO 20022 payments messaging standard. Despite being a robust modern system, only 8 of 49 banks have taken up the service and those banks have struggled to make a viable business case. Accordingly, uptake of customer usage has been slow to date.
Singapore	The new FAST (also called G3) real-time system processes both debits and credits, 24/7. It is a brand new infrastructure owned by the Bankers' Association and is operated by VocaLink. FAST is designed as a system to consolidate many other systems over the near future. It will fully replace the Giro batch deferred payment system as well as numerous other associated systems. In order to replace these legacy systems, FAST uses modular functionality which allows it to cover all payment scenarios (including direct debit mandate management, the future ability to operate as a multi-currency and as a cross-border payments platform). FAST is part of an ambitious strategic approach aligned to Singapore's national strategy of being a cutting edge regional economic hub. The system was launched in March 2014 and has already found success in terms of participant uptake, regulatory support and customer adoption. These are all indicators of rapid growth, including the fact that the population is fully banked and highly electronic. Currently, settlement occurs twice a business day via multilateral net deferred settlements, although the frequency is expected to increase. Implementation involved core infrastructure development and banks building capability around real-time service levels, the ISO 20022 messaging format, system migrations and multiple settlement cycles. Customers access the system via normal bank channels, internet banking and mobile banking applications.

Country	Summarised description of each RTP system
South Africa	Real Time Clearing (RTC) was built by the main South African Clearing House BankServ in 2006 in response to calls for modernisation, regulatory imperatives and using fast payments as a platform for mobile payments to reduce the unbanked population. Available 24/7, RTC focuses primarily on P2P and P2B. Deferred net settlement occurs hourly and BankServ also provide a range of settlement and liquidity management tools. It is available to customers through normal banking channels. Only the six largest banks among South Africa's 22 banks use the system. RTC's uptake remains low and only has 2% of the volumes of the deferred batch system. RTC has struggled to get traction in the P2P segment and faces competition from a range of other mobile payment providers.
South Korea	The bank owned not for profit KFTC clearing house developed the real-time Electronic Banking System for commercial reasons in 2001. South Korea has one of the most electronic societies in the world and this is reflected in payments with the world's highest P2P and e-commerce rates in the world. EBT has a 90% usage penetration into the adult population. Approximately 55% of all electronic credits are via EBT (with the balance via a deferred system) which is the third highest RTP system penetration in the world. This high uptake was achieved despite issues with the Digital Signature Law mandating Microsoft's ActiveX as the only permissible digital certificate until recently. Banks partner with MNO's and offer mobile payments products, which often sit on top of the EBT infrastructure. EBT is the only RTP system that has deferred net settlement delayed until the following business day.
Sweden	Fully banked, high electronic usage, high levels of trust in government, banking and business and with the world's best chance of becoming a cash-less society, Sweden needed a savvy real-time system. Following considerable research, the clearing house Bankgirot established a successful business case and the BiR real-time infrastructure became operational in 2012. Bankgirot operates the core infrastructure, but to date, payments can only be made via the Swish mobile payments application. Swish is a cross industry collaboration (including regulatory support) and is owned by six banks (but not by Bankgirot). Customers register with Swish and download a mobile device application (the same application for all banks) that is linked to the customer's account. Swish was well marketed and had instant success, and now has well over 1 million registered users (out of population of 9 million). The BiR core infrastructure was designed to cater for a wide range of payment types, but to date only Swish initiates payments (banks, for the time being, have decided not to migrate other deferred electronic payments into BiR). BiR also supports direct access for billers into the RTP system.
Switzerland	Established to reduce settlement risk and lower operational costs, SIC was set up in the 1980s. SIC is available 24 hours a day but not during weekends. SIC's volumes are skewed towards high value payments, but by leveraging the RTGS system for low value payments, the Swiss banking system has avoided creating a separate infrastructure for fast retail payments, can take advantage of economies of scale, and can pool liquidity across both types of payments. Each payment is settled real-time 'line by line'. SIC is upgrading from a proprietary payments message format to ISO 20022. The Swiss make twice as many SIC real-time credits as they do debit and credit card transactions combined. Consumer uptake is growing but remains moderate, and its usage in the low value P2P and mobile segments remains limited. SIC has recently committed to migrate from the proprietary file format to ISO 20022.
UK	The most well-known RTP system in the world, the Faster Payments Service, was established in 2008 in response to a regulatory mandate to speed payments clearing to half a day. The industry countered by proposing an RTP system. It is owned and governed by Faster Payments Scheme Ltd, and operated by VocaLink. Available to customers 24/7, the system has three deferred net settlements per business day. While it has historically been used mainly for P2P payments, new overlay services are being added to expand its use scenarios, such as Paym (which allows payments using customer proxy identifiers such as their mobile numbers, linked to bank accounts), and VocaLink's new Zapp service (to be launched in 2015 to facilitate in-store real-time purchases). Other payment volumes have been steadily migrating to Faster Payments, which has been growing consistently by 30% per year. Growth is expected to continue rapidly due to: recently becoming the default way to pay on bank's online banking, Paym's usage expanding, mobile P2P payments growing, and new overlay services such as Zapp taking hold. It is available to customers through normal banking channels. With close to a billion transactions a year, Faster Payments are now double the UK's cheque volumes and are about half of the Bacs (deferred net batch system) electronic credits volumes. Faster Payments uses the ISO 8583 messaging standard. Faster Payments caters for five payment instrument categories, each with their own rules, being: Single Immediate Payments (the majority of volume and the fastest growing instrument), Forward Dated Payment, Standing Orders, Returns, and Corporate Bulk Payments.

Drivers for establishment

- Wide range of catalysts. There is not any one singular success formula.
- Unbanked leapfrog strategy common. Response to slow clearing common.
- Even split between regulatory and competition catalysts. Competition catalysts more recent.
- Uptake/penetration very mixed with no clear commonality or success formula.
- Channels mixed falling into one of three categories: 1) mobile only; 2) multiple channel retail banking; and 3) hybrid retail and wholesale only. None have all three yet.
- In most cases, the growth trajectory is high.
- Full support of banks is a critical success factor (Poland and Brazil are examples of where there was less than full bank support resulting in low uptake).

Country	Environmental conditions	Batch/deferred system speed	Catalyst	Resulting design option approach*	Outcome and impact
Australia	High electronic payments penetration.	Next day posting (generally). Robust.	Regulatory mandate Primary concern re innovation.	Build new infrastructure - build new network switch to link together limited-participation networks. Establish NPP Australia Ltd to own/govern. Competitive tender won by SWIFT to operate system.	Targeting being operational mid 2017.
Brazil	Hyperinflation. Liquidity and settlement risk concerns. Large geography with regional banks, poor transport and post, large unbanked population. Moderate electronic payments penetration.	Next day posting.	Regulatory pressure Primary concern re liquidity and settlement risk.	Evolve existing infrastructure – evolve wire infrastructure. Banking industry established Sitraf system (owned and operated by CIP) as a vehicle to address regulatory concerns.	Very low uptake. Slow growth. Banks resisting due to liquidity management issues. Narrow channel usage focusing on high value – not mobile.
Chile	Moderate electronic payments penetration. National drive for modernisation.	Next day posting (was two days at the time the RTP system was built)	Regulatory and market pressure Customer dissatisfaction re payments speed. Regulatory concern re lack of innovation/speed.	Evolve existing infrastructure – evolve ACH infrastructure. At behest of banks, the existing clearing house developed a new real-time payments infrastructure. Clearing House R&D on solutions conducted. Three months internal development then launch.	Extremely high uptake. Fast growth. Broad channel usage.

Country	Environmental conditions	Batch/deferred system speed	Catalyst	Resulting design option approach*	Outcome and impact
Denmark	High electronic payments penetration. Very low cash. MNO's established JV to provide payments wallet.	Same day posting. Robust and efficient.	Commercial competitive response.	<p>Evolve existing infrastructure – evolve ACH infrastructure.</p> <p>Banks responding to MNO competition. BankSMS small purchases established 2011, followed by RealTime24/7 launch 2014. Established clearing house Nets developed infrastructure.</p>	Uptake and growth TBD. Narrow channel usage (specialising mobile).
India	High cash and cheques. Low electronic payments. 66% unbanked population. Very high smartphone ownership (550m people).	Next day posting. Electronic used 20% as much as cheques. Unbanked population faces access barriers to electronic payments.	Regulatory pressure	<p>Evolve existing infrastructure – evolve ATM/Cards infrastructure.</p> <p>Targeted mobile payments platform for banked and unbanked. Existing clearing house leveraged ATM & EFT network to provide RTP infrastructure.</p>	Low uptake to date. Moderate growth. Narrow channel usage (mobile) but expanding.
Japan	High cash. High smartphone ownership. 40 year old very established real-time system. Moderate electronic payments penetration. High NFC mobile use.	No deferred batch system exists.	Unknown (established 1973)	<p>Evolve existing infrastructure – evolve ACH infrastructure.</p> <p>Hybrid retail/wholesale system. Specialist RTP infrastructure established.</p>	Low uptake (given age). Low growth. Mid channel usage, but not mobile.
Kenya	High unbanked population. High smartphone ownership. Emergence of micro-finance	Unbanked population face access barriers to electronic payments.	Commercial competitive response to Mobile Network Operators (MNOs) establishing as payments processors.	<p>Leverage emerging payments infrastructure – leverage telecom infrastructure.</p> <p>3x MNOs established mPesa.</p>	Extremely high uptake (near ubiquitous). High growth (expanding into other countries). Narrow channel usage (specialising mobile).

Country	Environmental conditions	Batch/deferred system speed	Catalyst	Resulting design option approach*	Outcome and impact
Mexico	High unbanked. Expensive electronic payments. Ambitious and strong central bank.	Next day posting. Unbanked population face access barriers to electronic payments.	Regulatory leadership	<p>Evolve existing infrastructure – evolve ACH infrastructure.</p> <p>Central bank established a mini-batch based hybrid low/high value RTP system. Migrated all government payroll to it. Ensured low cost. Progressive speed improvements.</p>	High uptake. Very high growth. Broad channel usage. Continual improvements.
Poland	Growing economy. Medium electronic payments penetration.	Same day posting.	Commercial competitive response by banks to non-bank payment processors. Regulatory pressure to address speed.	<p>Evolve existing infrastructure – evolve ACH infrastructure.</p> <p>All banks already had real-time internal systems. Bank response to non-bank competition resulted in clearing house putting out RFP.</p>	Low uptake (both in customers and banks) due to difficult business case. Low growth. Narrow channel usage (specialising mobile).
Singapore	Highly banked. Highly electronic but also high cash. High smartphone ownership. Ambition to be regional economic hub. Moderate electronic payments penetration.	Reliable but dated bulk system. Next day posting.	Commercial collaborative strategy based on a drive for regional cutting edge payments capability (with central bank endorsement).	<p>Build new infrastructure - build new network switch to link together limited-participation networks.</p> <p>Clearing House established a truly next-generation system for debits and credits, designed to ultimately totally replace the batch deferred system eGiro.</p>	While only launched 2014, high uptake. High growth. Broad channel usage.
South Africa	High unbanked population. Strong economy. Modernisation and inclusiveness policy focus. Moderate electronic payments penetration.	Reliable and established. Posting speeds vary bank-to-bank.	Regulatory pressure Modernisation and efforts to reduce unbanked via mobile phones.	<p>Evolve existing infrastructure – evolve ACH infrastructure.</p> <p>Clearing House BankServ established RTP infrastructure.</p>	Low-mid uptake. Moderate growth. Broad channel use.

Country	Environmental conditions	Batch/deferred system speed	Catalyst	Resulting design option approach*	Outcome and impact
South Korea	Strong economy. High smart-phone ownership. Tech savvy.	Next day posting.	Commercial collaborative strategy	Evolve existing infrastructure – evolve ACH infrastructure. Clearing house KFTC established RTP infrastructure.	Very high uptake. High growth. Broad channel usage.
Sweden	Very low cash. Efficient economy. Fully banked. High electronic payment penetration.	Same day posting.	Commercial collaborative strategy	Evolve existing infrastructure – evolve ACH infrastructure. Clearing house Bankgirot established RTP infrastructure. Joint venture Swish provides mobile application	Rapid customer penetration. Volumes growing quickly. Narrow channel usage (mobile only).
Switzerland	Low cash. Efficient economy. Fully banked. Medium electronic payments penetration.	Next day posting.	Regulatory leadership reduce infrastructure costs. Also remove settlement risk.	Evolve existing infrastructure – evolve ACH infrastructure. Central bank established hybrid low/high value RTP infrastructure, operated by commercial clearing house.	Medium uptake. Medium growth. Medium channel usage (not mobile)
UK	Strong modern economy. Fully banked. Regulatory pressure. High electronic payments penetration.	Next day posting.	Regulatory mandate reduce clearing times.	Build new infrastructure - build new network switch to link together limited-participation networks. Industry (APACS) proposed establishing RTP system. New clearing house infrastructure established, operated by payments processor VocaLink.	Medium uptake. High growth. Broad channel usage (recently added mobile).

* 'Resulting Design Option Approach' models (in italics) sourced from USA's Federal Reserve *FRFS Faster Payments Roundtable* presentation, June 3-4 2014, slides 34-35. Available at https://fedpaymentsimprovement.org/wp-content/uploads/faster_payments_roundtable.pdf. Note that "Evolve existing..." and "Build new..." can often overlap depending on how much "new" is added onto legacy infrastructure.

RTP system core features

- Most (11 out of 15) RTP systems are available 24/7.
- Of those that are not 24/7, with the exception of Mexico (which is 23/7), Japan, Switzerland and Brazil have all had comparatively low market penetration/ impact. Japan is soon to move 24/7
- Most (13) RTP systems are credit only, with India and Singapore the exceptions. Singapore's RTP system is designed to ultimately take over the deferred batch system, including debits.
- Most RTP systems do not provide direct notifications to customers (except Sweden and Kenya). Generally, banks/financial institutions provide instant notifications to customers via their own products and services, often through their online banking applications.
- 7 RTP systems have the capability to make payments destined to a proxy identifier such as a mobile phone number, and then the payment is mapped from that proxy identifier to the destination bank account, via a common database. With the exception of Kenya (M-PESA launched 2007), this capability has been launched since 2012.
- 6 RTP systems use ISO 20022 messaging standard to include rich payments information. 2 RTP systems (South Africa and Switzerland) are migrating to ISO 20022.
- 5 RTP systems have the capability to store future dated payment instructions but these account for a small proportion of total RTP payment volumes.

Country	Customer availability	Credit/Debit transactions	Customer instant notifications	Customer proxy addressing	Messaging format	Payment warehousing
Australia	24hrs / 7 days	Credit only	Yes: Via banks but TBD exactly how.	Yes: P2P payments use mobile phone numbers as proxy identifier, mapped to bank account..	ISO 20022	No. Instant processing only.
Brazil	10.5hrs / 5 days	Credit only	No standardised notification practice.	None	XML format – rich content.	Yes.
Chile	24hrs / 7 days	Credit only	Many banks provide as optional service.	None	ISO 8583 – lean content	No. Instant processing only.
Denmark	24hrs / 7 days	Credit only	Yes: SMS and in banking App.	None	ISO 20022	No. Instant processing only.
India	24hrs / 7 days	Credit and debit	Yes: SMS and in banking App.	Yes: 7 digit Mobile Money Identifier ID linked to mobile number and bank account	ISO 8583 – lean content	No. Instant processing only.
Japan	8 hrs / 5 days	Credit only	No standardised notification practice.	None.	Proprietary. Just expanded 20 characters to 140. Optional ISO 20022 use.	Yes. Up to 5 days in advance.

Country	Customer availability	Credit/Debit transactions	Customer instant notifications	Customer proxy addressing	Messaging format	Payment warehousing
Kenya	24hrs / 7 days	Credit only	Yes: SMS, wide range of Apps including MNO and banks.	Yes: Entire system based on mobile numbers.	Proprietary – lean content.	No. Instant processing only.
Mexico	23hrs / 7 days	Credit only	Many banks provide as optional service.	Yes: (just developed) P2P payments use mobile phone number as proxy identifier, mapped to bank account.	Proprietary – lean content.	No. Instant processing only.
Poland	24hrs / 7 days	Credit only	Some banks provide as optional service.	Yes: P2P payments use mobile phone numbers as proxy identifier, mapped to bank account.	ISO 20022 – rich content.	No. Instant processing only.
Singapore	24hrs / 7 days	Credit and debit	Yes: Agreed bank-to-customer notification SLA of 5 min max.	None.	ISO 20022 – rich content.	No. Instant processing only.
South Africa	24hrs / 7 days	Credit only	Many banks provide as optional service.	None. BankServ has developed capability but not in use.	ISO 8583 – lean content. Migrating to ISO 20022.	Yes. Up to 30 days in advance.
South Korea	24hrs / 7 days	Credit only	Many banks provide as optional service.	None.	Unknown.	No. Instant processing only.
Sweden	24hrs / 7 days	Credit only	Yes: Notification via the Swish app.	Yes: Swish app can use mobile number as identifier proxy.	ISO 20022 – rich content.	No. Instant processing only.
Switzerland	24hrs / 5 days	Credit only	No standardised notification practice.	None.	Proprietary. Migrating to ISO 20022.	Yes. Up to 5 days in advance.
UK	24hrs / 7 days	Credit only	Yes: via bank apps and bank sent SMS.	Yes. Paym added 2014. Uses mobile number as identifier proxy.	ISO 8583.	Yes. Future Dated Payments and Standing Orders are payment features.

RTP speed and certainty

- Even 'real-time' systems take some time.
- Most (10) RTP systems are considered 'real-time' with a speed of < 10 seconds. Some (3) are 'near real-time', between 10 – 30 seconds. Some (3) are 'fast', between 30 seconds and 1 minute.
- The UK has a large time gap between their posting time rules (2 hours), and market practice speed (generally near real-time).
- All send cleared funds.
- Immediate posting (funds are made immediately available to the customer when the receiving bank receives the payment) is the norm. There are not many returns (except Mexico and Brazil), but many have technical rejects.

Country	Customer experience speed	Initiating bank speed	System speed	Beneficiary bank posting speed	Beneficiary bank: Cleared funds	Returns and rejects
Australia	Real-time*	Real-time	Real-time	Immediate	Cleared funds	No returns
Brazil	< 1 min	Fast	Fast	< 60 seconds	Cleared funds	Not stipulated
Chile	< 10 sec	Near real-time	<10 seconds	Immediate (rules state <10 sec)	Cleared funds	No returns
China	< 20 sec	Near real-time	Near real-time	Immediate	Cleared funds	No returns
Denmark	< 10 sec	Near real-time	Near real-time	Immediate	Cleared funds	No returns
India	Real-time*	Real-time	Real-time	Immediate	Cleared funds	No returns
Japan	Real-time*	Real-time	Real-time	Immediate	Cleared funds	No returns
Kenya	Real-time*	Real-time	Real-time	Immediate	Cleared funds	No returns
Mexico	< 1 min 30 sec	< 30 seconds	< 30 seconds (Developing < 5 second capability)	< 30 seconds. Mobile payments < 5 seconds. Official receipt issued within 30 minutes.	Cleared funds	Returns. If beneficiary account cannot be credited or does not exist, must return funds < 20 min.
Poland	< 12 sec	Near real-time	Near real-time	Immediate	Cleared funds	No returns

Country	Customer experience speed	Initiating bank speed	System speed	Beneficiary bank posting speed	Beneficiary bank: Cleared funds	Returns and rejects
Singapore	< 15 sec	Near real-time	Near real-time	< 30 seconds	Cleared funds	No returns. System resends failed messages and cancels rejections.
South Africa	< 1 min	Fast	Fast	< 60 seconds	Cleared funds	No returns. Receiving bank sends 'successful' / 'unsuccessful' message back. 'Unsuccessful' payments are not settled.
South Korea	Real-time*	Real-time	Real-time	Immediate	Cleared funds	No returns
Sweden	Real-time*	Real-time	< 2 sec	Immediate	Cleared funds	No returns. Technical rejections possible.
Switzerland	Real-time*	Real-time	Real-time	Immediate	Cleared funds	No returns. Technical rejections possible.
UK	15 seconds	Notification must be completed within 15 seconds. Posting of funds must be < 2 hours, although in practice it is faster.	Cleared funds	No returns		

* Many systems are considered "real-time" and have not defined their actual speed. In practice, there is always some time delay so "real-time" should be considered < 10 seconds.

RTP target usage and customer access

- All RTP systems are predominately used in person-to-person (P2P) payment scenarios.
- Most RTP systems are accessed by customers as a feature within their mobile/internet banking application. Notable exceptions are Kenya and Sweden.
- The three RTP systems with the highest usage penetration (Mexico, Chile and South Korea) have all made their RTP system usable and widely available in all payment scenarios, including business related payments (e.g. salaries).

Country	P2P: Internet banking	P2P: Mobile (excluding standard mobile internet banking app)	P2B	B2B	B2P	\$ Value: Low <\$10k (L) Mid <\$100k (M) High >\$100k (H)	Customer use notes
Australia	Y	TBD	TBD	TBD	TBD	TBD	To be determined once launched in 2017.
Brazil	Y	N	Y	N	N	L, M, H	Customers access via internet banking and other bank channels and products. Targets special payments (not everyday payments). Predominantly higher value transactions.
Chile	Y	Y	Y	Y	Y	L, M	Customers access via internet banking and other bank channels and products. Targets all electronic credit payment scenarios. The dominant way to pay (excluding cards).
Denmark	Y	Y	TBD	TBD	TBD	L	Customers access via internet banking and other bank channels and products.
India	N	Y	N	N	N	L	Mobile number to mobile number credit payments, mapped to bank account or closed loop stored value account.
Japan	Y	N	Y	Y	Y	L, M, H	Customers access via internet banking and other bank channels and products. A mixed high value/wholesale and low value/retail RTP system.
Kenya	N	Y	Y	N	N	L	Customers establish a stored-value account with their mobile network provider, which they can top up at outlets. Customers can then instantly transfer funds to any other registered mobile number.

Country	P2P: Internet banking	P2P: Mobile (excluding standard mobile internet banking app)	P2B	B2B	B2P	\$ Value: Low <\$10k (L) Mid <\$100k (M) High >\$100k (H)	Customer use notes
Mexico	Y	Y	Y	Y	Y	L, M	Customers access via internet banking and other bank channels and products. Targets all electronic payment scenarios. The dominant way to pay (excluding cards). New functionality added to enable payments between two registered mobile numbers.
Poland	Y	N	N	N	N	L	Customers access via internet banking and other bank channels and products. Recently launched, and is currently focusing on P2P payments.
Singapore	Y	N	Y	Y	Y	L & M	Customers access via internet banking and other bank channels and products. Targets all electronic payment scenarios including debit transactions. Designed to ultimately replace the existing deferred batch system.
South Africa	Y	N	Y	Y	Y	L, M & H	Customers access via internet banking and other bank channels and products.
South Korea	Y	Y	Y	Y	Y	L & M	Customers access via internet banking and other bank channels and products.
Sweden	Y	Y	Y	N	N	L	Customers require the Swish app on their phone/device. The Swish app is linked to their bank account and online banking. New P2B capability added.
Switzerland	Y	N	Y	Y	Y	L, M, H	Customers access via internet banking and other bank channels and products. Is a mixed high value/wholesale and low value/retail RTP system.
UK	Y	Y*	Y**	Y	Y	L, M	Customers access via internet banking and other bank channels and products.* Paym mobile number to mobile number service added 2014.** VocaLink has announced Zapp, which will use RTP to make in-store POS payments.

RTP system track record

Of the 13 examples with a track record:

- 3 are showing signs of customer penetration maturity (Kenya, Switzerland and Japan).
- 8 have high or very high annual growth rates (Chile, India, Kenya, Mexico, Singapore, South Korea, Sweden and the U.K.)
- 3 have low growth rates (Poland, which has been only recently launched. Brazil and Japan, which are both mature hybrid low/high value systems,

RTGS, used little in the P2P and mobile segments, and have limited customer availability).

- A trend is emerging of RTP systems surpassing electronic credits in deferred batch systems (RTP volumes in Chile, South Korea and Mexico all exceed batch deferred payment volumes. Singapore and UK RTP strategies and volumes point them on a trajectory to surpass batch-deferred systems).

Country	Participant penetration	Customer penetration	Volume statistics	Ratio: RTP vs. Batch	Growth trajectory
Australia	TBD	TBD	TBD	TBD	TBD
Brazil	High (99 Participants out of ~120 possible).	Low . Not widely used by customers.	~300k per day	Low . After 12 years, only ~3% of all electronic credit volumes.	Low
Chile	Very High . All banks / FIs (either directly or indirectly).	Very high . Usage is a part of every-day banking.	~430k per day	High . ~60% of all electronic credits.	High . 20% growth p.a.
Denmark	High . Corporate customers can also directly access system.	TBD. Launched in 2014.	TBD. Launched late 2014	TBD. Launched late 2014.	TBD. Launched late 2014.
India	Medium . 73 banks and FIs.	Mid . 58 million mobile IDs registered (pop'n 1.2 bill).	~300k per day	Very low . Relatively new system.	Very High . ~15% per month. High mobile registration growth.
Japan	Very High . ~1400 Participants.	Mid .	~6m per day	High	Low . ~3%. High value transactions growing faster than low value.

Country	Participant penetration	Customer penetration	Volume statistics	Ratio: RTP vs. Batch	Growth trajectory
Kenya	Very High. 122k outlets.	High. Approx 60% adult population use. 19m registered users. New user registration reaching saturation and growth slowing to 3%.	~2m per day	High. ~ 65% of all electronic credits.	Very High: 7% per month, on top of very large base.
Mexico	Very high	Very high (amongst banked population). Integrated with everyday banking. All government payments.	~2m per day	High. ~65% of all electronic credits.	Very High. 90% growth p.a.
Poland	Low. Only 8 out of 49 banks. Business case difficult.	Low	~1k	Very low	Low
Singapore	Very high.	TBD. Launched in 2014.	Unknown (TBD)	TBD	Very high (Anticipated). Planned high migration from batch to RTP system.
South Africa	Medium: 6 of 22 banks but majority market share.	Low	~30k per day	Low: ~2%	Mid: showing consistent growth but from very low base.
South Korea	Very High.	Extremely High: 90% population penetration.	~3.5m per day	High. ~60% of all electronic credits.	High.
Sweden	High	High: In 12 months, 1m people had a working Swish app.	Unknown (TBD)	Unknown (TBD)	Very High: 150% p.a.
Switzerland	Very high (as hybrid high/low value system).	Medium:	~700k per day	Full - 100% (no deferred batch system exists).	Mid: ~10% p.a.
U.K.	Medium: 12 banks but majority market share.	High.	~3m per day	Mid. ~15% of all electronic credits.	High: ~30% p.a.

RTP inter-participant settlement

- There is no relationship between the customer-experienced RTP speed and the speed of inter-participant financial settlement.
- Of the 15 RTP systems, 9 have inter-participant financial settlement on the processing critical path for a customer to have their RTP payment completed. Of these 9, the limited operating hours of 4 settlement systems (Mexico, Brazil, Japan and Switzerland) have a direct constraint on the hours customers can make RTPs, and these 4 are the only examples of not having RTP available to customers 24/7.
- The other 6 have deferred settlements that occur after the customers have their RTP completed (resulting in some levels of settlement risk).
- Of the RTP systems:
 - 4 RTP systems are settled in real-time (Switzerland, Poland, Sweden and Australia).
 - 2 have close to real-time settlements (Mexico and Brazil).
 - 8 have multiple settlements per business day.
 - 1 (South Korea) settles the next business day.
- A range of risk management tools are made available by central banks.

Country	Settlement category	Settlement frequency	Settlement system availability	Settlement system vs. Customer availability impact	Settlement and liquidity risk management
Australia	RTGS. Single payment per settlement.	Real-time	24/7	Settlement System required for customer availability. No customer availability impact (24/7 customer availability).	Real-time gross settlement, so no other risk management tools
Brazil	Hybrid: Net deferred & RTGS. Multiple payments.	Every 5 minutes	06:30-17:30, 5 days	Settlement System required for customer availability. Direct customer availability impact (13 hour/5 day customer availability).	Multilateral net deferred against collateral held. Hybrid settlement algorithm. Central bank offers free unlimited intraday liquidity facilities by means of repo transactions backed by federal securities.
Chile	Net deferred – same day.	2 per day	09:00-18:15, 5 days	Settlement System required for customer availability. No customer availability impact (24/7 customer availability).	Automated multilateral net settlements across multiple payment systems, to improve netting.
Denmark	Net deferred – same day.	6 per day	08:00-15:00, 5 days	Settlement System required for customer availability. No customer availability impact (24/7 customer availability).	Multilateral netting at defined times across multiple payment systems to reduce liquidity requirements.

Country	Settlement category	Settlement frequency	Settlement system availability	Settlement system vs. Customer availability impact	Settlement and liquidity risk management
India	Net deferred – same day	3 per day	08:00- 19:00, 5 days	Settlement System not required for customer availability. No customer availability impact (24/7 customer availability).	Members intraday liquidity from central bank (fully collateralised) free of interest to augment their available liquidity in the RTGS system.
Japan	Hybrid: Net deferred & RTGS	1 at end of day, but RTGS if high value transaction > 100m yen	8:30-15:30, 5 days (moving to 24/7)	Settlement System required for customer availability. Direct customer availability impact (7 hour/5 day customer availability).	Split high value transactions into RTGS and net defer settlement for low-mid value transactions.
Kenya	Net deferred – same day	Daily, with settlements between bank M-Pesa trust accounts	Not applicable to M-Pesa	Settlement System not required for customer availability. No customer availability impact (24/7 customer availability).	Funds held in trustee bank custodial accounts on behalf of M-Pesa users. Funds held separately to operator Safaricom.
Mexico	RTGS. Multiple payments per settlement.	A batch is settled every 20 seconds or 300 transactions, whichever comes first. (Soon to be every 5 seconds.)	19:00- 17:35 (22.5 hours a day), 5 days	Settlement System required for customer availability. Direct customer availability impact (23 hour/5 day customer availability).	SPEI has an advanced queuing system and continuously runs an algorithm to determine which payments can be settled, by whom, given the available funds.
Poland	RTGS. Single payment per settlement.	Real-time	07:30 - 18:00, but 24/7 for RTP system	Settlement System required for customer availability. No customer availability impact (24/7 customer availability).	Real-time gross settlement, so no other risk management tools.
Singapore	Net deferred – same day	2 per day	09:00 - 17:00, 5 days	Settlement System not required for customer availability. No customer availability impact (24/7 customer availability).	Each settlement account holder has an RTGS account and a reserve account with a minimum opening balance. Reserve funds can be used to settle payments on an intraday basis.

Country	Settlement category	Settlement frequency	Settlement system availability	Settlement system vs. Customer availability impact	Settlement and liquidity risk management
South Africa	Net deferred – same day	One per hour 8am-4pm, and 10:30pm and 11:30pm	24/7	Settlement System not required for customer availability. No customer availability impact (24/7 customer availability).	Participants lodge collateral at central bank, which is used to secure intraday loans and to provide sufficient liquidity.
South Korea	Net deferred – next day	Once, at 11am the following business day	09:00- 17:30, 5 days	Settlement System not required for customer availability. No customer availability impact (24/7 customer availability).	None.
Sweden	Hybrid: RTGS (business hours) and net deferred (non-business hours)	Real-time (unless outside operating hours when automated multilateral net settlements occur)	07:00- 17:00, with auto settle in non-operational hours	Settlement System required for customer availability. No customer availability impact (24/7 customer availability).	When settlement system closed auto-settlements continue with deferred bilateral gross settlement from pre-funded accounts.
Switzerland	RTGS. Single payment per settlement.	Real-time	24 hours, 5½ days (closed Sat p.m. and Sun)	Settlement System required for customer availability. Direct customer availability impact (23 hour / 5 day customer availability).	Real-time gross settlement, so no other risk management tools.
UK	Net deferred – same day	3 per day	6am- 4pm, 5 days	Settlement System not required for customer availability. No customer availability impact (24/7 customer availability).	Members' net settlement exposures are capped, limiting risk taken by the other members each cycle. The cap is calculated using a formula based on past volumes of transactions. If the cap is breached, they cannot send any further payments. Default arrangements exist where each member commits liquidity and pledges collateral held at the central bank that is sufficient to cover their largest cap..

RTP system previous and upcoming development plans

RTP systems are continually improving their functionality and capabilities. Normally, the core infrastructure remains stable and more add-ons, or “overlay” services, get added. One common theme is to make ongoing improvements to increase the ability of individual customers to make payments initiated on mobile phones.

Country	Notes
Australia	Designed as a core infrastructure, it is envisaged commercial parties will develop ‘overlay’ services in the future. To get started, one industry based basic overlay payment service will be developed in time for launch in 2017. After that, it is hoped the market will use the NPP’s core capabilities to innovate and to build new products and services.
Brazil	No known development plans. There are many individual mobile payments pilot initiatives in the market but Sitraf and the central bank have not taken an active role.
Chile	With a very agile approach and mind-set, the system was built and deployed in 3 months. In relation to future developments, Luis Feldman, CCA’s Head of Operations, says “we have a new project around mobile as we see many non- and near-banks as well taking up deposit and savings accounts. There is a large demand from the under-banked community for banking services without checkbooks or credit, a pure debit and low value payments account. This can even mean paying for a taxi off a debit account by mobile. We are currently working on this and hope to announce a formal service later this year” ⁵⁹ . Feldman would like CCA to spread its wings and also manage payments originated in the mobile and credit card space and in different currencies such as Euros and US dollars. “I can only say that if you view our success in Immediate Payments in the light of being such an early adopter, with no reference, no experience, no technology providers to support us, our steep learning curve qualifies us for the next stage of payment innovation in Chile.” ⁶⁰
Denmark	As the RealTime24/7 system was only launched in December 2014 there is little information on future developments.
India	IMPS (launched 2012) is seen as the backbone on which the future of a full range of Indian mobile banking services will be established. It is currently focusing primarily on penetration of customer registrations and financial institution adoption. It is also looking to extend its current mobile phone P2P payments into other banking channels, particularly internet banking and ATM real-time account-to-account transfers.
Japan	In 2011, the 6th generation Zengin system was deployed, adding new capabilities to: manage both bulk and individual payment requests, introduce dual RTGS and net deferred settlement processes depending on transaction value, introduce the optional use of XML payments messaging formats including ISO 20022, and to expand proprietary messaging standard remittance data up to 140 characters. There is a current major initiative to move from a 10 hour / 5 day operating timeframe to be 24/7.

⁵⁹ Clear2Pay (June 2014) *Flavours of fast. A trip around the world in immediate payments*, page 33. Available at <http://www.asset.es/Documentos/2014/RI/Clear2Pay-Flavours-of-Fast-Final.pdf>

⁶⁰ Ibid

Country	Notes
Kenya	<p>Key to M-Pesa's rapid growth has been based on continual improvement and adding additional functionality. Key milestones include:</p> <ul style="list-style-type: none"> • 2007: launch. • 2008: Access M-Pesa at petrol stations (not via a mobile device). Withdraw cash from M-Pesa accounts at ATMs, without using any cards. • 2009: Western Union agreement to enable cross-border transfers to/from UK. Agreements with major utility providers to facilitate bill payments. Partnerships with micro-financiers. Agreement with banks on M-Pesa agent arrangements. • 2010: Partnerships with some banks for customers to manage their bank accounts and transact via M-Pesa. Ability for M-Pesa users to pay for groceries in supermarkets. Dividend payments into M-Pesa accounts. Ability to buy tickets online with M-Pesa. • 2011: Ability to transfer money from M-PESA account into Visa Pre-Paid Card. Global Western Union alliance. • 2012: Alliances with major retailers for in-store payments. Launched M-Pesa Pay Bill account for short-term fund raising purposes (charity, weddings, etc). Alliance with major bank to provides financial customer access to micro savings and micro credit. • 2013: Merchants (small and large) set up with 6 digit ID and other security features, allowing M-Pesa customers to buy goods and services easily. Expansion into Eastern Europe countries (coverage now extends to about 20 countries in multiple currencies).
Mexico	<p>What makes Mexico stand out is the series of incremental improvements, which in sum have transformed a batch deferred system into a highly successful and widely used RTP system. Lead firmly by a progressive central bank, they have ensured all types of customers can use the system across a broad set of payment types. They have made a series of incremental changes speeding up its cycle with multilateral net settlement cycles originally every 30 minutes and then reduced to 10 minutes, 5 minutes, and 20 second settlement cycles.</p> <p>The current focus is on ensuring the system can efficiently facilitate real-time account-to-account mobile payments by making the following enhancements: migrating from 20 second batches to mini-batches being settled and processed every 5 seconds, implementing system changes to significantly increase capacity to support peak volumes, and extending operating hours to near 24/7 (SPEI's availability has been recently extended from 9 hours / 5 days, to 23 hours / 7 days, but as it is a batch system it still requires end of day down time hence 23 hours). Also, there is a current initiative underway to further support mobile payments without requiring the sharing of account information by registering the consumer's mobile phone number with their bank.</p> <p>Changes were made to migrate the payment of all government salaries into SPEI and there is a current initiative to migrate all government payments to SPEI.</p>
Poland	<p>Poland introduced ExpressELIXIR 2012 with limited adoption to date. There are current plans for more value added services to be deployed to drive bank participation and consumer adoption, including proxy identifiers to facilitate more convenient mobile payments. Future plans include integration with a planned national P2P mobile service and potentially the addition of direct debits. The largest Polish banks have recently established common standards for mobile payments and are launching an interbank mobile payments scheme which will leverage the ExpressELIXIR infrastructure.</p>
Singapore	<p>A series of future enhancements and changes have been planned well in advance of FAST's launch in March 2014. These planned changes include facilitating multi-currency payments between banks in Singapore and conducting cross-border payments. Also planned is a post-implementation review of the high value transaction cap of \$10k SGD, and waves of new banks and financial institutions accessing the system. Ultimately, the future goal will be to have the FAST system totally replace the existing deferred batch system.</p>

Country	Notes
South Africa	South Africa has made a commitment to move to the ISO 20022 standard. The operator, BankServ, would also like to move some of the evening settlements back into daytime operational hours. Bankserv has also developed a mobile pay by proxy software but it is not being used by anyone yet.
South Korea	No known development plans identified by the research undertaken. However, a 'more of the same' approach would see a continuation of very high volume penetration and growth in account-to-account mobile payments
Sweden	Introduced in 2012, the core BiR system is seen as a backbone for clearing and settlement for a range of payment channels, including internet, mobile and telephone banking, and at bank branches. Currently, only Swish mobile payments are run on the BiR platform. When created, banks were interested in migrating payments in the traditional batch system into BiR, but they concluded that most of these transactions, for the time being, do not need to run faster and should remain in the batch system. Significant efforts have been put in branding and marketing Swish, driving registrations, and promoting Swish to SMEs. Swish has plans to introduce a P2B solution for real-time payments to enable consumers to make payments to small businesses, organisations and charities.
Switzerland	A current initiative is underway to replace the original 27 year old SIC infrastructure. This will help position SIC for greater innovation, flexibility and efficiency and to enable better integration with regional and global payment schemes. Included in this initiative is the gradual migration to ISO 20022 standards by 2018.
UK	<p>The mission statement of Faster Payments focuses on innovation and development of additional services. Accordingly, a series of enhancements have occurred and are occurring to increase functionality and lay the foundation for market innovation.</p> <p>Most recently, Paym was launched in 2014 to support mobile payments. Paym is a customer addressing mapping system to enable customers to pay to mobile numbers instead of a bank account number. It is integrated into existing mobile banking applications so customers of participating financial institutions that are already registered do not need to do any setup.</p> <p>Zapp mobile and ecommerce solutions (operated by VocaLink) will be offered in 2015 by a variety of UK banks which will enable P2B payments, in-store purchases and e-commerce.</p> <p>A set of proprietary products and services have been developed, all of which leverage the core RTP infrastructure. The most well-known of these is Pingit offered by Barclays to both their customers and non-customers, for P2P, mobile point of sale and mobile bill payments.</p> <p>In 2009, non-participant corporates were also given the ability to directly access the scheme.</p>

RTP web references

We have included the website addresses to documents or information that we relied on in the course of undertaking the detailed review of RTP systems around the world that are included in this appendix.

Country	Official website	Specific website sources	Generic website sources
Australia	http://www.apca.com.au/about-payments/future-of-payments/new-payments-platform	http://www.rba.gov.au/payments-system/reforms/strategic-review-innovation/conclusions/	https://www.bis.org/cpmi/publ/d124p2.pdf http://www.rba.gov.au/publications/bulletin/2014/dec/pdf/bu-1214-6.pdf
Brazil	http://translate.google.fr/translate?hl=en&sl=pt&u=https://www.cip-bancos.org.br/&prev=search	http://www.bcb.gov.br/Pom/Spb/Ing/InterbankFundsTransfer/ISitraf.asp?idpai=INTERBANK https://globalconnections.hsbc.com/us/en/tools-data/treasury-management-profiles/br/payment-systems https://books.google.fr/books?id=obSfP7J_zh0C&pg=PA48&lpg=PA48&dq=chile+rtgs+operating+hours&source=bl&ots=Kj6_SULa4S&sig=OwV4pXMINjKrIgywoiiNqvONSpC&hl=en&sa=X&ei=G1m-VKPWFaSY7gaY3YD4BQ&ved=0CC0Q6AEwAQ#v=onepage&q=chile%20rtgs%20operating%20hours&f=false	http://www.asset.es/Documentos/2014/RI/Clear2Pay-Flavours-of-Fast-Final.pdf http://starfishvc.sa.metacdn.com/images/files/Distra_RTPP_Report-screen.pdf https://www.bnymellon.com/global-assets/pdf/our-thinking/business-insights/global-payments-2020-transformation-and-convergence.pdf
Chile	www.cca.cl	https://books.google.fr/books?id=obSfP7J_zh0C&pg=PA48&lpg=PA48&dq=chile+rtgs+operating+hours&source=bl&ots=Kj6_SULa4S&sig=OwV4pXMINjKrIgywoiiNqvONSpC&hl=en&sa=X&ei=G1m-VKPWFaSY7gaY3YD4BQ&ved=0CC0Q6AEwAQ#v=onepage&q=chile%20rtgs%20operating%20hours&f=false	http://www.fundtech.com/news/218/fundtech-whitepaper-highlights-momentum-immediate-/
Denmark	http://translate.google.fr/translate?hl=en&sl=da&u=http://www.nets.eu/dk-da&prev=search	http://www.nationalbanken.dk/en/publications/Documents/2014/09/Express%20Transfers%20in%20Denmark_Mon3-2014.pdf http://www.finansraadet.dk/Tal--Fakta/Documents/2014/Clearing%20and%20Settlement%20of%20Retail%20Payments%20in%20Denmark.pdf	

Country	Official website	Specific website sources	Generic website sources
India	www.npci.org.in/aboutimps.aspx	http://www.slideshare.net/AkshayKaul1/payments-and-transaction-processing-systems-global-and-indian-overview http://www.npci.org.in/impsvolumes.aspx http://en.wikipedia.org/wiki/Indian_settlement_systems#Real-time_gross_settlement http://www.paymentscouncil.org.uk/files/payments_council/paym/delivering_world_leading_mobile_payments_how_does_the_uk_compare_internationally.pdf	
Japan	www.zengin-net.jp	http://www.zenginkyo.or.jp/en/banks/payment_systems/index/paymentsystems.pdf http://www.boj.or.jp/en/paym/outline/pay_boj/pss1212a.pdf https://www.boj.or.jp/en/statistics/set/kess/release/2014/kess1401.pdf http://www.bis.org/cpmi/publ/d105_jp.pdf http://www.bis.org/cpmi/publ/d97_in.pdf	
Kenya	http://www.safaricom.co.ke/personal/m-pesa/m-pesa-resource-centre	http://en.wikipedia.org/wiki/M-Pesa http://www.safaricom.co.ke/mpesa_timeline/timeline.html http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/03/keystompesassuccess4jan69.pdf http://www.gsma.com/mobilefordevelopment/safaricom-m-pesas-h1-fy13-results-a-portrait-of-a-maturing-mobile-money-service http://www.paymentscouncil.org.uk/files/payments_council/paym/delivering_world_leading_mobile_payments_how_does_the_uk_compare_internationally.pdf	
Mexico	www.banxico.org.mx/sistemas-de-pago/informacion-general/ http://www.banxico.org.mx/sistemas-de-pago/servicios/sistema-de-pagos-electronicos-interbancarios-spei/sistema-pagos-electronicos-in.html	https://books.google.fr/books?id=obSfP7J_zh0C&pg=PA48&lpg=PA48&dq=chile+rtgs+operating+hours&source=bl&ots=Kj6_SULa4S&sig=OwV4pXMINjKrIgywoiiNqvONSpC&hl=en&sa=X&ei=G1m-VKPFwFaSY7gaY3YD4BO&ved=0CC0O6AEwAO#v=onepage&q=chile%20rtgs%20operating%20hours&f=false	
Poland	www.expresselixir.pl	http://www.capgemini.com/resources/real-time-payments-with-krajowa-izba-rozliczeniowa-sa-express-elixir-service	

Country	Official website	Specific website sources	Generic website sources
Singapore	www.abs.org.sg/fast.php	http://www.emeap.org/emeapdb/upload/WGMeeting/Payment_clearing%20and%20settlement%20systems%20in%20Singapore.pdf http://www.bis.org/cpmi/paysys/singaporecomp.pdf	
South Africa	http://www.bankserveafrica.com/Regulated-Payments/Real-time-clearing	http://www.bis.org/cpmi/publ/d105_za.pdf	
South Korea	www.kftc.or.kr		
Sweden	http://www.bgc.se/Default.aspx 12747 http://translate.google.fr/translate?hl=en&sl=sv&u=https://www.getswish.se/&prev=search	http://www.aljazeera.com/video/europe/2012/09/20129812148701922.html https://www.youtube.com/watch?v=K8_3O7-AfL0 http://www.paymentscouncil.org.uk/files/payments_council/paym/delivering_world_leading_mobile_payments_how_does_the_uk_compare_internationally.pdf	
Switzerland	www.six-interbank-clearing.com/en/home/payment-services/sic.html		
UK	http://www.fasterpayments.org.uk	http://www.paymentscouncil.org.uk/files/payments_council/publications_2014/free_industry_statistics_2014/monthly_clearing_statistics_nov_2014.pdf http://www.paymentscouncil.org.uk/files/payments_council/paym/delivering_world_leading_mobile_payments_how_does_the_uk_compare_internationally.pdf http://www.zapp.co.uk	

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