Regulatory Challenges of Electronic Payment Systems and Electronic Money

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The exchange and transfer of value have underpinned commercial transactions for as long as commerce has been conducted by humans. From payments made with tangible commodities and specie money to fiat money and beyond, the evolution of payment systems has propelled and changed the face of commerce over the years. But the real game changing developments have mostly taken place over the last 65 years, fueled largely by technological innovations and alternative mindsets. Resulting in a dynamic payment systems industry that continues to churn out non-traditional players and ever mutating electronic payment systems, these developments at the frontier challenge the very notion of money as well as its regulators seeking to energise, yet manage, economic growth through money regulation and who are also charged with other regulatory responsibilities. This article tracks these developments and speculates at the journey ahead.

I. Introduction

1 Electronic payment systems ("**e-payment systems**") and electronic money ("**e-money**") have seen tremendous changes in the past few years. Innovative payment services such as Paypal, Apple Pay and Bitcoin have transformed the payments industry and created new and unique challenges for regulators. This article commences with a survey of the key historical developments in e-payment systems and e-money, before proceeding to discuss the role and challenges of regulation in the payments industry.

II. A Brief History of Money

2 Money has been defined as a medium of exchange – that is, a set of assets in an economy which people regularly exchange for goods and services from others.[1] Commodities such as salt, cacao seeds, cows and precious metals are among the earliest examples of money, and were used to supplement barter trade. When merchants wished to trade goods of unequal value, they would use quantities of a commodity to round out the exchange.[2] Standardised coins of precious metals were subsequently invented for the sale and purchase of all types of goods and services. This form of money – specie money – enhanced and expanded trade and commerce

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[1] Bill Z. Yang, "What is (Not) Money? Medium of Exchange ≠ Means of Payment" (2007) 51 The American Economist 101

[2] Jack Weatherford, *The History of Money* (Crown, 1997) at p 19 – 20

around the world. [3] Gold and silver coins gave way to paper currency, which was cheaper to print and more convenient to use. Early paper currencies were backed by precious metals, and holders could exchange their paper notes at banks for their equivalent value in precious metals.[4]

3 Commodity and specie money no longer dominate modern trade and commerce – that honour belongs to fiat money. Unlike commodity and specie money, fiat money has no intrinsic value; instead, its value originates from government decree, or fiat.[5] Following the permanent suspension of the United States ("**US**") dollar's convertibility into gold and the resulting end of the Bretton Woods system,[6] fiat money has become the dominant form of money used today.[7]

4 The payments industry developed out of the need to transfer and move money. Inter-bank settlement systems have their origins in the payment services offered by early banks:[8] customers of the same bank could request for transfers of funds between their accounts. Such bank transfers were considerably safer and more convenient than physically handing over sums of money. Subsequently, banks began to accept claims on each other to enable customers of different banks to transfer funds. Banks would resolve their claims by calculating the amounts due to and from one another i.e. clearing, and settling the resulting obligations. Inter-bank settlement systems, together with institutions such as clearing houses and central banks, were developed to enable banks to efficiently clear and settle claims among themselves.[9]

5 Remittance services came about to facilitate small-scale cross-border money transfers because such transfers were not adequately served by banks.[10] Remittance service providers, such as Western Union, have historically served migrant workers sending funds back to their

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[3] The earliest form of specie money was invented in the kingdom of Lydia at around 640 – 630 B.C. *See* Jack Weatherford, *The History of Money* (Crown, 1997) at p 30 – 36

[4] Paper currency originated in China, which was also the birthplace of paper. *See* Jack Weatherford, *The History of Money* (Crown, 1997) at p 126

[5] Fiat money is currency designated as "legal tender" and persons are compelled by law to accept it for payment of debts. *See* Gary Shoup, *International Guide to Foreign Currency Management* (Routledge, 2013) at p 18 – 19

[6] The Bretton Woods system was created after World War II to facilitate post-war reconstruction and international trade by creating an international basis for exchanging national currencies. 44 countries agreed to fix their exchange rates by tying their currencies to the US dollar; in turn, the US dollar would be convertible to gold at a fixed rate. Unfortunately, there was a surplus of US dollars by the 1960s arising from foreign aid, military spending and foreign investment, such that the US did not have enough gold to back the total volume of US dollars in world circulation. The overvaluation of the US dollar led the US to suspend the US dollar's convertibility into gold in 1971. By 1973, many major world economies had abandoned the Bretton Woods system by allowing their currencies to float freely against the US dollar. *See* Jack Weatherford, *The History of Money* (Crown, 1997) at p 183; M J Stephey, "A Brief History of the Bretton Woods System", *Time* (21 October 2008) < http://content.time.com/time/business/article/0,8599,1852254,00.html > (accessed 13 August 2015); US Department of State website "Milestones: 1969 – 1971, Nixon and the End of the Bretton Woods System", (13 October 2013) < https://history.state.gov/milestones/1969-1976/nixon-shock > (accessed 13 August 2015)

[7] Jack Weatherford, *The History of Money* (Crown, 1997) at p 186

[8] Examples of early banks include late-medieval moneychangers in Continental Europe and 17th century goldsmiths in England.

[9] Ben Norman, Rachel Shaw and George Speight, "The history of interbank settlement arrangements: exploring central banks' role in the payment system", *Social Science Research Network* (June 2011) < http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1863929 > (accessed 13 August 2015)

[10] The Economist, "Remittances: Over the sea and far away" (19 May 2012) < http://www.economist.com/node/21554740 > (accessed 13 August 2015)

families in their home countries, a service which remains very much alive today.[11] Cross-border remittances between money agents around the world typically rely on inter-bank settlement systems, although the exact mechanism for such money transfers may differ depending on the countries and currencies involved.[12] Remittances have been a significant source of capital for developing countries, and continue to play an important role in their economic growth.[13]

III. Development of E-Payment Systems and E-Money

6 E-payment systems and e-money evolved as further innovations to facilitate payments and money transfers, and have rapidly advanced over the past 65 years. Early examples of e-payment systems include credit and debit card services offered by banks and credit card companies in the 1950s. Internet and mobile payment services followed in the 1990s,[14] and paved the way for the recent introduction of smartphone-based mobile payment services.[15]

7 The development of e-money as an electronic surrogate for coins and banknotes was a significant milestone in the evolution of e-payment systems.[16] Popular examples of e-money involving stored value instruments include the CashCard and ez-link card in Singapore. Interestingly, in one of its earliest incarnations in the 1990s, e-money bore significant similarities to cryptography-based virtual currencies i.e. cryptocurrencies. In particular, DigiCash, one of the earliest e-money issuers, allowed users to make untraceable and secure money transfer transactions over the World Wide Web using cryptographic protocols developed by its founder, David Chaum. After low demand for DigiCash's services forced it to eventually shut down in 1999,[17] developers of payment systems shifted their attention to stored value instruments such as transit fare cards, which could electronically store and transmit monetary value.[18] This initial popularity of stored value instruments over virtual currencies meant that the recognition of e-money at a regulatory level was directed towards stored value instruments. The E-Money Directive adopted by the European Union in 2000 defined "electronic money" as "monetary value as represented by a claim on the issuer which is: (i)

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[11] Rui Esteves and David Khoudour-Castéras, "Remittances, capital flows and financial development during the mass migration period, 1870–1913" (2011) 15 European Review of Economic History 443

[12] The World Bank Committee on Payment and Settlement Systems, "General principles for international remittance services" *Bank for International Settlements* (March 2006) < http://www.bis.org/cpmi/publ/d73.pdf > (accessed 13 August 2015)

[13] The Economist, "Remittance corridors: New rivers of gold" (28 April 2012) < http://www.economist.com/node/21553458 > (accessed 13 August 2015)

[14] Daniel Roth, "The Future of Money: It's Flexible, Frictionless and (Almost) Free", *Wired* (22 February 2010) < http://www.wired.com/2010/02/ff_futureofmoney/ > (accessed 3 September 2015)

[15] Flavio Martins, "The History of the Mobile Payments Experience", *Winthecustomer!* (9 June 2015) < http://winthecustomer.com/technology-changing-the-mobile-payment-customer-experience/ > (accessed 14 August 2015)

[16] Steven Levy, "E-Money (That's What I Want)", *Wired* (December 1994) < http://archive.wired.com/wired/archive/2.12/emoney_pr.html > (accessed 27 August 2015)

[17] Julie Pitta, "Requiem for a Bright Idea", *Forbes* (1 November 1999) < http://www.forbes.com/forbes/1999/1101/6411390a.html > (accessed 27 August 2015)

[18] Committee on Payment and Settlement Systems, "Survey of developments in electronic money and internet and mobile payments" *Bank for International Settlements* (March 2004) < http://www.bis.org/cpmi/publ/d62.pdf > (accessed 27 August 2015)

stored on an electronic device; (ii) issued on receipt of funds of an amount not less in value than the monetary value issued; (iii) accepted as means of payment by undertakings other than the issuer". [19] This definition was refined in 2009 to "electronically, including magnetically, stored monetary value as represented by a claim on the issuer which is issued on receipt of funds for the purpose of making payment transactions … and which is accepted by a natural or legal person other than the electronic money issuer".[20]

8 This early appropriation of the expression "e-money" to the narrow confines of electronic stored value instruments representing fiat money, was a source of anecdotal confusion over the scope of e-money when virtual currencies subsequently re-emerged in the late 2000s in forms which did not represent fiat money value but had currency in the electronic world. Prominent examples of virtual currencies include in-game currencies issued by online games, such as EverQuest and World of Warcraft, and cryptocurrencies such as Bitcoin. [21] Against the backdrop of such developments, regulators put forward definitions of "virtual currency" apparently intended to distinguish it from the definition of e-money as a stored value of fiat money. For example, the European Central Bank initially defined virtual currencies in 2012 as "a type of unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community".[22] This definition was updated in 2015 based on developments in the regulation and operation of virtual currencies, to "a digital representation of value, not issued by a central bank, credit institution or an e-money institution, which, in some circumstances, can be used as an alternative to money." [23] While virtual currencies are often thought of as cutting-edge innovations in financial technology, many of them have their roots in the cryptographic protocols established by DigiCash, one of the first e-money issuers. In this sense, virtual currencies are essentially a new variation of an old idea.[24]

IV. Driving Forces

9 The evolution of e-payment systems and e-money have been driven by commercial, technological and ideological considerations, which have played out in a highly fluid and interconnected way. Technological advancements, such as smart cards and the World Wide Web, [25] have simultaneously satisfied and fuelled commercial demands for cheap, fast, secure

[19] Directive 2000/46/EC, Article 1(b)
[20] Directive 2009/110/EC, Article 2(2)
[21] Julian Dibbell, "The Decline and Fall of an Ultra Rich Online Gaming Empire", *Wired* (24 November 2008) < http://archive.wired.com/gaming/virtualworlds/magazine/16-12/ff_ige?currentPage=all > (accessed 27 August 2015)
[22] European Central Bank, "Virtual currency schemes", (October 2012) < https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf > (accessed 27 October 2015)
[23] European Central Bank, "Virtual currency schemes – a further analysis", (February 2015) < https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf > (accessed 27 August 2015)
[24] Ken Griffith, "A Quick History of Cryptocurrencies BBTC – Before Bitcoin" *Bitcoin Magazine* (16 April 2014) < https://bitcoinmagazine.com/12241/quick-history-cryptocurrencies-bbtc-bitcoin/ > (accessed 27 August 2015)
[25] The Internet is not, strictly speaking, synonymous with the World Wide Web. The Internet refers to the infrastructure that connects computer networks around the world, while the World Wide Web is an avenue for transmitting data over the Internet. *See* Keith Wagstaff, "The Internet and the World Wide Web Are Not the Same

and convenient payment services. Libertarian ideologies have spurred inventors to create new technologies that challenge and subvert the *status quo*. Together, these drivers have propelled competition and innovation in the rapidly-evolving global payments industry.

A. Commercial

10 Developments in e-payment systems and e-money have been driven by commercial considerations and concerns of service providers, consumers and merchants, generally centering on the cost, convenience and security of payments.

(1) Service Providers

11 Competition among service providers has been a major driving force behind the growth of e-payment systems, especially in the early days of the credit card industry. The Diners Club card is commonly credited as the first modern credit card, and was introduced by the Diners Club in 1950. [26] The Diners Club card was initially made of cardboard, and allowed cardholders to buy meals at participating restaurants. Diners Club would reimburse the restaurant for the cardholder's purchase, and bill the cardholder at the end of the month. Diners Club profited from extending such unsecured loans to cardholders by charging participating restaurants a small fee for every purchase, and charging cardholders interest every month.[27] The remarkable popularity of the Diners Club card spurred banks and businesses to issue credit cards which could be used at a variety of establishments. In 1958, American Express Company introduced the American Express Personal Card, a credit card initially dedicated to the payment of travel and entertainment expenses,[28] and in 1959, Bank of America Corporation launched the first general-use credit card, the BankAmericard.[29] The Master Charge credit card was launched in 1969 by a group of American banks to compete with the BankAmericard.[30] About a decade later, the BankAmericard name was changed to Visa,[31] followed by the name change from

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Thing", *NBC News* (12 March 2014) < http://www.nbcnews.com/tech/internet/internet-world-wide-web-are-not-same-thing-n51011 > (accessed 14 August 2015)

[26] Some department stores and oil companies introduced credit payment schemes in the 1800s so that customers could make purchases and pay for them at the end of the month. However, unlike modern credit cards, cards issued under these schemes could only be used at a single establishment. *See* James Stuart Olsen, *Historical Dictionary of the 1950s* (Greenwood Publishing Group, 2000) at p 66 – 67

[27] James Stuart Olsen, *Historical Dictionary of the 1950s* (Greenwood Publishing Group, 2000) p 66 – 67

[28] American Express, "Our Story", < https://secure.cmax.americanexpress.com/Internet/GlobalCareers/Staffing/Shared/Files/our_story_3.pdf > (accessed 13 August 2015); American Express, "Company History and Development", < https://www.americanexpress.com/china/en/aboutamex/corpinfo_history.shtml > (accessed 24 November 2015)

[29] The BankAmericard was considered a general-use credit card because it could be used for any type of purchase at participating merchants. The BankAmericard was also the first credit card to offer revolving credit, which allowed customers to pay down their balances over time. *See* Bank of America, "Introducing the modern credit card", < http://about.bankofamerica.com/en-us/our-story/birth-of-modern-credit-card.html > (accessed 13 August 2015)

[30] MasterCard, "Key Milestones", < https://www.mastercard.us/en-us/about-mastercard/who-we-are/history.html > (accessed 14 August 2015)

[31] The BankAmericard name was changed to Visa in 1976. *See* Bank of America, "Introducing the modern credit card", < http://about.bankofamerica.com/en-us/our-story/birth-of-modern-credit-card.html > (accessed 13 August 2015)

Master Charge to MasterCard.[32] Together with technological advancements such as magnetic stripe cards and data networks, robust competition among credit card service providers fuelled the growth of the global credit card industry.

12 The first debit cards were introduced by banks in the late 1970s as a substitute for cheques. These cards enabled monies to be deducted from the cardholder's bank account when the cardholder made a purchase, and were generally issued to bank customers with large savings accounts, such as business executives.[33] Debit card usage dramatically increased in the late 1990s for two main reasons. First, banks introduced debit cards which cardholders could use at automated teller machines ("**ATMs**") to withdraw cash from their bank accounts.[34] Second, the banks who issued credit cards such as Visa and MasterCard began to open up their credit card infrastructure, including their extensive electronic network linking cardholders, merchants, card-issuing banks and merchant banks, for use in their debit card services. Debit cards are now a convenient alternative to credit cards, and a strong competitor.[35]

13 Besides debit cards and despite their status as industry veterans, traditional credit card companies also began to face stiff competition from Internet-based payment services. The introduction of the World Wide Web in the early 1990s[36] facilitated the transfer of funds at a much lower cost than traditional money transfers. Providers of Internet-based payment services began to spring up to take advantage of this new technology. Paypal, which was launched in 1998, allowed users to quickly and inexpensively transfer funds through its online platform[37] and rapidly established itself as a dominant player in the payments industry. Paypal's success demonstrated the utility of online payments, and rival online payment processors such as Stripe were quickly established in its wake.[38] Stripe offers simple software and services for online businesses to receive electronic payments,[39] and its current customers include industry leaders

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[32] The Master Charge name was changed to MasterCard in 1979. *See* MasterCard, "Key Milestones", < https://www.mastercard.us/en-us/about-mastercard/who-we-are/history.html > (accessed 14 August 2015)
[33] M Lambert, "The History of Debit Cards", *Bright Hub* (7 June 2011), < http://www.brighthub.com/money/personal-finance/articles/42073.aspx > (accessed 9 November 2015)
[34] Stuart E. Weiner, "Electronic Payments in the US Economy: An Overview", *Federal Reserve Bank of Kansas City* (1999) < https://www.kansascityfed.org/publicat/ECONREV/PDF/4q99wein.pdf > (accessed 18 November 2015); Fumiko Hayashi, Richard Sullivan and Stuart E. Weiner, "A Guide to the ATM and Debit Card Industry". The issuance of debit cards with ATM access in the late 1990s also boosted the general utility of ATMs. *See Federal Reserve Bank of Kansas City* (2003) < https://www.kansascityfed.org/publicat/psr/bksjournarticles/atmpaper.pdf > (accessed 9 November 2015. *Also see* paragraph 25 below for further information on ATMs.
[35] Fumiko Hayashi, Richard Sullivan and Stuart E. Weiner, "A Guide to the ATM and Debit Card Industry", *Federal Reserve Bank of Kansas City* (2003) < https://www.kansascityfed.org/publicat/psr/bksjournarticles/atmpaper.pdf > (accessed 9 November 2015)
[36] Tony Long, "Aug. 7. 1991: Ladies and Gentlemen, the World Wide Web", *Wired* (7 August 2012) < http://www.wired.com/2012/08/aug-7-1991-ladies-and-gentlemen-the-world-wide-web/ > (accessed 14 August 2015). For further discussion on the World Wide Web, see note 25 above.
[37] Paypal relies on existing credit card and bank services to make money transfers. *See* Paypal, "Learn How Paypal Works", < https://www.paypal.com/webapps/mpp/pay-online > (accessed 14 August 2015)
[38] Marcus Wohlsen, "The Internet Needs A Better Way To Handle Money. This Startup Has The Key", *Wired* (23 July 2014) < http://www.wired.com/2014/07/the-startup-that-wants-to-change-the-language-of-online-payments/ > (accessed 7 September 2015)
[39] Mike Isaac, "Stripe, Digital Payments Start-Up, Raises New Funding and Partners With Visa", *New York Times* (28 July 2015) < http://www.nytimes.com/2015/07/28/technology/stripe-digital-payments-start-up-raises-new-funding-and-partners-with-visa.html > (accessed 9 November 2015)

such as Kickstarter and Twitter.[40] By providing an inexpensive, convenient and secure avenue for money transfers, Internet-based payment services began to pose a major threat not only to credit card companies, but to banks as well.[41]

14 On the back of the Internet, mobile payment applications accessible through smartphones, such as Google Wallet, Android Pay, Apple Pay and CurrentC, were also developed as alternatives to credit card services. Google first introduced Google Wallet in 2011 as a mobile payment system that enabled users to store their debit, credit, gift and loyalty card information on their smartphones, and use such information in the smartphone to make online payments. A further variation enabled a Google Wallet user with a smartphone equipped with Near Field Communication ("**NFC**") capabilities to pay for purchases by securely transmitting such information to a point-of-sale terminal.[42] However, Google Wallet saw tepid success following its launch, and met with stiff competition from the introduction of Apple Pay by Apple in October 2014.[43] Apple Pay is a mobile payment system which shares significant similarities with Google Wallet: it allows users to upload their credit and debit card information to their NFC-equipped smartphones and use such smartphones to pay for purchases. [44] Google responded by introducing Android Pay in May 2015 [45] which built on technology from Google Wallet, to compete with Apple Pay.[46] In contrast, CurrentC is a mobile payment system introduced by a consortium of US retailers in 2014 with the aim of replacing credit cards altogether. CurrentC uses QR codes[47] displayed on a cashier's payment terminal and scanned by the customer's smartphone, or *vice versa*, to initiate and verify purchases at participating retailers. This system is designed to automatically apply discounts, use loyalty programmes and charge the customer for purchases. Unlike Android Pay or Apple Pay, CurrentC directly debits funds from a user's bank account, allowing retailers to avoid costly credit card charges.[48] These diverse offerings demonstrate considerable competition among mobile payment service

[40] Sarah Perez, "Stripes New Product Helps Marketplaces Go Global More Quickly", *TechCrunch* (23 March 2015) < http://techcrunch.com/2015/03/23/stripes-new-product-helps-marketplaces-go-global-more-quickly/#.oeebvx:sOTB > (accessed 9 November 2015)
[41] Daniel Roth, "The Future of Money: It's Flexible, Frictionless and (Almost) Free", *Wired* (22 February 2010) < http://www.wired.com/2010/02/ff_futureofmoney/ > (accessed 14 August 2015)
[42] Megan Geuss, "How Apple Pay and Google Wallet actually work", *Ars Technica* (30 October 2014) < http://arstechnica.com/gadgets/2014/10/how-mobile-payments-really-work/ > (accessed 14 August 2015). For an explanation of NFC technology, see paragraph 26 below.
[43] Apple, "Apple Pay Set to Transform Mobile Payments Starting October 20", *Apple Press Info* (16 October 2014) < https://www.apple.com/sg/pr/library/2014/10/16Apple-Pay-Set-to-Transform-Mobile-Payments-Starting-October-20.html > (accessed 9 September 2015)
[44] Megan Geuss, "Google Wallet use grows after Apple Pay launch", ", *Ars Technica* (5 November 2014) < http://arstechnica.com/gadgets/2014/10/how-mobile-payments-really-work/ > (accessed 27 October 2015)
[45] Pali Bhat, "Pay Your Way with Android", *Android Official Blog* (28 May 2015) < http://officialandroid.blogspot.sg/2015/05/pay-your-way-with-android.html > (accessed 14 August 2015)
[46] Megan Geuss, "Android Pay is all about tokenisation; Google Wallet takes a backseat", *Ars Technica* (29 May 2015) < http://arstechnica.com/business/2015/05/android-pay-will-embrace-tokenization-mostly-replace-google-wallet/ > (accessed 14 August 2015)
[47] QR codes are similar to barcodes; when a user scans a QR code with a smartphone, the information embedded in the code is transmitted to the smartphone. *See* Rachel Swaby, "QR Code", *Wired* (16 April 2013) < http://www.wired.com/2013/04/qrcode/ > (accessed 14 August 2015)
[48] Josh Constine, "CurrentC Is The Big Retailers' Clunky Attempt To Kill Apple Pay And Credit Card Fees", *Techcrunch* (25 October 2014) < http://techcrunch.com/2014/10/25/currentc/ > (accessed 14 August 2015)

providers *inter se*, even as such services seek to compete with and vis-à-vis banks, credit card companies and Internet payment services.

15 Service providers have employed various strategies to maintain their profitability in the highly competitive payments industry. To reduce operating costs, e-payment service providers have devised ways to reduce their exposure to credit card companies and banks. For example, Paypal allows users to use existing funds in their Paypal account to make payments to other Paypal users, which enables Paypal to avoid paying credit card or bank transfer fees for such transactions. This allows Paypal to charge lower transaction fees than traditional credit card services, making it more competitive and attractive to consumers.[49]

16 High transaction volumes and cross-border transactions expose service providers to significant security risks, [50] and maintaining consumer data protection and payment security is a major challenge for service providers. Some service providers have mitigated such risks through innovative technologies. For example, concerns over credit card fraud led to the introduction of the EMV standard, a chip-based authentication system named after the three service providers that invented it – Europay, Mastercard and Visa. [51] However, recent customer data thefts from major service providers such as JPMorgan Chase[52] demonstrate that despite such technological advancements, safeguarding consumer data remains a pressing issue in the payments industry.[53]

(2) Consumers

17 Consumer demand for services offered by e-payment systems and e-money has been driven by factors such as cost, variety, convenience, security and privacy.

18 Faced with rising credit card fees, many consumers have turned to payment services with lower transaction costs, such as Paypal.[54] Convenience and user-friendliness have also been major drivers of consumer demand for mobile payment applications such as Android Pay, which enable consumers to make contactless payments using their smartphones.[55]

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[49] Daniel Roth, "The Future of Money: It's Flexible, Frictionless and (Almost) Free", *Wired* (22 February 2010) < http://www.wired.com/2010/02/ff_futureofmoney/ > (accessed 3 September 2015)
[50] Steve Bodow, "The Money Shot", *Wired* (September 2001) < http://archive.wired.com/wired/archive/9.09/paypal_pr.html > (accessed 4 September 2015)
[51] Kevin Poulson, "Why the Heyday of Credit Card Fraud is Almost Over", *Wired* (25 September 2014) < http://www.wired.com/2014/09/emv/ > (accessed 14 August 2015)
[52] "JPMorgan hacked: 70 million client names and personal information stolen in major data breach", *The Independent* (3 October 2014) < http://www.independent.co.uk/news/business/news/jpmorgan-hacked-70-million-client-names-and-personal-information-stolen-in-major-data-breach-9771835.html > (accessed 22 September 2015)
[53] Bill Hardekopf, "The Big Data Breaches of 2014", *Forbes* (13 January 2015) < http://www.forbes.com/sites/moneybuilder/2015/01/13/the-big-data-breaches-of-2014/ > (accessed 22 September 2015)
[54] Eric Adamowsky, "Bitcoin: The Pros and Cons for Consumers and Merchants", *Yahoo! Finance* (2 March 2014) < http://finance.yahoo.com/news/bitcoin-pros-cons-consumers-merchants-140041526.html > (accessed 4 September 2015)
[55] Tery Spataro, "Apple Pay, Samsung Pay, Android Pay: What This Means for Banks", *BankInnovation* (3 August 2015) < http://bankinnovation.net/2015/08/apple-pay-samsung-pay-android-pay-what-this-means-for-banks/ > (accessed 4 September 2015)

19 The growth in e-payment systems and e-money has significantly increased consumer demand for a variety of payment options.[56] Studies have observed that many consumers use a wide range of payment methods depending on the type of payment, the amount of the payment, and other complex factors. For example, a consumer might purchase a $5 car-wash token with cash, but pay for a more costly plane ticket using a credit card.[57] Service providers have responded to the varying needs of consumers by providing diverse payment solutions with different characteristics.[58]

20 Acceptance by merchants has been another driver of consumer demand, as new payment systems that are not supported by small merchants face consumer reluctance in adopting such systems. For new payment services to gain global acceptance, consumers need to be able to use them at local eateries, street vendors and stores.[59]

21 On the flip side, consumer demand has been tempered by security and privacy concerns, and consumer data thefts have cast a pall over the payments industry.[60] This has made payment services that restrict access to personal data more appealing to consumers, such as services which use Bitcoin as a means of anonymous payment.[61]

(3) Merchants

22 Acceptance by merchants has been a critical factor in the development of e-payment systems and e-money. Merchants have generally been less willing to adopt new payment systems where the costs of implementing and using them are high.[62] Installing the required

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[56] KPMG Financial Services Regulatory Risk Practice and the Americas Financial Services Regulatory Center of Excellence, "Payment Systems: Regulatory Interest in Payment Processors, Faster Payments, and Related Consumer Protections", (July 2015) < https://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/regulatory-practice-letters/Documents/rpl-1504-cfpb-payment-systems.pdf > (accessed 13 November 2015)

[57] Stacey L. Schreft, "How and When Do Consumers Choose Their Payment Methods?", *The Federal Reserve Bank of Kansas City* (April 2006) < https://www.kansascityfed.org/PUBLICAT/RESWKPAP/pdf/rwp06-04.pdf > (accessed 13 November 2015); Marques Benton, Krista Blair, Marianne Crowe and Scott Schuh, "The Boston Fed Study of Consumer Behavior and Payment Choice: A Survey of Federal Reserve System Employees", *Federal Reserve Bank of Boston* (14 February 2007) < https://www.bostonfed.org/economic/ppdp/2007/ppdp0701.pdf > (accessed 13 November 2015)

[58] Federal Reserve Bank of Cleveland, "Our Payments System: Challenges and Opportunities", (31 December 1997) < https://www.clevelandfed.org/newsroom-and-events/publications/annual-reports/ar-1997-our-payments-system/ar-199702-essay.aspx > (accessed 13 November 2015)

[59] Apple Pay was initially less popular among consumers despite its strong marketing campaign due to its limited acceptance by small merchants. *See* Gene Marks, "Why Is Almost No One Using Apple Pay?", *Forbes* (1 June 2015) < http://www.forbes.com/sites/quickerbettertech/2015/06/01/why-is-almost-no-one-using-apple-pay/ > (accessed 7 September 2015)

[60] Bill Hardekopf, "The Big Data Breaches of 2014", *Forbes* (13 January 2015) < http://www.forbes.com/sites/moneybuilder/2015/01/13/the-big-data-breaches-of-2014/ > (accessed 22 September 2015)

[61] Bitcoin users do not have to disclose personal information when making payments using Bitcoin. This provides protection against identity theft. *See* Bitcoin Foundation, "Frequently Asked Questions", < https://bitcoin.org/en/faq#what-are-the-advantages-of-bitcoin > (accessed 7 September 2015)

[62] Bank for International Settlements, "Implications for Central Banks Of The Development Of Electronic Money", (October 1996) < http://www.bis.org/publ/bisp01.pdf > (accessed 7 September 2015)

infrastructure (e.g. contactless payment terminals) and training employees to use new payment technologies represent additional costs,[63] which are especially unpalatable to small merchants.[64] Service providers have responded by developing cheaper and more convenient alternatives to pricey point-of-sale terminals, such as tablet and smartphone applications.[65] Service providers have also significantly reduced transaction fees to incentivise merchants and compete with credit card companies, banks and other service providers.

23 Another incentive for merchants to support new payment technologies has been their "cool factor" – by supporting novel and trendy technologies, merchants have been able to distinguish themselves from their competitors and attract tech-savvy consumers.[66] These incentives have contributed greatly to the growing popularity of innovative payment services among merchants, as can be seen from the rise of new entrants such as Stripe.[67]

B. Technological

24 Technology has been a major driving force in the payments industry since the introduction of the credit card in the 1950s. While early credit cards such as the Diners Club card were initially made of cardboard[68] and later issued as embossed plastic cards, it was the invention of the magnetic stripe card in the 1960s that catalysed the establishment of the global credit card industry. Together with point-of-sale devices, data networks and computers, magnetic stripe cards enabled credit card information to be transmitted efficiently, accurately and securely.[69]

25 ATMs were introduced in the late 1960s, and required users to have a personal identification number and a special paper voucher, which could be inserted into the machine in

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[63] Payment terminals can be expensive, and represent a significant investment on the part of the merchant. *See* Ruth Reader, "Forget about payment apps: the new battle is around payment terminals", *Venture Beat* (29 October 2014) < http://venturebeat.com/2014/10/29/forget-about-payment-apps-the-new-battle-is-around-payment-terminals/

[64] Gene Marks, "Why Is Almost No One Using Apple Pay?", *Forbes* (1 June 2015) < http://www.forbes.com/sites/quickerbettertech/2015/06/01/why-is-almost-no-one-using-apple-pay/ > (accessed 7 September 2015)

[65] Services providers such as Paypal and Bitpay allow merchants to accept payments using smartphone and tablet applications. *See* Paypal, "Paypal Here", < https://www.paypal.com/webapps/mpp/credit-card-reader > (accessed 7 September 2015); Bitpay, "Bitcoin Checkout", < https://bitpay.com/bitcoin-for-retail > (accessed 7 September 2015)

[66] Mark Sullivan, "Here's how Apply Pay will win with small merchants", *Venture Beat* (17 April 2015) < http://venturebeat.com/2015/04/17/heres-how-apple-pay-will-win-with-small-merchants/ > (accessed 7 September 2015)

[67] Marcus Wohlsen, "Stripe Leads the Race to the $1 Trillion Future of Mobile Payments", *Wired* (30 September 2014) < http://www.wired.com/2014/09/stripe-leads-race-1-trillion-future-mobile-payments/ > (accessed 18 November 2015)

[68] American Express, "Our Story", < https://secure.cmax.americanexpress.com/Internet/GlobalCareers/Staffing/Shared/Files/our_story_3.pdf > (accessed 13 August 2015)

[69] The magnetic stripe card was invented by IBM engineer Forrest Parry. *See* IBM, "Magnetic Stripe Technology", < http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/magnetic > (accessed 13 August 2015)

return for paper currency.[70] ATMs were subsequently modified to accept magnetic stripe cards and smart cards instead of paper vouchers, which greatly improved the security of ATM transactions.[71]

26 The introduction of smart card technology in the 1970s enabled plastic cards to be outfitted with microprocessors,[72] and allowed credit cards with enhanced capabilities to be issued. Although the ATM was invented earlier than and independently of smart card technology, ATMs came to embrace smart card technology. Smart card technology also paved the way for credit and debit cards to be outfitted with the EMV chip-authentication system which provided greater protection against fraud.[73] Credit cards with additional NFC capabilities[74] have also enabled consumers to make convenient and secure payments by tapping their card against a point-of-sale terminal.[75] These technological advancements contributed towards the popularity of credit cards and the overall growth of the payments industry.

27 Smart card technology facilitated the development of e-money in the form of stored value cards.[76] Stored value cards were first used in France for public phone networks in the 1980s,[77] and the ease and convenience they offered for payment systems made them particularly useful for transit fare payments. By the early 2000s, stored value cards were used in public transportation networks around the world. Examples of such applications include the Octopus card in Hong Kong, and the ez-link card in Singapore. Stored value cards are now one of the most popular forms of e-money and are used in countries all over the world.[78]

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[70] "Enfield's cash gift to the world", *BBC* (27 June 2007) < http://www.bbc.co.uk/london/content/articles/2007/06/26/cash_machine_feature.shtml > (accessed 27 October 2015)

[71] "All ATM cards to have secure smart chips installed by 2014", *AsiaOne* (21 January 2012) < http://news.asiaone.com/News/Latest+News/Singapore/Story/A1Story20120121-323230.html> (accessed 27 October 2015)

[72] Roland Moreno obtained the first patent for smart cards in 1974. *See* Phil Davidson, "Roland Moreno: Inventor who missed out on global recognition for his computer chip smart card", *The Independent* (4 May 2012) < http://www.independent.co.uk/news/obituaries/roland-moreno-inventor-who-missed-out-on-global-recognition-for-his-computer-chip-smart-card-7715617.html > (accessed 14 August 2015)

[73] Olga Kharif and Elizabeth Dexheimer, "Credit and Debit Cards Lag on Upgrades", *BloombergBusiness* (2 October 2015) < http://www.bloomberg.com/news/articles/2015-10-01/credit-and-debit-cards-lag-on-emv-upgrades > (accessed 9 November 2015)

[74] NFC technology evolved from radio frequency identification technology, and allows data to be transmitted over short distances (e.g. 4 cm). *See* Chris Foresman, "Near Field Communications: a technology primer", *Ars Technica* (9 February 2011) < http://arstechnica.com/gadgets/2011/02/near-field-communications-a-technology-primer/ > (accessed 14 August 2015)

[75] Cameron Faulkner, "What is NFC? Everything you need to know", *Techradar* (20 April 2015) < http://www.techradar.com/news/phone-and-communications/what-is-nfc-and-why-is-it-in-your-phone-948410 > (accessed 14 August 2015)

[76] Committee on Payment and Settlement Systems, "Survey of developments in electronic money and internet and mobile payments" *Bank for International Settlements* (March 2004) < http://www.bis.org/cpmi/publ/d62.pdf > (accessed 7 September 2015)

[77] Ali M Al-Khouri, *Critical Insights from Government Projects* (Chartridge Books Oxford, 2013) at p 147

[78] Committee on Payment and Settlement Systems, "Survey of developments in electronic money and internet and mobile payments" *Bank for International Settlements* (March 2004) < http://www.bis.org/cpmi/publ/d62.pdf > (accessed 27 August 2015)

28 The single greatest game changer to the payments industry has arguably been the World Wide Web. Before the World Wide Web was introduced in the 1990s,[79] payment networks were dependent on expensive infrastructure maintained and monopolised by banks and credit card companies. The World Wide Web provided an inexpensive, accessible and superior alternative to such infrastructure, which opened up the payments industry to new players, such as technologists and entrepreneurs.[80] The World Wide Web also facilitated convergence between mobile and computer devices, telecommunication networks and various computing platforms.

29 This convergence accelerated technological developments in the payments industry, leading to the invention of virtual currencies and smartphone-based mobile payment systems. Interestingly, the first mobile payment service was offered by Coca-Cola in 1997, when it allowed a user to purchase drinks from any designated vending machine by sending a mobile text message to that vending machine.[81] Since then, innovations in mobile technology, especially the introduction of smartphones with NFC capabilities, have driven similarly ground-breaking developments in mobile payments, culminating in the introduction of Android Pay, Apple Pay and CurrentC.[82] Arguably, these mobile payment services are the next wave in the evolution of payment services. Consumers have been the ultimate beneficiaries of these new technologies, because they now have access to a wider array of payment services at lower costs.[83]

C. Ideological

30 Libertarian ideals have been influential in the development of e-money, and have inspired the creation of virtual currencies which did not need to be sustained by financial institutions, central banks or governments.

31 Many early e-money businesses were inspired by libertarian ideals. For example, David Chaum founded DigiCash,[84] which issued anonymous and untraceable e-money, to help individuals prevent overzealous governments from monitoring or blocking their transactions.[85]

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[79] For further discussion on the World Wide Web, see note 25 above.
[80] Daniel Roth, "The Future of Money: It's Flexible, Frictionless and (Almost) Free", *Wired* (22 February 2010) < http://www.wired.com/2010/02/ff_futureofmoney/ > (accessed 7 September 2015)
[81] Flavio Martins, "The History of the Mobile Payments Experience", *Winthecustomer!* (9 June 2015) < http://winthecustomer.com/technology-changing-the-mobile-payment-customer-experience/ > (accessed 14 August 2015)
[82] Megan Geuss, "Google Wallet use grows after Apple Pay launch", ", *Ars Technica* (5 November 2014) < http://arstechnica.com/gadgets/2014/10/how-mobile-payments-really-work/ > (accessed 27 October 2015); Megan Geuss, "Android Pay is all about tokenisation; Google Wallet takes a backseat", *Ars Technica* (29 May 2015) < http://arstechnica.com/business/2015/05/android-pay-will-embrace-tokenization-mostly-replace-google-wallet/ > (accessed 14 August 2015)
[83] Julia Greenberg, "Tech Upended Banks and Stock Trading. Insurance is Next", *Wired* (1 July 2015) < http://www.wired.com/2015/07/tech-upended-banks-stock-trading-insurance-next/ > (accessed 7 September 2015)
[84] For further discussion on DigiCash, see paragraph 7 above.
[85] Steven Levy, "E-Money (That's What I Want)", *Wired* (December 1994) < http://archive.wired.com/wired/archive/2.12/emoney_pr.html > (accessed 27 August 2015)

Another e-money business founded on a similar libertarian outlook was E-Gold, an electronic currency backed by gold and other precious metals. E-Gold was established by Douglas Jackson in 1996 as a private currency that would circulate independently of government controls. E-Gold users were allowed to anonymously open online accounts and make fund transfers; unfortunately, this anonymity also allowed criminal organisations to use E-Gold to covertly transmit funds. By 2009, E-Gold had been effectively shut down by the US authorities for engaging in money laundering and operating as an unlicensed money transmission business.[86]

32 Failed e-money businesses such as DigiCash and E-Gold evidently shared a common exposure: they relied on a central operator that could be shut down by government authorities or simply go out of business. When Bitcoin was introduced in 2009 by Satoshi Nakamoto, [87] this exposure was addressed by its decentralised peer-to-peer network that obviated the need for a central operator.[88] Bitcoin uses cryptographic technologies and a shared public ledger called the "blockchain" to track, confirm and secure transactions. Like Chaum's DigiCash and Jackson's E-Gold, Nakamoto's Bitcoin has been designed in the belief that to protect individual autonomy, government oversight over monetary systems and individual citizens should be minimal at best. [89]

33 Libertarians and privacy enthusiasts were early users of Bitcoin because it allowed them to make secure and potentially untraceable payments without relying on centralised banking institutions[90] Following its rapid rise in popularity in 2013, Bitcoin became a target for speculative investments, making its exchange rates with various fiat currencies increasingly volatile.[91] The absence of a central regulator has made Bitcoin's users vulnerable to scams and thefts. [92] Despite these issues, many Bitcoin businesses, ranging from Bitcoin exchanges[93] to

[86] Kim Zetter, "Bullion and Bandits: The Improbable Rise and Fall of E-Gold", *Wired* (9 June 2009) < http://www.wired.com/2009/06/e-gold/ > (accessed 27 August 2015)
[87] To date, the identity of "Satoshi Nakamoto" remains a mystery. *See* Martin O'Leary, "The Mysterious Disappearance of Satoshi Nakamoto, Founder & Creator of Bitcoin", *Huffington Post* (11 May 2015) < http://www.huffingtonpost.com/martin-oaleary/the-mysterious-disappeara_2_b_7217206.html > (accessed 27 October 2015)
[88] Martin Venezky, "The Rise and Fall of Bitcoin", *Wired* (23 November 2011) < http://www.wired.com/2011/11/mf_bitcoin/ > (accessed 22 September 2015)
[89] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System", *Bitcoin* < https://bitcoin.org/bitcoin.pdf > (accessed 31 August 2015); Rainey Reitman, "Bitcoin – a Step Towards Censorship-Resistant Digital Currency", *Electronic Frontier Foundation* (20 January 2011) < https://www.eff.org/deeplinks/2011/01/bitcoin-step-toward-censorship-resistant > (accessed 13 November 2015)
[90] Annie Lowrey, "My Money Is Cooler Than Yours", *Slate* (18 May 2011) < http://www.slate.com/articles/business/moneybox/2011/05/my_money_is_cooler_than_yours.html > (accessed 1 September 2015)
[91] Joe Light, "Should You Invest in Bitcoin?", *The Wall Street Journal* (23 November 2013) < http://www.wsj.com/articles/SB10001424052702304607104579212101356897382 > (accessed 1 September 2015)
[92] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 8 September 2015)
[93] Bitcoin Foundation, "How to Buy Bitcoins", < http://howtobuybitcoins.info/#!/ > (accessed 1 September 2015)

electronic wallet providers[94] and even remittance service providers,[95] have sprung up in the past few years. Financial institutions, such as Barclays and Credit Suisse, are also investigating potential uses of the blockchain for financial market technology platforms. [96] While there may be doubts if Bitcoin can transcend its libertarian origins and become a globally accepted mainstream currency,[97] its future does not appear to be without promise.[98]

V. Regulation of Payment Systems

A. Objectives

34 Payment system regulations around the world have generally been implemented to address the broad policy objectives of safety and efficiency. [99] Safety refers to the resilience, security and stability of payment systems, whereas efficiency is achieved when payments can be made quickly, cheaply and effectively. Safe and efficient payment systems facilitate the use of money as an effective means of payment, engender public confidence in electronic transactions, enable the smooth functioning of financial markets and promote economic growth.[100]

(1) Safety

35 Safe payment systems are stable and secure, and facilitate the effective functioning of financial markets and economies. [101] Safety in payment systems can be enhanced by protecting payment systems from credit, liquidity and settlement risks, and by ensuring that transactions

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[94] Bitcoin Foundation, "Choose your Bitcoin Wallet", < https://bitcoin.org/en/choose-your-wallet > (accessed 1 September 2015)
[95] Florian Graillot, "Bitcoin Might Be The Next Big Thing In The Remittance Market" , *TechCrunch* (25 May 2015) < http://techcrunch.com/2015/05/25/bitcoin-might-be-the-next-big-thing-in-the-remittance-market/ > (accessed 1 September 2015)
[96] Cassandra Khaw, "Nine major banks working on Bitcoin-like block chain tech for market trading", *Ars Technica* (17 September 2015) < http://arstechnica.com/business/2015/09/nine-major-banks-working-on-bitcoinesque-block-chain-tech-for-market-trading/ > (accessed 27 October 2015)
[97] PriceWaterhouseCoopers, "Virtual currencies: Out of the deep web, into the light" (March 2014) < https://www.pwc.com/en_IM/IM/publications/assets/banking/pwc_virtual_currencies_risk_opportunities.pdf > (accessed 8 September 2015)
[98] David Wolman, "Bitcoin's Radical Days Are Over. Here's How To Take It Mainstream", *Wired* (30 October 2013) < http://www.wired.com/2013/10/bitcoin/ > (accessed 22 September 2015)
[99] Monetary Authority of Singapore, "Consultation Paper: Payment Systems Oversight Act", (April 2003) < http://www.mas.gov.sg/~/media/resource/publications/consult_papers/2003/MASConsultationPaperonPaymentSystemsOversightAct.pdf > (accessed 30 September 2015); Committee on Payment and Settlement Systems, "Central bank oversight of payment and settlement systems", *Bank for International Settlements* (May 2005) < http://www.bis.org/cpmi/publ/d68.pdf > (accessed 30 September 2015)
[100] Bank of Canada and the Department of Finance, "The Canadian Payments System: Public Policy Objectives and Approaches", *Bank of Canada* (May 1997) < http://www.bankofcanada.ca/wp-content/uploads/2010/09/psac2.pdf > (accessed 30 September 2015)
[101] Bank of Canada and the Department of Finance, "The Canadian Payments System: Public Policy Objectives and Approaches", *Bank of Canada* (May 1997) < www.bankofcanada.ca/wp-content/uploads/2010/09/psac2.pdf > (accessed 30 September 2015)

which have been effected by such systems are final and irrevocable.[102] To achieve these objectives, the Payment and Settlement System (Finality and Netting) Act[103] ("**PSSA**") was introduced in Singapore in 2002 to provide the broad legal foundations for the operation of stable payment and settlement systems so as to reduce the risk of systemic disruptions to Singapore's financial system.[104] The PSSA empowers the Monetary Authority of Singapore ("**MAS**") to designate payment and settlement systems, which are exempt from the application of specific legal rules, including the rule in insolvency law for the unwinding of specific type of transactions. In determining whether to designate a system, MAS will consider the systemic risks associated with that system.[105] Payment systems that have been designated under the PSSA include (i) the MAS Electronic Payment System, the real-time gross settlement system operated by MAS for the settlement of funds between banks,[106] and (ii) the Continuous Linked Settlement system, a global payment and settlement system that aims to eliminate foreign exchange settlement risk due to time zone differences among international banks.[107] Thus, the PSSA provides an omnibus solution to the risks that would otherwise surround the operation of payment and settlement systems by according legal protection to, and thereby preserving the integrity and finality of transactions processed under, systems designated by MAS.[108]

36 Safe payment systems are also necessary to combat criminal activity, especially money laundering and terrorism financing.[109] As such, MAS has implemented anti-money laundering and countering the financing of terrorism ("**AML/CFT**") regulations to protect the integrity of Singapore's financial system from illegal activities and illicit fund flows. E-money issuers,[110] money changing and remittance businesses[111] and other financial institutions are therefore required to put in place appropriate controls to detect and deter the flow of illicit funds through

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[102] Monetary Authority of Singapore and Attorney-General's Chambers of Singapore, "Legal Protection for Financial Payment Systems", (15 August 2002) < https://www.agc.gov.sg/DATA/0/Docs/PublicationFiles/Consultation_paper.pdf > (accessed 1 October 2015)
[103] (Cap 223, 2003 Rev Ed)
[104] *Singapore Parliamentary Debates, Official Report* (25 November 2002) vol 75 at cols 1539–1542 (Lee Hsien Loong,
[105] Payment and Settlement System (Finality and Netting) Act (Cap 223, 2003 Rev Ed), s 3; *Singapore Parliamentary Debates, Official Report* (25 November 2002) vol 75 at cols 1539–1542 (Lee Hsien Loong, Deputy Prime Minister and Minister for Finance)
[106] Monetary Authority of Singapore, "MAS Electronic Payment System (MEPS+), (21 June 2014) < http://www.mas.gov.sg/Singapore-Financial-Centre/Payment-and-Settlement-Systems/Clearing-and-Settlement-Systems/MEPS.aspx > (accessed 18 November 2015)
[107] Monetary Authority of Singapore , "Continuous Linked Settlement System", (21 June 2014) < http://www.mas.gov.sg/singapore-financial-centre/payment-and-settlement-systems/clearing-and-settlement-systems/continuous-linked-settlement-system.aspx > (accessed 29 October 2015)
[108] *Singapore Parliamentary Debates, Official Report* (25 November 2002) vol 75 at cols 1539–1542 (Lee Hsien Loong, Deputy Prime Minister and Minister for Finance)
[109] Department of Finance Canada, "Balancing Oversight and Innovation in the Ways We Pay: A Consultation Paper", (13 April 2015) < http://www.fin.gc.ca/activty/consult/onps-ssnp-eng.asp > (accessed 10 October 2015)
[110] MAS has issued AML/CFT measures applying to entities which issue stored value facilities. *See* MAS Notice PSOA-N02: Notice to Holders of Stored Value Facilities on Prevention of Money Laundering and Countering the Financing of Terrorism, (5 November 2007) < http://www.mas.gov.sg/~/media/MAS/Regulations%20and%20Financial%20Stability/Regulatory%20and%20Supervisory%20Framework/Anti_Money%20Laundering_Countering%20the%20Financing%20of%20Terrorism/PSOAN02%20Revised%20Notice%20to%20Holders%20of%20SVF.pdf > (accessed 12 October 2015)
[111] Money-Changing and Remittance Businesses Act (Cap 187, 2008 Rev Ed)

the financial system in Singapore. Such controls include customer due diligence checks, regular account reviews and monitoring and reporting of suspicious transactions.[112]

(2) Efficiency

37 Efficient payment systems operate with reasonable costs and timely and simple processes, thereby providing cheap and convenient payment services for users. The Payment Systems (Oversight) Act ("**PSOA**") was promulgated in 2006 to promote the efficiency and safety of "stored value facilities" ("**SVFs**") and institutions which issue such SVFs.[113] An SVF is effectively e-money,[114] being a facility that represents monetary value and is used for the payment of goods and services up to that stored value, and which can be in various forms, such as magnetic stripe cards, smart cards and Internet accounts.[115] The PSOA distinguishes between a widely accepted SVF and a non-widely accepted SVF. An SVF is deemed a widely accepted SVF where its aggregate stored value exceeds SGD 30 million, which must be guaranteed by an approved bank and the holder of which must be approved by MAS.[116] In contrast, an SVF with an aggregate stored value not exceeding SGD 30 million is regarded as a non-widely accepted SVF and does not need to be guaranteed by any bank nor the specific approval of MAS, although it is still subject to stipulated conditions and requirements under the PSOA.[117] By such distinction, the PSOA reflects a regulatory approach that operates on the basis that the prescribed amount of SGD 30 million is a "proxy indicator for how widely used and accepted"[118] an SVF is, and that some SVFs which are less widely accepted have a "lower level of funds-at-risk"[119] than those which are more widely accepted.[120] In doing so, the PSOA seeks to strike a balance between addressing the safety of widely accepted SVFs and preserving the efficiency, innovation and competition for smaller-scale SVF schemes i.e. non-widely accepted SVFs.[121]

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[112] Monetary Authority of Singapore, "Anti-Money Laundering / Countering the Financing of Terrorism", (4 May 2015) < http://www.mas.gov.sg/regulations-and-financial-stability/anti-money-laundering-countering-the-financing-of-terrorism-and-targeted-financial-sanctions/anti-money-laundering-and-countering-the-financing-of-terrorism.aspx > (accessed 10 October 2015)

[113] Payment Systems (Oversight) Act, (Cap 22A, 2007 Rev Ed), s 4

[114] For a detailed explanation on e-money, see paragraphs 6 to 8 above.

[115] Monetary Authority of Singapore "Stored Value Facility Guidelines", (June 2006) < http://www.mas.gov.sg/~/media/resource/legislation_guidelines/payment_system/payment_act2006/guidelines/Stored%20Value%20Facility%20Guidelines%20final%20version.pdf > (accessed 26 September 2015)

[116] Payment Systems (Oversight) Act, (Cap 22A, 2007 Rev Ed), s 35 and 36

[117] Payment Systems (Oversight) Act, (Cap 22A, 2007 Rev Ed), s 29 to 32

[118] Monetary Authority of Singapore, "Draft Payment Systems (Oversight) Bill", (December 2004) < http://www.mas.gov.sg/~/media/resource/publications/consult_papers/2005/Consultation%20Paper%20on%20Draft%20Payment%20Systems%20Oversight%20Bill.pdf > (accessed 12 November 2015

[119] Monetary Authority of Singapore, "Draft Payment Systems (Oversight) Bill", (December 2004) < http://www.mas.gov.sg/~/media/resource/publications/consult_papers/2005/Consultation%20Paper%20on%20Draft%20Payment%20Systems%20Oversight%20Bill.pdf > (accessed 12 November 2015

[120] Joyce A Tan and Daniel Seng, "A Review of IT Law Developments in Singapore" (Paper presented at Developments in Singapore Law between 2001 and 2005, 12-14 January 2006)

[121] Tharman Shanmugaratnam, "The Payment Systems (Oversight) Bill: Second Reading Speech by Mr Tharman Shanmugaratnam, Minister For Education and Deputy Chairman, Monetary Authority of Singapore", *Monetary Authority of Singapore* (16 January 2006) < http://www.mas.gov.sg/news-and-publications/speeches-and-monetary-policy-statements/speeches/2006/second-reading-speech-by-mr-tharman-on-payment-bil.aspx > (accessed 26 September 2015)

(3) Oversight

38 As the central bank of Singapore, MAS's mission is to promote sustained non-inflationary economic growth through appropriate monetary policy formulation and close macroeconomic surveillance of emerging trends and potential vulnerabilities.[122] To this end, MAS conducts integrated supervision of the financial services sector and oversees payment systems in Singapore.[123]

39 To support the oversight and policy-making functions of MAS, the PSOA confers on MAS the power to gather information from all relevant parties in any payment system in Singapore,[124] including details on the operation of, and the pricing of services offered by such payment systems.[125] Such information may be used by MAS to monitor trends and developments in the payments industry, and fine-tune its oversight framework for payment systems where appropriate[126]

40 Beyond such specific regulations, MAS is also vested with the general power to "require any financial institution or classes of financial institutions whose operations are considered by [MAS] to affect (a) monetary stability and credit and exchange conditions in Singapore; (b) the development of Singapore as a financial centre; or (c) the financial situation of Singapore generally, to be approved by [MAS] for the purpose of carrying on business in Singapore".[127] This overarching power allows MAS to regulate such institutions without necessarily having to pass further statutory legislation.

B. Challenges and Considerations

41 In the constantly-evolving payments industry where the identities of service providers and the shape of frontier technology are ever dynamic, regulators are challenged by the inherent trade-offs that result from deciding one way or the other, on the nature, scope and extent of regulation for e-payment systems and e-money. A light-touch regulatory regime with minimal

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[122] Monetary Authority of Singapore, "About MAS", (14 July 2014) <http://www.mas.gov.sg/about-mas.aspx> (accessed 13 November 2015)
[123] Monetary Authority of Singapore, "Annual Report 2012/2013", *Parliament of Singapore* < http://www.parliament.gov.sg/lib/sites/default/files/paperpresented/pdf/2013/S.%2040%20of%202013.pdf > (accessed 13 November 2015)
[124] Tharman Shanmugaratnam, "The Payment Systems (Oversight) Bill: Second Reading Speech by Mr Tharman Shanmugaratnam, Minister For Education and Deputy Chairman, Monetary Authority of Singapore", *Monetary Authority of Singapore* (16 January 2006) < http://www.mas.gov.sg/news-and-publications/speeches-and-monetary-policy-statements/speeches/2006/second-reading-speech-by-mr-tharman-on-payment-bil.aspx > (accessed 26 September 2015)
[125] Payment Systems (Oversight) Act, (Cap 22A, 2007 Rev Ed), s 6
[126] Tharman Shanmugaratnam, "The Payment Systems (Oversight) Bill: Second Reading Speech by Mr Tharman Shanmugaratnam, Minister For Education and Deputy Chairman, Monetary Authority of Singapore", *Monetary Authority of Singapore* (16 January 2006) < http://www.mas.gov.sg/news-and-publications/speeches-and-monetary-policy-statements/speeches/2006/second-reading-speech-by-mr-tharman-on-payment-bil.aspx > (accessed 26 September 2015)
[127] Monetary Authority of Singapore Act (Cap 185, 1999 Rev Ed) s 28

restrictions may encourage innovation, but fail to provide legal clarity, certainty and safety. Strict and comprehensive regulations may enhance consumer protection and reduce financial crime, but also create high compliance costs for businesses and hinder industry growth. A proportionate regulatory response to innovative payment businesses and technologies is necessary to promote industry growth while safeguarding societal and economic interests.[128]

(1) Control and Supervision

42 Payments regulators around the world have traditionally addressed policy objectives such as crime control, consumer protection and monetary stability through regulatory control and supervision, which have become increasingly complex and challenging in light of recent innovations and developments in the payments industry.[129]

(a) Criminal Activities

43 As payment systems may be used to facilitate criminal activities, especially money laundering and terrorism financing,[130] regulators around the world have been led to impose AML/CFT safeguards on e-payment systems and e-money including those that require identity verification of customers. However, such safeguards have created challenges for payment service providers serving low-income customers, such as mobile payment systems or remittance businesses operating in developing countries. These service providers may find it difficult to comply with customer verification requirements, as low-income people often lack formal identification documentation, and developing countries may lack independently verified sources of data that could identify and verify customers, such as voter registration records and national identification cards. [131]

44 Innovative e-payment systems that do not need to rely on centralised banking institutions, and yet enable effective and anonymous payment transactions, such as Bitcoin,

[128] Heather McKenzie, "The long arm of the law", *Banking Technology* (30 September 2014) < http://www.bankingtech.com/249792/the-long-arm-of-the-law/ > (accessed 10 September 2015)
[129] Kerry A. Dolan, "M-Pesa And GCash : Can 'Lean Regulation' Be A Gamechanger for Financial Innovation?", *Forbes* (3 October 2013) < http://www.forbes.com/sites/kerryadolan/2013/10/03/m-pesa-and-gcash-can-lean-regulation-be-a-gamechanger-for-financial-innovation/ > (accessed 28 October 2015) Anna Neumann, "Fostering payments innovations" *Chicago Fed Letter* (September 2014) < https://www.chicagofed.org/~/media/publications/chicago-fed-letter/2015/cfl332-pdf.pdf > (accessed 28 October 2015)
[130] Financial Action Task Force, "Guidance For A Risk-Based Approach: Prepaid Cards, Mobile Payments and Internet-Based Payment Services", (June 2013) < http://www.fatf-gafi.org/media/fatf/documents/recommendations/Guidance-RBA-NPPS.pdf > (accessed 10 September 2015); Financial Action Task Force, "Virtual Currencies: Key Definition and Potential AML/CFT Risks", (June 2014) < http://www.fatf-gafi.org/media/fatf/documents/recommendations/Guidance-RBA-NPPS.pdf > (accessed 10 September 2015)
[131] Thomas Abell and Vangelis Tsianaxis, "AML/CFT: Balancing Regulation with Innovation", *CGAP* (23 January 2015) < http://www.cgap.org/blog/amlcft-balancing-regulation-innovation > (accessed 28 October 2015)

have also proven to be particularly useful to criminal activities[132] such as money laundering[133] and illegal drug purchases.[134] The absence of a central issuer or regulator who can be held accountable for the illicit activities has posed a problem for government authorities. Such authorities have faced significant difficulties in applying AML/CFT laws to anonymous transactions conducted using virtual currencies, including Bitcoin.[135] Despite these challenges, AML/CFT regulations remain in place over such payment systems. For example, in the US, Bitcoin exchanges are subject to anti-money laundering regulations, and are required to register with the federal government, collect customer information and report suspicious activities.[136] Notably, compliance costs have forced some smaller Bitcoin exchanges to exit the market.[137] MAS announced in 2014 that it will impose AML/CFT regulations on Bitcoin exchanges similar to those imposed on money changers and remittance businesses who undertake cash transactions.[138] However, it is unclear if such regulations can be effectively adapted to address the unique characteristics of Bitcoin, especially its operation as a decentralised virtual currency.[139]

(b) Consumer Protection

45 Consumer protection has also been a key concern for regulators.[140] Many countries have instituted e-money regulations, such as the PSOA[141] in Singapore, and the E-Money Directive in the European Union,[142] to ensure that e-money issuers provide effective protection for consumers. E-money issuers may also be obliged to protect personal data of consumers

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[132] Zoe Kleinman, "Bitcoin Island: cleaning up the crypto currency", *BBC News* (24 April 2015) < http://www.bbc.com/news/business-32394170 > (accessed 1 September 2015)
[133] Andy Greenberg, " 'Dark Wallet' Is About To Make Bitcoin Money Laundering Easier Than Ever", *Wired* (29 April 2014) < http://www.wired.com/2014/04/dark-wallet/ > (accessed 1 September 2015)
[134] Andy Greenberg, "Crackdowns Haven't Stopped The Dark Web's $100M Yearly Drug Sales", *Wired* (12 August 2015) < http://www.wired.com/2015/08/crackdowns-havent-stopped-dark-webs-100m-yearly-drug-sales/ > (accessed 1 September 2015)
[135] Financial Action Task Force, "Virtual Currencies: Key Definitions and Potential AML/CFT Risks", *Financial Action Task Force* (June 2014) < http://www.fatf-gafi.org/media/fatf/documents/reports/Virtual-currency-key-definitions-and-potential-aml-cft-risks.pdf > (27 October 2015)
[136] In 2013, the Financial Crimes Enforcement Network issued new guidelines expressly addressing regulatory requirements for "de-centralized virtual currencies". *See* Financial Crimes Enforcement Network, "Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies", (18 March 2013) < http://fincen.gov/statutes_regs/guidance/html/FIN-2013-G001.html > (accessed 10 September 2015); Timothy B. Lee, "US regulator: Bitcoin exchanges must comply with money-laundering laws", *Ars Technica* (20 March 2013) < http://arstechnica.com/tech-policy/2013/03/us-regulator-bitcoin-exchanges-must-comply-with-money-laundering-laws/ > (accessed 10 September 2015)
[137] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 10 September 2015)
[138] Monetary Authority of Singapore, "MAS to Regulate Virtual Currency Intermediaries for Money Laundering and Terrorist Financing Risks", (13 March 2014) < http://www.mas.gov.sg/news-and-publications/media-releases/2014/mas-to-regulate-virtual-currency-intermediaries-for-money-laundering-and-terrorist-financing-risks.aspx > (accessed 12 November 2015)
[139] Alexander Loke, "Virtual Currency Regulation in Singapore" (2015) Journal of Financial Regulation 1, 2
[140] Group of Ten, "Electronic Money: Consumer protection, law enforcement, supervisory and cross border issues", *Bank of International Settlements* (April 1997) < http://www.bis.org/publ/gten01.pdf > (accessed 11 September 2015)
[141] Payment Systems (Oversight) Act (Cap 222A, 2007 Rev Ed)
[142] Directive 2009/110/EC

under existing data protection regulations,[143] and are also subject to supervision and oversight of government authorities.[144] Broadly speaking, countries that monitor compliance and enforce consumer protection regulations discourage abusive service providers from entering or remaining in the payments industry. Such regulations help to instill trust in legitimate payment services, and are important enablers for the uptake of such services.[145]

(c) Monetary Stability

46 The proliferation of e-money in the different forms and forums held and used by consumers could potentially affect the behaviour of monetary aggregates, [146] which is an important factor to be considered in the work of a financial regulator.[147] To monitor such monetary aggregates, central banks may require information on the outstanding amounts of e-money from issuers, and on e-money usage in general.[148] The broad information gathering powers conferred by the PSOA grant MAS the ability to adjust to significant changes in the popularity of e-money, and to fine-tune its policies where necessary.[149]

47 Similarly, the widespread adoption of virtual currencies as an alternative to fiat currency may have an effect on the money supply in an economy.[150] However, due to the current relative low use of virtual currencies, regulators such as the Bank of England and the European Central Bank have concluded that virtual currencies do not presently pose a material risk to monetary

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[143] For example, e-money issuers would be obliged to protect their users' personal data which they handle or gain access to, under legislation such as the Personal Data Protection Act (No. 26 of 2012) in Singapore and the European Union Directive 95/46/EC.

[144] For example, the Financial Conduct Authority regulates the issuance of e-money in the United Kingdom, and the Monetary Authority of Singapore regulates the issuance of stored value facilities in Singapore. *See* Financial Conduct Authority, "Electronic money institution", < https://small-firms.fca.org.uk/firms-sectors/electronic-money-institution > (accessed 11 September 2015); Monetary Authority of Singapore

[145] Ros Grady, "'Model Law for Best Practice in Financial Consumer Protection': An important driver for Universal Financial Access", *World Bank* (7 February 2015) < http://blogs.worldbank.org/psd/model-law-best-practice-financial-consumer-protection-important-driver-universal-financial-access > (accessed 28 October 2015); Klaus Prochaska, "What's the linkage between consumer protection and financial access?", *Alliance for Financial Inclusion* (17 August 2015) < http://blogs.afi-global.org/2015/08/17/whats-the-linkage-between-consumer-protection-and-financial-access/ > (accessed 28 October 2015)

[146] Monetary aggregates measure the amount of money circulating in an economy. *See* The Organisation for Economic Co-operation and Development, "Glossary of Statistical Terms: Monetary Aggregates", (23 October 2012) < https://stats.oecd.org/glossary/detail.asp?ID=1672 > (accessed 12 November 2015)

[147] Board of Governors of the Federal Reserve System, "Current FAQs", (24 January 2014) < http://www.federalreserve.gov/faqs/money_12845.htm > (accessed 18 November 2015)

[148] US Department of the Treasury, "An Introduction to Electronic Money Issues", (20 September 2015) < http://www.occ.gov/topics/bank-operations/bit/intro-to-electronic-money-issues.pdf > (accessed 12 November 2015)

[149] Tharman Shanmugaratnam, "The Payment Systems (Oversight) Bill: Second Reading Speech by Mr Tharman Shanmugaratnam, Minister For Education and Deputy Chairman, Monetary Authority of Singapore", *Monetary Authority of Singapore* (16 January 2006) < http://www.mas.gov.sg/news-and-publications/speeches-and-monetary-policy-statements/speeches/2006/second-reading-speech-by-mr-tharman-on-payment-bil.aspx > (accessed 26 September 2015). For further discussion on MAS's information gathering powers, see paragraph 39 above.

[150] Robleh Ali, John Barrdear, Roger Clews and James Southgate, "The economics of digital currencies", *Bank of England* (2014) < http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2014/qb14q3digitalcurrenciesbitcoin2.pdf > (accessed 23 September 2015)

stability in their respective countries.[151] MAS has indicated that it will continue to monitor developments in this area and consider implementing regulations to address the risks posed by virtual currencies.[152]

(d) "Wait-and-See" Approach

48 Regulators have generally exercised control and supervision over e-payment systems and e-money through legislation and various regulatory bodies. However, new developments in the payments industry, such as mobile payment systems which cater to low-income customers and innovative payment services such as Bitcoin, pose challenges to these tried-and-tested regulatory mechanisms. In response, some regulators have favoured adapting, using or extending existing regulations as a short term measure, and adopting a "wait-and-see" approach towards establishing bespoke regulatory regimes. Regulators have also been more reluctant to completely ban new payment services, as doing so might reduce the visibility of transactions and encourage the illegitimate use of such services.[153]

(2) Facilitation and Collaboration

49 Without a robust regulatory framework, it may be difficult for new and innovative payment services to gain and maintain credibility and legitimacy within the payments industry. However, complex regulations may create high compliance costs and stifle businesses. Conversely, a consistent and proportionate regulatory approach would reduce the cost and complexity of compliance, thereby encouraging innovation and facilitating competition among new and established industry players. [154]

50 Creating an attractive and supportive environment for service providers is likely to encourage innovation and growth in the payments industry, and the development of efficient payment services. Beyond financial incentives, regulators may even create initiatives to promote best practices, standardisation and interoperability between service providers,

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[151] Robleh Ali, John Barrdear, Roger Clews and James Southgate, "The economics of digital currencies", *Bank of England* (2014) < http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2014/qb14q3digitalcurrenciesbitcoin2.pdf > (accessed 23 September 2015); European Central Bank, "Virtual currency schemes – a further analysis", (February 2015) < https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf > (accessed 23 September 2015)

[152] Monetary Authority of Singapore, "MAS to Regulate Virtual Currency Intermediaries for Money Laundering and Terrorist Financing Risks", (13 March 2014) < http://www.mas.gov.sg/news-and-publications/media-releases/2014/mas-to-regulate-virtual-currency-intermediaries-for-money-laundering-and-terrorist-financing-risks.aspx > (23 September 2015)

[153] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 11 September 2015)

[154] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 11 September 2015)

merchants and other industry players.[155] Financing research grants to academic institutions, banks and businesses can enable regulators to facilitate research into new financial technologies. Regulators may also collaborate with industry players to institute regulations that encourage legitimate uses of payment services while clamping down on criminal activity.[156]

51 Industry collaboration facilitates flexible, realistic and proportionate regulation, as industry players engaging in legitimate business activities have an interest in quashing criminal activity, so as to maintain consumer trust and confidence. For example, regulators at the Central Bank of Kenya collaborated with the operators of M-Pesa, a mobile payments platform in Kenya, to create a regulatory framework that mitigates systemic risks while providing the M-Pesa operators room to innovate and grow.[157] Spurred by this regulatory support, M-Pesa has become one of the most successful mobile payments platforms in the world.[158]

52 The case for industry self-regulation as a viable, if not preferable, option is founded on the motivation of industry players to protect their investments and promote their business interests, [159] and the apprehension that prescriptive regulation may inhibit industry players from devising flexible solutions and best practices to address illegitimate activities. Such flexible solutions have been pursued by virtual currency businesses, which have used creative technological solutions like multi-signature authentication and escrow accounting to enhance consumer protection and thereby gain acceptance of the solutions offered. Open-source technologies, such as the Bitcoin blockchain, have also helped industry players to independently monitor and regulate payment transactions. [160]

53 The availability and flexibility of these internal regulatory mechanisms have made self-regulation a realistic alternative to top-down, government-driven and prescriptive regulations. The United Kingdom ("**UK**") government has decided to collaborate with the virtual currency industry to develop voluntary standards for consumer protection. By creating a regulatory framework based on industry best practice standards, the UK government aims to address crime and consumer protection risks without imposing a disproportionate regulatory burden on the

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[155] Ben Fung, Miguel Molico and Gerald Stuber, "Electronic Money and Payments: Recent Developments and Issues", *Bank of Canada* (2014) < http://www.banqueducanada.ca/wp-content/uploads/2014/04/dp2014-2.pdf > (accessed 14 September 2015)
[156] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 14 September 2015)
[157] Kerry A. Dolan, "M-Pesa And GCash: Can 'Lean Regulation' Be A Gamechanger for Financial Innovation?", *Forbes* (3 October 2013) < http://www.forbes.com/sites/kerryadolan/2013/10/03/m-pesa-and-gcash-can-lean-regulation-be-a-gamechanger-for-financial-innovation/ > (accessed 29 October 2015)
[158] T.S., "Why does Kenya lead the world in mobile money?", *The Economist* (27 May 2013) < http://www.economist.com/blogs/economist-explains/2013/05/economist-explains-18 > (accessed 29 October 2015)
[159] Paypal, "Payments Regulation for Asia Pacific: A Model For Innovation & Growth", (October 2013) < https://www.paypalobjects.com/webstatic/en_US/mktg/public-policy/PayPal-Payment-Regulations-Booklet-APAC.pdf > (accessed 14 September 2015)
[160] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 14 September 2015)

industry. [161] However, virtual currency users and businesses with libertarian ideologies may be unwilling to support any form of government regulation, and attempts to collaborate or negotiate with such industry players may be unduly difficult.[162]

54 Given the rise of cross-border and Internet-based transactions, there is a growing need for international cooperation in regulation. A consistent international regulatory framework for the payments industry would greatly reduce the cost and complexity of compliance for industry players. Countries could consider developing such a regulatory framework based on existing cross-border regulations, including European Union legislation and international AML/CFT measures.[163] Close international cooperation will also be crucial for the enforcement of such regulations, and for addressing cross-border criminal activities in general.[164]

VI. Conclusion

55 Regulating the dynamic and ever-changing payments industry is far from an easy task. Payments regulators face the compelling need to develop sophisticated measures that balance a wide range of policy goals, including crime control, consumer protection and monetary stability, while stimulating innovation and competition in the payments industry. International harmonisation of payments regulations has also become a key concern due to the popularity of cross-border and Internet-based transactions. Given the complexity of the challenges and considerations faced by payments regulators, industry collaboration may play a critical role in the development of innovative and effective regulatory regimes.

[161] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 14 September 2015)
[162] Daniel Roberts, "Yes, regulation is coming to bitcoin", *Fortune* (24 March 2015) < http://fortune.com/2015/03/24/bitcoin-regulated-exchanges-winklevoss-coinbase/ > (accessed 14 September 2015)
[163] HM Treasury, "Digital currencies: response to the call for information", (March 2015) < https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf > (accessed 14 September 2015)
[164] Sophie Knight, "Japan says any bitcoin regulation should be international" *Reuters*, (27 February 2014) < http://www.reuters.com/article/2014/02/27/us-bitcoin-mtgox-japan-idUSBREA1Q0I520140227 > (accessed 14 September 2015); European Central Bank, "Virtual currency schemes – a further analysis", (February 2015) < https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf > (accessed 14 September 2015)