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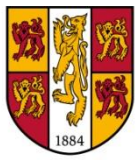

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IS DLT THE CURE FOR THE OMNI-CHANNEL BLUES? A PROVOCATION

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By

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Abstract

(Bold, Times New Roman 10) A current trend in both retailing and retail financial services aims to match customers to their purchases with the least amount of friction. For depositary institutions this entails enabling customers to deal with their financial affairs, including purchases, through whatever channel the customer chooses (branch, ATM, web, mobile, etc.). For merchants, it entails shipping and delivering the purchase when and how the customer chooses (in store, at a desired location, at a pick-up point, etc.), while settling outstanding financial claims with the different actors involved in the manufacturing, storage, shipping and distribution network. This essay briefly explores the potential use of distributed ledger technology (DLT) to deliver integrated omni-channel solutions.[1]

[1] Readers unfamiliar with distributed ledger technology (DLT) may like to look at Dwyer, G. P. (2016) "Blockchain: A Primer", manuscript, Clemenson University http://econpapers.repec.org/paper/pramprapa/76562.htm (Accessed May 8, 2017); or Peters, G. W. and Panayi, E. (2015) "Understanding Modern Banking Ledgers through Blockchain Technologies", Systemic Risk Center – London School of Economics https://papers.ssrn.com/sol3/Papers.cfm?abstract_id=2692487 (accessed May 11, 2017).

Title Is DLT the Cure for the Omni-Channel Blues? A Provocation

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ATMs and the Origins of Self-Service

Before the introduction of computer technology in retail banking, current accounts were the remit of large businesses and high income individuals. Savings banks and other similar organisations provided some services but most people lived in a cash economy while those with some type of bank account were customers of a specific retail branch.

The advent of new applications of computer technology slowly but steadily began to redefine interactions with financial institutions and eventually helped to bring large parts of the population into the financial system. The cash machine was one of these applications and the first that successfully changed the point of contact between individuals and financial institutions. The first cash machines became operational in Britain and Sweden in 1967, 50 years ago – and it was only a couple of years later that Canada, Israel, Japan, Mexico, Spain and the USA had their own. This after-hours access to cash opened the door to changes in people's consumer patterns, such as impromptu purchases and regular take-away dinners. But cash machines were part of a larger drive to automate and digitalise banking, so that banks around the world could significantly increase their customer base. Enabling a large number of people to have a current account for the first time was, however, challenged by a rise in labour costs and limited space at branches (which witnessed queues growing past the branch door and other forms of congestion at retail branches).

The 1970s observed several interesting developments. These included the first shared ATM networks, home banking, "hinky dinky" programs (that is, the in-store cashing of personal cheques), video banking, as well as taking the bank closer to the point of purchase through the first electronic funds transfer terminals at the point of sale (EFPOS). For instance, Dahl's Foods of Iowa was the first grocery to install ATMs in its stores, while Visa piloted the first debit card in Ohio in 1975.[2] But more important, banks sought to extend the concept of automation. This was the case of another Iowa bank, Merchants National Bank, which was the first to successfully explore a "teller-less office" by installing point of sale terminals in supermarkets and remodelling one of its offices in order to replace human tellers with three

[*] Helpful comments from Andy Goodman, Halimatun Aris and staff at IOV42 are gratefully acknowledged. The usual caveats apply.

[2] For an authoritative history of Visa see Stearns, D. L. "Automating Payments: Origins of the Visa Electronic Payment System." In Technological Innovation in Retail Finance: International Historical Perspectives, edited by Bernardo Bátiz-Lazo, Joan Carles Maixé-Altés and Paul Thomes, 246-74. London: Routledge, 2010 and Stearns, D. L. Electronic Value Exchange: Origins of the Visa Electronic Payment System. London: Springer-Verlag, 2011.

wall-mounted, 24-hour automated teller machines (ATMs) – which occupied about a third of the office space. In New York City, meanwhile, Citibank launched the first large scale, self-service branches in 1977; they included a dual-ATM-in-branch program (an initiative labelled the "Citicard Banking Centre"). In short, the arrival of the cash machine, the debit card and the point of sale terminal marks a watershed in the early days of self-service banking.

The Omni-Channel

As the 21st century progresses, industry has been grappling with yet another concept of self-service, namely the so-called *omni-channel.* For retail financial institutions this is a strategy that aims to enable customers to bank anywhere, at any time, whether the interaction is in person or through a device. It is no secret that customers want convenience, and providing convenience means supplying the customer with several access options. This, in turn, poses at least three challenges to retail financial intermediaries that aim to provide an omni-channel platform: first, enabling the bank to deliver its services in a consistent way across a variety of locations, machines and devices; second, allowing the bank to leverage customer information so that individual customers can be reached with targeted offers (this implies allowing each channel to provide multiple services whenever the offer or incentive is appropriate to the delivery channel; and third, maintaining the value of the bank's brand and even enhancing it.

Not surprisingly delivering the omni-channel has become the "Holy Grail" of retail banking. A recent industry report by ATMmarketplace (sponsored by KAL ATM Software) estimates that in 2015 almost half of the banks sampled were in the process of developing an omni-channel strategy, while 33% thought it was a long-term strategy. The rest had either given up or were not planning to attempt it.[3]

A common explanation behind the fragmented adoption of omni-channel strategies is that, to adopt an effective strategy, the bank must provide a platform that brings together information stored across a number of databases (ledgers) disseminated over different departments and geographies.[4] For instance, in the absence of a single master ledger, an everyday clearing and balancing process for all retail banks is to reconcile all transactions by its customers within and among the different databases (ledgers) under the bank's control, as well as reaching a settlement with other financial institutions with which the bank or its customers may have

[3] http://www.atmmarketplace.com/whitepapers/2015-atm-and-self-service-software-trends/ (accessed April 29, 2017).

[4] Strictly electronic ledgers used in a DLT environment are different from other well-understood recording technologies such as databases. See Peters and Panayi (2015: 8).

interacted. These processes of clearing and settlement have been at the core of retail banking for centuries.[5]

But the promise of an omni-channel involves other serious difficulties. Chief amongst these is the wealth of information distributed across ledgers which, most often, are supported by a rainbow of architectures. For instance, not only are banks the last bastion of COBOL programming but, for some people, legacy systems are a latent threat that could cause a new financial crisis.[6] In response to these "inefficiencies", it has been suggested that one use of DLT would be to create a single ledger for financial institutions that could articulate omni-channel strategies or even create DLT applications that would replace financial institutions altogether.[7]

Meanwhile, merchants set up customer relationship management (CRM) strategies through a combination of in-house and outsourcing processes for supporting customers through multiple channels before, after and during sales.[8] Delivering omni-channel facilities then requires retailers to keep track of orders, inventory and the settling of outstanding financial transactions through entire networks of manufacturing, storage, shipping and distribution points.[9] It is the role of "current order management systems" to provide solutions to track orders and inventory (while the treasury function oversees financial settlements). But order management systems are complex to implement and maintain. Like banks, current order management systems and treasury functions at retailers rely on a central clearinghouse to keep track of activity across a network of actors and locations. And as in the case of banks, DLT applications could be implemented to co-ordinate these networks from purchase to delivery, while the use of "smart contracts" within this ecosystem could replace a coordinating treasury function.[10]

In short, DLT's ability to coordinate multiple, decentralized ledgers could make possible a frictionless, end to end, omni-channel experience for retail consumers. Efficiency gains

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[5] http://www.bankingtech.com/749402/first-new-clearing-bank-in-250-years-enters-uk-market-clearbank/ (accessed May 4, 2017)

[6] http://www.information-age.com/legacy-systems-next-financial-crisis-123465888/ (accessed April 29, 2017).

[7] See for instance Mills, D. et al. (2016) "Distributed ledger technology in payments, clearing and settlement", Washington, D.C.: Federal Reserve Board (wp 2016-95).

[8] Trautmann, H. et al. (2017) "Challenges of Data Management and Analytics in Omni-Channel CRM", European Research Center for Information Systems

No. 28, Münster

https://www.econstor.eu/bitstream/10419/157377/1/884895548.pdf (accessed May 8, 2017).

[9] https://www.linkedin.com/pulse/blockchain-next-big-thing-omnichannel-technology-mark-treshock (accessed April 29, 2017).

[10] For a primer on "smart contracts" see Peters and Panayi (2015) or Savelyev, A. (2016) "Contract Law 2.0: <<Smart>> Contracts and the Beginning of the End of Classic Contract Law", National Research University

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2885241 (accessed May 11, 2017).

would arise, first from greater speed and reduced cost, thanks to the elimination of clearing and settlement; second, from potential scalability as the number of nodes is significantly reduced to meet demand and customer expectations; third, from a fault tolerant solution because even if one node fails others have a complete copy of the data; fourth, from reducing the friction when ordering through smart contracts; and fifth, tailor the customer experience, incentives and loyalty programs to the channel of choice.

Implementing Change

At the time of writing, most DLT applications are very much at the "proof of concept" stage. There are several factors that help to explain this state of affairs. A first and obvious limitation is that these are untested and still not fully understood systems. The potential advantages in terms of speed, greater efficiency, increased risks or indeed customer convenience are as yet uncalculated. This is frustrating, since financial transactions, in particular, those to do with retail finance, involve the financial well-being of individuals; who, by the way, are used to resolving on-the-spot payments within seconds, whereas the current DLT applications on offer are far from being able to deliver "pipelines" of sufficient speed and size to accommodate the traffic volume in today's retail payments systems.

Another reason to expect a slow, step by step migration to DLT is that the large scale deployment of any technology involves sorting out "teething problems". For omni-channels, these would include among other things clarifying some regulatory and data protection issues as well as the criteria for "permission" membership and consensus mechanisms. It is also well documented that "tipping points" follow changes in end-user behaviour, as illustrated when consumers incorporate new and unexpected applications/uses (i.e. domestication).

Third, as the consulting firm Mphasis affirms, organisations across industries are embarking on an "omni-channel, digital led, mobile first but not digital only" transformation of customers' experience.[11] The quotation is eloquent in that it sobers up far fetched ideas of a digital only, cashless world right around the corner. Moreover, digital solutions, like all binary answers, either work or they don't whereas analogue solutions can tolerate more degrees of failure and this, for some, compensates for their disadvantages in speed and efficiency.

It would seem then that for all the hype and potential applications, we are unlikely, at least in the foreseeable future, to see DLT or any other IT application eliminating financial

[11] http://www.mphasis.com/solutions/CEM-digital-customer-experience-management.html (accessed April 29, 2017).

intermediaries or integrating financial and retail transactions in a single, seamless experience. The case for incremental migration is even stronger when considering that in some markets, as is often the case in finance, the success of a technology depends on its adoption by many counterparties; hence the incumbents have an advantage over potential entrants. Indeed, both financial institutions and merchants have substantially invested, in terms of organizational procedures, processes and actual technology (i.e. sunk or irrecoverable investments), in making current systems and "payment highways" work. There is/will be resistance to scrapping these investments, however many promises new applications can offer (that is, there is path dependence).

A similar and related issue in markets with "network externalities" revolves around the fact that IT systems are often designed for internal consistency within the host organization. But a system's widespread adoption and/or interaction with systems in other organizations requires a number of standards and agreed protocols, including those for the secure exchange of information. These standards and communication protocols often take years to develop.

Other known challenges in implementing new computer applications include that of the "white elephant", where large sums are invested to develop a system that not only over-runs allocated time and budgets but also fails to meet service expectations.

Finally, in today's world there are "thin markets" for skills and other forms of specialisation in the deployment of DLT technology – where in-house development is favoured rather than outsourcing or any other market solution.

In summary, incremental change where multiple technologies co-exist is thus a more likely scenario for DLT applications in the foreseeable future.

The Case of IOV42

It is often the case that inflated expectations are followed by disillusionment before a new technology eventually finds its place. In the case of DLT, however, there is a perception that, in spite of challenges and the early stage of DLT development, it would be wrong to conclude that this technology is merely a fad, that it is merely moving through the same hype cycle as other next-big-things have done before it. Examples of such sentiments include a growing number of research efforts by central banks as well as serious efforts and significant

investments in exploring actual DLT applications by global financial institutions – investments which have been both internal and collaborative.[12]

In financial institutions, however, senior management often lack sufficient technical background to fully understand the nuance and detail of IT applications. This is certainly the case of DLT applications, which are technically very demanding. As a result, senior managers often rely on middle and junior staff, together with publications by consulting firms, to keep abreast of changes in the market place. Such publications, however, tend to reveal a certain bias in their technological preferences (such as those where the authoring firm has a perceived advantage or which is supplied by a company it favours) rather than presenting a fair and balanced review of alternative solutions. The broader mass media domain is no better off, as it is quite unhelpful for journalists and even consulting firms to suggest the inevitability of a "one size fits all" solution for DLT.

In light of the above between July 2016 and May 2017 and with the aim of exploring some of the actual limitations of rolling out a possible new DLT application, I was given privileged access to IOV42.

After two years of research and prototype development, IOV42 was established in April 2016 by a team of experienced bankers, entrepreneurs and software engineers. After two successful funding rounds in June and December 2016, IOV42 targeted a Series C investment in 2017, at a valuation of around 1bn Euros, based on massive progress and innovations that enabled it to deliver DLT at industry speed and resilience,[13] both are solutions that respond to substantial requests from the market.

The team behind IOV42 understands that financial institutions deal with assets of many types. Their solution was planned to take a slow migration path while, at the same time, providing a scalable platform. IOV42's ecosystem is divided into "regions" (i.e. locally separate processing environments)[14] that can compute in parallel, each "region" having three layers of security. The ecosystem not only combines "permissionless" and "permissioned" blockchains coexisting alongside each other but also includes many diverse technologies and approaches under the same hood. It is from its "inclusion" and modularity, as opposed to a monolithic clam to fit all, that IOV42 can claim to be all-inclusive.

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[12] http://uk.reuters.com/article/us-jpmorgan-r-idUKKBN17T2T4 (accessed May 6, 2017).

[13] Taylor, S. et al. (2017) "IOV42 Evaluation", London: 11:FS Team Review.

[14] IOV42 defines a "region" as a self-contained economy within a legal framework (i.e. a country), managed by local distribution partners, considering hardware & infrastructure and being able to roll out clients on the spot. This is relevant because IOv42 aims for a blockchain strategy that offers a customized service offering per region.

IOV42 enjoys a greater degree of feasibility than other applications currently on the market (or which are known to be in course of development) because this application has been designed with a new stronger cryptographic algorithm and is able to process a minimum of 20,000 transactions per second per "region" (that is, n x 20,000 trx/sec – while the experience during the "proof of concept" stage suggests that inter-regional traffic will stay below 1% of total traffic). The 20,000 trx/sec lower edge of the bandwidth is an important benchmark not only because it points to the potential scalability of IOV42 but also because of the speed observed in other applications currently in the market. Etherium, for instance, can reach 200 trx/sec, which is sufficient bandwidth for a smart contract application, but inadequate for the average retail payment ecosystem in a developed country. Indeed, Visa Germany currently requires an average of 2,500 trx/sec, with peaks of up to 8,000 trx/sec; while backend communication in global clearing in the banking system would need a sustained capability of 2,000 trx/sec.

From the above it is evident that, at least initially, IOV42 aims at exploiting DLT technology for all kinds of heavy-duty high speed transaction business, i.e. it supports all assets that could either be digitised or have a digital fingerprint stored in a distributed ledger. For instance, it is also aimed at supporting money books concurrently with digital currency, while simultaneously acting as a migration tool for national banks for rolling out digital cash initiatives.

IOV42 has also invested in developing an education program. The intention here is to enhance its customers' skill sets and perhaps even transfer expertise and know-how to host organizations.

In short, my early impressions of the development of IOV42 discussed above come under three headings, namely, planned migration, feasibility, and people/education. These three distinguishing characteristics of IOV42 are supported by the following specific features:

a) ID Minting and Verification, one of the IOV42 cornerstones, since IDs make up the "master blockchain" to which asset side chains are attached. Thus one person who has her/his ID minted can have side chains for many other assets, e.g. different accounts (current, savings, investments, ...), loyalty points, kWh, etc.
b) IOV42's read-only node, which could be situated within a central bank or the banking regulator: this provides in-house data for in-house reporting. The read-only node obviates the need for individual financial institutions to report to a central point because the read-only node enables the central bank or regulator to design a reporting layout as well as "drilling

down" information for itself, thus dramatically speeding up report creation and ensuring accurate daily data of the overall system or a specific financial institution.

c) IOV42's own consensus, comprising the election of an asynchronous distributed random master node, distributed asset pre-allocation and a high-performance "Hauberk protection". This replaces the traditional "proof of work" or "proof of stake" and similar methods by a new one which uses "data to protect data".

d) A financial ecosystem with open APIs is made possible by IOV42. This is in line with recent developments in financial market infrastructure and specifically the Open Banking Development Group (OBDG).[15] IOV42 can thus help to build momentum to establish new global open source standards.

e) IOV42's own hardware blockchain, an ultra-high performing DLT database, which scales at/grows while delivering linear performance.

f) IOV42's "regions", which allow not only for the unlimited scaling and growth of global DLT networks, but also make space for implementing local regulations. Thus the UK and Mexico, as two different regions, can implement different behaviour and rules to comply with locally but still be part of the same common global platform, significantly reducing the need to devise multiple communication and security protocols.

g) IOV42's revival of "nostro" accounts, whereby a bank's "nostro" and "vostro" accounts are automatically brought into the transaction flow, eliminating central settlements and replacing them by netting. This feature is likely to be an attractive way of facilitating international money transactions, while improving the liquidity of the participating financial institutions.

Together these features have led me to believe that IOV42 has the potential to be a new category of DLT in terms of data architecture, consensus and cryptography. It is an application that could well be 18 to 24 months ahead of any similar effort in the market or known to be under development. Moreover, it is a platform suitable for leading a new generation of IT applications that offer fully integrated omni-channel, self-service solutions at some point in the near future.

About the Author

Bernardo Bátiz-Lazo is professor of business history and bank management at Bangor University in Wales. His research interests revolve around innovation and the adoption of computer technology in retail banking. He edits a weekly report on new research in financial technology and payments (http://nep.repec.org/nep-pay.html). Contact: b.batiz-lazo@bangor.ac.uk or @BatizLazo

[15] For instance see, https://www.openbankproject.com/ (accessed May 11, 2017) and https://theodi.org/open-banking-standard (accessed May 11, 2017).