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Speech

Towards a common financial language

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In the first book of the Old Testament, God punishes the builders of the Tower of Babel for their folly. The choice of punishment is revealing. God replaces the Earth's then-common language with multiple tongues. The costs of that original sin are still being felt. Today, there are nearly 7000 languages spoken globally across fewer than 300 nation states.

Linguistic diversity has of course cultural benefits. But this comes at some considerable economic cost. A common language has been found to increase dramatically bilateral trade between countries, by more than 40%.[1] It has been found to increase bilateral investment between two countries by a factor of three or more.[2] In Iceland at the start of the century as much as 3% of annual GDP was, quite literally, lost in translation.[3]

Finance today faces a similar dilemma. It, too, has no common language for communicating financial information. Most financial firms have competing in-house languages, with information systems silo-ed by business line. Across firms, it is even less likely that information systems have a common mother tongue. Today, the number of global financial languages very likely exceeds the number of global spoken languages.

The economic costs of this linguistic diversity were brutally exposed by the financial crisis. Very few firms, possibly none, had the information systems necessary to aggregate quickly information on exposures and risks.[4] This hindered effective consolidated risk management. For some of the world's biggest banks that proved terminal, as unforeseen risks swamped undermanned risk systems.

These problems were even more acute across firms. Many banks lacked adequate information on the risk of their counterparties, much less their counterparties' counterparties. The whole credit chain was immersed in fog. These information failures contributed importantly to failures in, and seizures of, many of the world's core financial markets, including the interbank money and securitisation markets.

Yet there are grounds for optimism. Spurred by technology, other industries have made enormous strides over recent years towards improving their information systems. Improved visibility of the network chain has transformed their fortunes. It has allowed the management of risks previously unmanageable. And it has allowed the development of business practices and products previously unimaginable.

To gauge that, we begin by discussing the progress made by two well-known industrial networks over recent years – product supply chains and the world wide web. For both, a common language was the prime-mover behind a technological transformation. That transformation has delivered huge improvements in system resilience and productivity.

1 Oh et al (2011).
2 Oh et al (2011).
3 Ginsburgh and Weber (2011).
4 Counterparty Risk Management Policy Group (2008).

Compared with these industries, finance has been a laggard. But the tide is turning. Since the crisis, significant progress has been made by financial firms, regulators and trade associations in developing information systems and the common data standards necessary to underpin them. Conferences like this are evidence of that.

At the same time, there is a distance to travel before banking harvests the benefits other industries have already reaped. A common financial language has the potential to transform risk management at both the individual-firm and system-wide level. It has the potential to break-down barriers to market entry, leading to a more decentralised, contestable financial sector. And it thereby has the potential to both boost financial sector productivity and tackle the too-big-to-fail problem at source.

There is no technological barrier to this transformation. And private and social interests are closely aligned as improved information systems are a public as well as a private good. That public-private partnership is one reason why such good progress has been made over the past few years. So stand back for a good news story – a story of how finance could transform both itself and its contribution to wider society.

Lessons from Other Industries

In look and feel, the topology of the financial network is part product, part information network. The multiple products and counterparties of financial firms have a close parallel in the behaviour of non-financial firms operating in a product supply chain. And the complex configuration of multiple criss-crossing nodes and links in the financial web are hallmarks too of global information webs.

Yet despite these similarities, finance lags by a generation both products and information in the management of its network. Today's financial chains mimic product supply chains of the 1980s and the information chains of the 1990s. For global supply chains and the internet, their fortunes were transformed by a common language. This enabled them to become global in scale and scope and highly adaptive to new demands and technologies. They are astonishing success stories.

(a) Product Supply Chains

On 26 June 1974, Clyde Dawson bought a pack of chewing gum from a Marsh supermarket in Troy Ohio. Twenty-five years later, this event would be celebrated in a Smithsonian Institute exhibition. This was the first time a barcode had been scanned.

Barcodes are the most recognisable element of what, over the past 40 years, has become a global language. Before barcodes, suppliers, manufacturers and retailers recorded their products in bespoke languages. This was a recipe for inefficiency, as goods were recorded and re-recorded in different tongues.

It was also a recipe for confusion as there was no simple means of understanding and communicating along the supply chain. The costs of translation were of Icelandic proportions.

In the early 1970s, members of the Grocery Manufacturers of America (GMA) set about tackling this problem. The result was a Uniform Product Code (UPC), a common standard for recording the identity of products. The UPC was launched in 1974, at first for retail products, using barcode technology. It immediately took off. By 1977, the UPC had become a global standard for retail products.

During the 1980s and 1990s, this UPC technology extended its reach along the supply chain. It did so by developing a system for locating products as well as identifying them. A Global Location Number (GLN) was introduced in 1980, tying products to fixed locations. And in 1989, the Serial Shipping Container Code (SSCC) was devised, enabling products to be grouped in transit.

These common data standards provided, for the first time ever, a vista on the global supply chain – a map of the end-to-end production conveyor belt as products moved between locations. This transformed production processes. For example, invoicing, purchase orders, despatch advice and receipt advice could now be standardised across firms in the new common language.

Because the language of individual countries was no longer an obstacle to trade, these standards helped to expand existing, and to create new, global supply links. From the 1980s onwards, supply chains lengthened and strengthened across geographic boundaries. They became genuinely global. Between 1980 and 2005, the total value of world exports quintupled.[5] A common language was their glue.

Entering this century, these technologies have continued to extend their reach. The introduction of the Global Data Synchronisation Network (GDSN) in 2004 standardised product descriptions with over 1,500 attributes, such as width, depth and height. Products were now recorded in a consistent way globally. At a stroke, a unique “DNA string” had been devised for each global product, describing its genetic make-up.

With an emerging language of product identifiers, locators and attributes, the stage was set for an umbrella organisation to maintain and develop these common standards. After 2005, this umbrella unfolded in the form of GS1. This is a global not-for-profit association. GS1 currently has over 1.5 million members and maintains information on over 40 million products in its global registry. This is the evolving, expanding, adapting genetic codebook for the global supply chain.

[5] World Trade Organisation (2011).

(b) World Wide Web

On October 29 1969, the first-ever message was sent between computer networks at UCLA and Stanford Universities. The message was only five characters long ("login"). It was an inauspicious start. The system crashed on the letter "g". The stage was nonetheless set for what has become a technological revolution. By the end of 1969, a network of campus computers – an embryonic internet - was up and running. Applications began to emerge, allowing this evolving network to expand its reach. Take electronic mail.

In the early 1970s, the US Defence Department's Advanced Research Projects Agency (ARPA) developed network electronic mail capabilities. In 1979, Compuserve opened up electronic mail to a rising community of personal computer users. In the same year, two graduate students at Duke University, Tom Truscott and Jim Ellis, developed Usenet, allowing users to post messages to (a precursor of) internet forums.

By 1983, after more than a decade of evolutionary development, a universal Internet Protocol was agreed. This provided infrastructure and common technical standards for this evolving communications network. But the languages of the internet remained technical and diffuse. That meant it largely remained the domain of the nerds - libraries and universities.

In March 1989, Tim Berners-Lee, a British software engineer working at CERN, the Geneva-based nuclear research lab, wrote a memo to his boss Mike Sendall.[6] It was a suggestion for improving information management at CERN, replacing the silo-ed approach to information storage and search with a more interconnected approach. Sendall described the proposal as "vague but exciting".

A year on, Berners-Lee made his proposal less vague and more exciting. A paper with Robert Cailliau proposed the development of a World Wide Web, with links between and within documents creating a web-like information network.[7] At the centre of this web was a common language - Hyper-Text Markup Language (HTML). This was a new lingua franca for computers, allowing them to communicate irrespective of their operating systems and underlying technologies.

To accompany this new language, Berners-Lee created some new co-ordinates for this global web - Universal Resource Identifiers, the most well-known of which is the URL (Uniform Resource Locator). These were a unique character string for identifying web locations. With a common language, common locators and an agreed syntax, the stage was set for the web to spread (as Berners-Lee had originally envisioned) worldwide.

At first progress was slow. In June 1993, there were still only 130 websites. But as web browsers became available for home use, the web began to spread exponentially. By 1996, over 15 million users were surfing

[6] Berners-Lee (1989).
[7] Berners-Lee and Cailliau (1990).

100,000 websites. Today, 7 million web sites and around the same number of users are added each week, with over 2 billion web users in almost every country in the world. A common language has been the linchpin. Like all good languages, HTML has had to adapt to these changing demands, with Version 5 currently under development.

Since 1994, the evolution and the maintenance of web standards has been overseen by a global organisation - the World Wide Web Consortium (W3C). W3C, like GS1, is a not-for-profit organisation, with 346 members drawn from across the globe.[8]

Measuring the Benefits of a Common Language

So taking these two examples, what benefits has a common language been able to deliver?

(a) Improving risk management in firms

Global companies face a hugely complex logistical problem. They manage multiple products, in multiple locations, with multiple suppliers operating to multiple time-lines. Effective inventory management along the supply chain is vital. Common data standards and technology have together transformed this process.

Global supply chain giants come no larger than Wal-Mart Stores Inc. It employs more than 2 million people in 28 countries across nearly 10,000 stores. Its total revenues, at over $400 billion annually, are almost four times higher than its nearest competitor. By comparison, one of the world's largest banks by assets, Citigroup, has revenues of just over $100 billion, with just over 250,000 employees.

Automation of supply chain management, facilitated by data standardisation, has been central to Wal-Mart's success. Wal-Mart was an early adopter of common data standards and technology. By 1998, around 85% of Wal-Mart's retail products were distributed using standardised barcodes and handheld computers. These identified and tracked the location of products in real time as they were distributed to individual stores.

This technology has since been extended to individual stores. Manual barcode scanning of shelves and supplies has been largely replaced by contactless tagging of container products using radio frequency GS1 identifiers. In 2010, Wal-Mart started tagging individual items, further improving inventory-tracking. By combining real-time inventory and point-of-sale data, stock-checking and shelf-replenishment has become almost fully-automated. Thinking machine has replaced man throughout the supply chain.

This "warehouse-to-shelf" inventory management process has transformed Wal-Mart's business. Full visibility of the internal supply chain has enabled close to real-time tracking and management of stock across

[8] As at 6 March 2012.

many of its stores. It has allowed genuinely consolidated inventory risk management. The results have been tangible. The risk of being out-of-stock in Wal-Mart stores equipped with radio frequency technology has been found to be 30% lower than in stores without that technology.[9]

More resilient supply chain management has also been a trademark of a number of web-based companies. In September 1995, Pierre Omidyar created a website for online buying and selling.[10] He did the programming over a weekend and launched Auction Web using the domain name he had bought for his freelance consultancy Echo Bay Technology Group (ebay.com).

Omidyar put a broken laser pointer for sale. At the end of its first day, the site had attracted no visitors. Even as transactions grew, so did disputes between buyers and sellers. Transactions between anonymous traders created enormous information problems. With sellers knowing more than buyers about their goods, the market risked being flooded by “lemons”.[11] For a time, Omidyar appeared to have created the first-ever global market for lemons.

Information markets such as these are notoriously fragile. But the web, underpinned by its common language, provided eBay with a solution to its gigantic lemons problem. Omidyar adapted the site to allow buyers and sellers to give each other feedback on transactions, positive or negative. These scores created a method for buyers to assess risk. It also incentivised good behaviour. Bad traders were removed from the supply chain, while good traders were rewarded with reputational incentives to strengthen their links.

With information problems mitigated, eBay has gone from strength to strength. It currently has 100 million active users.[12] The feedback system has remained eBay’s core risk assessment tool. It has since been emulated by other web-based marketplaces, such as Etsy and Amazon. Each uses the information embedded in the web, conveyed in a common language, to squeeze even the largest of lemons.

(b) Improving risk management across firms

The potential to improve resilience through a common language is, if anything, greater still when managing risks across the network. Take Wal-Mart. It is connected to all of its suppliers through a central inventory management network, giving suppliers full visibility of product inventories at Wal-Mart stores. Indeed, Wal-Mart requires that its suppliers use this network information to manage the frequency, timing and quantity of their product shipments to its stores. This is known as the continuous replenishment process.[13]

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[9] Hardgrave et al (2006).
[10] Cohen (2002).
[11] Akerlof (1970).
[12] eBay (2012).
[13] Grean and Shaw (2002).

The level of supply chain visibility in this system has enabled suppliers to fine-tune their responses to shifts in demand. This reduces the risk of being out of stock. It also reduces instabilities which otherwise arise along the supply chain between manufacturers, wholesalers and retailers. For example, it is well-known that small shifts in demand tend to get magnified as they move along the supply chain. This phenomenon is known as the “bull-whip effect”.[14]

The longer are supply chain lead-times, and the greater inventory uncertainties, the more destabilising are these bull-whip oscillations. Wal-Mart’s continuous replenishment process has compressed dramatically those lead times and uncertainties. As a result, the crack of the bull-whip has been nullified along the product supply chain, reducing system-wide instabilities.

For Wal-Mart, common standards have revolutionised *ex-ante* risk management, allowing real-time aggregation and visibility of risks and opportunities along the supply chain.[15] For other industries, a common language has also transformed *ex-post* risk containment. Take the pharmaceuticals industry.

Building on existing GS1 standards, individual packets of drugs can now be assigned a unique serial number by the manufacturer, along with information on the batch from which it was produced and other relevant attributes. These data can be shared in a common pool with retailers and distributors. As at Wal-Mart, the packet’s location is logged at every stage of the supply chain from factory to pharmacy.

This central supply chain information system has transformed drug risk management in a crisis. In the past, before drug packets had unique identifiers, defective products would have resulted in a mass recall of all packets of a certain drug type. This often caused massive disruption to the manufacturer and generated panic, bordering on hysteria, among consumers. The bullwhip effect was powerful and destabilising.

Today, those instabilities have been calmed courtesy of common standards and improved technology. If a product needs to be recalled, the manufacturer updates the common data pool with an instruction, alerting the distributor or dispenser at the next point in the supply chain. If a recalled product has already been sold, the points of sale can be tracked and those affected can be notified. Panic is no longer systemic; it is quickly localised.

(c) Mapping the Network

If data are not standardised, mapping complex networks is a high-dimension jigsaw puzzle. Understanding the underlying picture is taxing and time-consuming. Capturing the same data in a standardised way means that plotting the network becomes a much simpler game of join-the-dots. Experience with both product supply chains and the World Wide Web demonstrate the benefits of doing just that.

[14] Lee et al (1997).
[15] Chandran (2003).

In global product space, the recent work of Ricardo Hausmann and colleagues gives us some tantalising glimpses of the possibilities. They have recently constructed an "Atlas of Economic Complexity".[16] This is a visual representation of the product categories that contribute significantly to a country's exports. Those product categories can in turn be mapped to measures of complexity. For example, iPhones are the fruits of a more complex manufacturing process than ice-cubes.

This product network mapping provides new insights into trading opportunities and risks. For example, it allows country-specific measures of economic complexity to be constructed. These can explain almost three-quarters of the variation in income across countries. A one standard deviation rise in a country's "economic complexity" has been found to increase its long-term growth rate by a remarkable 1.6% per year.

If these numbers are even roughly right, this product atlas is a fantastic navigation device. It could help guide countries towards investing in their most profitable industries. Because it also shows how closely product types are linked, both within and across countries, product and country complexity maps might also be used to help chart a course for industrial policy and international trade.

The web is a higher-dimension network than the global supply chain. Navigating it is more complex still. Early in its life, that seemed likely to retard its progress. In the early 1990s, web search engines relied on the content of each page to determine its relevance. As the web grew, simple keyword search was being overwhelmed by the web's size and complexity. By the mid-1990s, search engines were lost in navigation.

In 1996, two Stanford students, Larry Page and Sergey Brin, devised a solution.[17] You are all now familiar with its name. It was called "BackRub". Page and Brin saw the links between websites, rather than the content within them, as the key to navigating the web. Using that basic intuition, they created a search algorithm which calculated a ranking of the relative importance of every web page in the global network. This ranking is known as PageRank.

By drawing explicitly on the information embedded in the network, PageRank produced dramatically improved web search capabilities. By now, the graduate project had become a company called Google. The vast, growing multi-dimensional cats-cradle of global information could now be sliced and diced in fractions of a second. Navigating the web no longer required a specialist pilot; it could be mapped by a novice. The World Wide Web had been given an instantaneous backrub.

That has yielded vast productivity improvements. Google itself is today valued at around $200 billion, having gained in value by on average $284 million every week of its life. Applications of Google's network mapping technology grow by the day. For example, Google indicators produced from the analysis of the popularity of

[16] Hausmann et al (2011).
[17] Vise and Malseed (2005).

search terms such as “estate agents” or “motor vehicles” have outperformed some existing indicators of house prices and motor sales.[18]

And what has allowed the World Wide Web to be Googled in this way? A common language.

(d) Lowering Barriers to Entry

Creating a common language also has the potential to transform the industrial organisation of an industry. It does so by simultaneously expanding the frontiers of a global network and by lowering the barriers to entering it. This allows new companies, with innovative and superior product offerings, to quickly erode the market share of incumbents. Higher productivity and growth have been the fruits.[19]

Global supply chains are one example. Prior to GS1 standards, small suppliers faced an uphill struggle connecting to global supply chains. Big suppliers viewed them as unreliable given the costs and difficulty of small suppliers executing real-time inventory management. Only large firms with big IT budgets could afford the sunk costs of such systems.

Today, a real-time inventory management system can be built using GS1 standards for a few thousand dollars. Small firms can connect to global product webs, through nodes such as Wal-Mart’s central inventory system, in the same way they might connect to a Facebook friend. A common language has levelled the playing field between the corner shop and the supermarket.

The transformative powers of a common language have been even more striking in such well-established industries as publishing, music, advertising, news and retailing. For decades, large incumbent firms dominated these markets – EMI, Borders, Tower Records. Yet in less than a decade, new entrants with new business processes have completely reshaped the industrial landscape. Take publishing.

Until 2007, publishing was an industry essentially unaltered since Gutenberg. The printing presses, while bigger and faster, would have been recognisable to a fifteenth century printer. Copying and distributing a book to the public involved a complex chain of printers, wholesalers and retailers. This lengthy supply chain added both risk and cost. It also created a significant barrier to entry for new authors who were reliant on publishers to get their physical books onto physical shelves.

Digital publishing and distribution has fundamentally changed this market. Both the books and the shelves are now electronic. Authors can now format books for e-readers in a couple of hours. Sales platforms like Amazon Kindle Direct give access to a worldwide audience with essentially no upfront costs. Supply can close to perfectly match demand as the marginal cost of creating and delivering an eBook is effectively zero.

[18] McLaren and Shanbhogue (2011), Choi and Varian (2011).
[19] Jorgenson et al (2010).

This digital revolution has caused barriers to entry to plummet while simultaneously raising returns to author entry: they now receive as much as 85% of the royalties from an eBook, compared to as little as 10% from a physical book. Previously unpublished authors now sell millions of books. The incumbent middle men - book publishers, distributors and retailers – have found their lunch devoured in one sitting. In effect, they have been disintermediated by technology and (in a delicious irony) a common language.

This pattern has been replicated in the music industry. For half a century or more, the music supply chain was unchanged. New acts were discovered by large record labels who distributed physical goods (vinyl, tapes or CDs) to retailers for sale to the public. Over the past decade, the costs of copying and distributing music have fallen to close to zero. As in publishing, barriers to new artist entry have plummeted. The middle-men – music production companies and distributors – have seen their piece of the pie eaten.

And as a direct result of this industrial transformation, the pie itself appears to have grown. Studies of the contributors to productivity growth since the 1960s indicate that the two top-performing sectors have been retail and wholesale.[20] This is attributed to improvements in business processes in these sectors – the "Wal-Mart effect". It is also attributed to wider and faster dissemination of innovation courtesy of new entrants.

Economist W. Brian Arthur believes this digitised network of automated processes, linked by a common language, may have put the world on the cusp of a second industrial revolution.[21] Arthur describes a "second economy" – the digital root system of the physical economy – and predicts it could become larger than the physical economy within a couple of decades. If so, those estimated benefits of a common language – in this case HTML and GS1 rather than Hindi and Mandarin - will need revising upwards.

A Common Language for Finance

Since the collapse of Lehman Brothers, the international financial policy community and the private financial sector has begun laying the foundations of their own second economy. A sequence of international initiatives, often led by the private sector, has taken us materially closer to constructing a global financial map. The co-ordinates of that map are defined by a fledgling global financial language.

This global mapping effort is underpinned by two, mutually supporting, pillars: greater financial data to help forge links in the financial information chain and common standards for recording and aggregating these data. Progress on data collection has been material. The Financial Stability Board is overseeing efforts to improve data, including on global banking interconnections, shadow banks and OTC transactions data.[22]

[20] Jorgenson et al (2010), Reinsdorf and Yuskavage (2010).
[21] Arthur (2011).
[22] Financial Stability Board / International Monetary Fund (2011).

Yet the full benefits of this deeper and richer array of financial network information will only be realised if these data can be simply aggregated within and across firms. That calls for common data describers and standards. Recent legislation recognises that. In the US, the Dodd-Frank Act created the US Treasury's Office of Financial Research (OFR), which has as a core objective data standardisation.[23] In Europe, the new European Markets Infrastructure Regulation (EMIR) embeds common data standards across the EU.[24]

The roots of these legislative initiatives were grown during the September 2009 G20 summit.[25] Out of this, the Financial Stability Board (FSB) initiated a programme which culminated in a report to G20 Finance Ministers and Central Bank Governors in October 2010. This set out a vision of common standards which would allow global financial data aggregation.[26] Like Berners-Lee's 1989 memo, it was vague but exciting. But in the reports that followed, two crucial ingredients were identified: a Legal Entity Identifier (or LEI) and a Product Identifier (or PI).[27]

Though these acronyms are new, the principles underpinning them are not. LEIs are effectively the nouns of a new financial vocabulary, naming the counterparties to each financial transaction. Meanwhile, PIs are the adjectives of this new vocabulary, describing the elements of each financial transaction. Together, LEI-nouns and PI-adjectives are key building blocks of a new common financial language.

LEIs and PIs have natural counterparts in the world of product supply chains. For LEIs read GLNs – the Global Location Numbers that uniquely define nodes in the global supply chain. GLNs are ultra-flexible. They can denote something as macro as a Wal-Mart warehouse or as micro as a specific shelf in a Wal-Mart store. They provide the co-ordinates of a high-definition map of the global supply chain.

For PIs read GTINs (Global Trade Identification Numbers) and the GDSN (Global Data Synchronisation Network). Together, these identifiers define not only products (such as toothpaste) but their attributes (the dimensions of the box the toothpaste is stored in). They too are ultra-flexible. These identifiers define the DNA string for everything from chocolate wafers to collateral swaps.

LEIs and PIs are being cast from a similar mould to GLNs and GTINs. International efforts so far have focussed on global LEIs. These are means of capturing, in a common data string, the old banking maxim of "know your counterparty". In today's financially interconnected world, knowing your counterparty may be insufficient. So global LEIs aim to barcode counterparty linkages at any order of dimensionality.

[23] Dodd-Frank Wall Street Reform and Consumer Protection Act (2010).
[24] European Commission (2010).
[25] G20 (2009).
[26] Financial Stability Board (2010).
[27] CPSS-IOSCO (2011).

In November 2010, the OFR issued a policy statement on LEIs.[28] This kicked-off an industry process, led by the Securities Industry and Financial Markets Association (SIFMA), aimed at settling on a single, industry-wide entity identification standard. This industry process formally began in January 2011, issued its requirements document in May 2011 and recommended a consortium led by the Depository Trust and Clearing Corporation (DTCC) as its preferred provider in July 2011.

DTCC is currently running a private sector entity identification pilot project, starting with over the counter derivatives. Although this market is fairly concentrated, building the database still poses challenges. DTCC anticipates the database could contain over 1 million entities. This pilot will provide valuable experience when moving to a broader range of products and market participants.

The FSB is constructing an LEI roadmap, harnessing the efforts of both official and private sectors. Its destination is a single, global LEI standard. As announced last week, significant progress is being made across five fronts: governance, operational model, scope and access, funding and implementation and phasing.[29] The FSB will present its LEI recommendations to the next G20 summit in June 2012.

Creating a PI for finance is altogether more complex. Finance is in the pre-barcode era for retail products or the pre-web era of the internet. But enough work has already been done to demonstrate that PIs are feasible. As long ago as 1997, the International Organization for Standardization (ISO) released a standard for the Classification of Financial Instruments (ISO 10962) and designated the Association of National Numbering Agencies (ANNA) as the registration body for this standard.[30]

More recently, following G20 commitments, the industry has been working to standardise classification of OTC derivative products. The International Swaps and Derivatives Association (ISDA) is working with derivatives clearing houses and other financial institutions to use Financial product Mark-up Language (FpML), which is already used in the industry for communications and processes, to provide a standardised presentation of each listed or cleared product. ISDA published the latest version of its OTC taxonomies in March 2012.[31] SIFMA is backing the use of FpML.

At a greater level of granularity still, LexiFi is selling a commercial programming language, MLFi, which breaks down financial transactions into their primitive constituents. These elements can be combined using a standardised syntax to describe instruments at any level of complexity. In essence, this approach is an attempt to create a “DNA string” for derivatives.

As yet, we are some distance from having a consistent global method for financial product identification. The prize beyond that, a big one, would be to integrate LEIs and PIs using a commonly-agreed global syntax - an

[28] Office of Financial Research (2010).
[29] Financial Stability Board (2012).
[30] International Organization for Standardization (2001).
[31] International Swaps and Derivatives Association (2012).

HTML for finance. This would allow us to move from words to sentences. It would provide an agreed linguistic base for a common financial language. Provided this language is flexible enough, like GS1 standards or HTML, it ought to be capable of describing any instrument whatever their underlying complexity.

Once developed, maintaining and updating this common language and syntax is likely to need some global governance body to act as guardian. This is akin to the role played by GS1 and W3C for supply chains and web standards. The success of these global standards organisations, without the need for regulatory intervention, sets an encouraging precedent for finance.

Using the Common Language of Finance

So if a common language for finance were to arise with these features, what benefits might be expected?

(a) Improving risk management in firms

Like retail giants, global financial firms face a hugely complex logistical problem. Like Wal-Mart, they produce multiple products, in multiple locations, with multiple counterparties working to multiple timelines. The world's largest banks have hundreds of thousands of assets, tens of thousands of counterparts and operate to timelines ranging between 50 years and 50 milliseconds. Like Wal-Mart, avoiding failure relies on the effective management of risks arising from these vast financial inventories and relationships.

The financial crisis exposed myriad weaknesses in those risk management practices, especially among the larger and more complex financial firms. Several reports, from both the official and private sectors, have exposed those deficiencies.[32] Many of the lessons are common. For example, it is clear that the governance of risk at many financial firms was defective. Risk committees lacked clout.

But underlying these high-level problems was a set of lower-level deficiencies in data and risk capture. IT infrastructure was often ill-suited to capturing these risks. As new products or business lines emerged, new bespoke systems were simply added to the legacy IT estate. A Tower of Babel was erected. Like product codes of the 1960s, or computer operating systems of the 1970s, banks' data networks became fragmented and unable to communicate effectively with one another.

A fragmented data infrastructure has a number of nasty side-effects. One is a reliance on manual intervention to operate data and risk management systems. Complete automation of business processes - second nature along the product supply chain - is a rare bird in banking. As well as improving efficiency, automation reduces the possibility of misreporting of exposures through human error.

[32] See, for example, Counterparty Risk Management Policy Group (CRMPG) (2008) and Senior Supervisors Group (2009).

Piecemeal data capture also complicates aggregation of risk exposures. That in turn undermine effective consolidated risk management. In its 2010 report, the Senior Supervisors Group found that some firms could take weeks to aggregate exposures across their balance sheet.[33] Even the best-run firms took several hours or days. This, too, contrasts starkly with the real-time inventory management systems operating along manufacturing supply chains, not only among the Wal-Marts but among the corner stores.

These data and risk management problems were well-highlighted in the official report into the failure of Lehman Brothers, a firm whose risk management was felt to be close to the frontier of risk management best practices ahead of the crisis.[34] For example, the mistaken exclusion of a significant commercial real estate exposure of $6 billion meant there was serious misreporting to the Lehman's board during the crucial months prior to its failure. Information on a significant exposure was lost in translation.

The aggregation of these individual risk exposures across the balance sheet was also seriously defective. From the middle of 2007, individual risk limits at Lehman were breached for the fixed income, real estate and high yield business lines. Yet in the process of aggregating these exposures, something too was lost in translation: firm-wide exposures were within risk limits, despite individual components being in breach.

It is clear that these failures in data infrastructure and aggregation were not unique to Lehman. They were endemic across the financial industry. Recent reports suggest progress, but make clear that almost all firms have a distance to travel. Real-time, consolidated data capture is still a distant aspiration. As long as that is the case, real-time consolidated risk management remains a pipe dream.

But it is a dream that has hope of becoming reality. Missing inventories and mistaken counterparties could be all but eliminated if financial firms' information systems spoke in a common tongue. That is one of the key messages of the 2010 Senior Supervisors Group report. The experience of global supply chains and the web tell us there is no technological constraint on real-time measurement and management of financial inventories by even the largest firms. Where Wal-Mart has led, Wall Street could follow.

Common data standards could similarly transform consolidated risk management. There is no technological reason why slicing and dicing of the aggregate balance sheet could not be done with the same simplicity as searching the web. Determining aggregate exposures to a given counterparty or a risk factor is a single cut of the financial web. It ought to be as straightforward as Googling Aung San Suu Kyi or Britney Spears.

(b) Improving risk management across firms

Measuring and managing risks across firms was perhaps the single most important cause of the seizure of financial markets during the crisis. Counterparty risk reigned supreme. In as densely-connected a web as

[33] Senior Supervisors Group (2010).
[34] Jenner and Block (2011).

global finance had become, this was hardly surprising. Network risk, the risk of cascading dominos, was several orders of magnitude larger than at any time in human history.

To see that, compare the failure of two financial leviathans only a decade apart. When LTCM collapsed in 1998, it had exposures of $150 billion in OTC derivatives with a handful of Wall Street's finest. When Lehman Brothers failed in 2008, it had OTC derivatives exposures alone of $800 billion with thousands of counterparties. It should have come as a surprise to no-one that the financial bullwhip effect from Lehmans' failure was far more painful than from LTCM.

Yet it did. That is because, at the time of Lehman's failure, no data existed to monitor meaningfully this network risk. Like the supermarket inventories of the early 1970s, the inventory list of bilateral exposures among the world's biggest banks was dog-eared, sparsely populated and out of date. Over the past three years, a variety of initiatives have sprung up to fill this vacuum.

One key plank has been better quality and more frequent data on links between the key global financial nodes – a full matrix of bilateral exposures, on and off balance sheet, between the world's largest financial firms. The Financial Stability Board is orchestrating efforts in this area.[35] In time, this will become one of the bedrocks of effective risk management across the global financial system. Having standardised LEIs will make constructing that counterparty matrix far simpler.

A second plank of reform has been to put such data to use in helping insulate the global financial network against the failure of one of its key nodes. In November 2011, the Financial Stability Board announced that in future the world's most systemically important banks would be required to hold additional capital.[36] These systemic surcharges are calibrated according to, among other things, very simple measures of firms' direct interconnectivity with other firms in the global financial network.[37]

More complete counterparty data, collected according to common standards, would enable a much more accurate calibration of the financial interconnectivity of key financial nodes. For example, a number of researchers have already begun to explore using Google's PageRank techniques to determine the systemic risk of financial firms.[38] That could in future serve as the basis for calibrating systemic surcharges. Where the information web has led, the financial web could follow.

A third reform plank is the G20 commitment to centrally-clear standardised OTC derivatives.[39] This re-wires the global financial web, transforming it from a dense, complex cats-cradle to a simplified hub-and-spokes

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[35] Financial Stability Board / International Monetary Fund (2011).
[36] Financial Stability Board (2011b).
[37] Basel Committee on Banking Supervision (2011).
[38] See, for example, Saltoglu and Yenilmez (2011).
[39] G20 (2008).

configuration. The dimensionality of the web is then radically compressed and counterparty risk management thereby simplified. Network risk, at least in principle, is much reduced.

It is easy to see how common standards for identifying products and counterparts would support this shift to central clearing. If clearing houses are not themselves to become a new manifestation of the too-big-to-fail problem, clearing house risk management will need to be transformed. For example, the setting of margin to cover risks to the clearing house relies on real-time information on aggregate exposures to counterparties and products. Common standards for data, LEIs and PIs, make that a more realistic prospect.

A fourth dimension of the reform agenda is to make the resolution of the world's largest financial firms easier and speedier.[40] The resolution of complex firms is rarely either. Reconciling competing claims on Lehman Brothers' asset pool has already taken insolvency practitioners three and a half years and thousands of man hours. It will take many more years before it is complete.

Homogenised information systems, which can be aggregated across business line and counterparty, could transform this resolution process. This relies on effective and timely information systems on the key counterparties and the key risk exposures. Counterparty traceability, like counterfeit drug traceability, is central to containing the panic once failure occurs. For both, a common language is key.

(c) Mapping the Network

The maps of the financial world being used and developed by regulators today broadly resemble those used and developed by cartographers in the 15th century. Large parts of the geographic globe were at that point uncharted territory, a source of fear and foreboding. Today, large parts of the financial globe are similarly uncharted or cast in shadows. They too are a source of regulatory fear and foreboding.

With financial data captured in a homogenous fashion across financial firms, the stage would be set for mapping much more comprehensively the contours of the financial world – an atlas of financial complexity to mirror Hausmann's atlas of economic complexity. Technologically, there is no reason why tracking the financial web should be any more complex than tracking global supply chains or the web. Monitoring global flows of funds, as they ebb and flow, should be possible in close to real time.

To get a sense of the possible, consider the case of meteorology. It operates within a huge, interconnected global network, with cross-border information pooling. The logistics are eye-watering. Forecasting the weather involves massively large-scale data sampling of over 100 million observations per day, across hundreds of thousands of locations scattered across the globe, measured along multiple dimensions.

[40] Financial Stability Board (2011a).

The result is a very high-dimension information grid, similar in some respects to the web. The information embedded in this high-dimension web is then aggregated, filtered and used to forecast weather patterns in close to real time. These weather predictions can be telescoped to any level of geographic granularity, from the smallest town to the largest continent. And the forecasts are made for timelines ranging from minutes to decades ahead.

There is no reason why, with the right data infrastructure captured in a common language, technology could not be used to map and simulate the risk contours of the global financial system. International regulatory authorities would play the role of the meteorologists. Risk warnings, like weather warnings, would form part of the regulatory toolkit. So too would stress-tests of the impact of extreme financial events on the functioning of the global financial web.[41]

(d) Lowering Barriers to Entry

Paul Volcker famously commented that the only useful piece of technological innovation in banking over the past 30 years had been the ATM. What is certainly true is that some markets for banking products appear to lack contestability. That has meant large incumbents have often dominated the banking landscape, in much the same way as was true until recently in music and publishing. In banking, this lack of contestability is one root cause of the too-big-to-fail problem.

Consistent with that, birth and death rates in banking are lower than among non-financial companies. They are lower even than in other areas of finance. Death rates among US banks have averaged around 0.2% per year over the past 70 years. Among hedge funds, average annual rates of attrition have been closer to 7% per year. Birth rates are similarly low. Remarkably, up until 2010 no new major bank had been set up in the UK for a century.

If product markets and the internet are any guide, a common financial language could help lower barriers to market entry, increasing birth rates in banking. They might even begin to erode the too-big-to-fail problem through market forces. At the fringes of finance, there may already be encouraging signs of network technology reshaping some elements of banking.

Max Levchin was not too-big-to-fail. Prior to founding Confinity Inc. in 1998 (with Peter Thiel), his previous three businesses had all failed. His new business provided a method of secure payments between Palm Pilots. By early 2000, however, it was clear that more people were using the website, rather than handheld devices, to make payments, in particular for purchases across auction websites. Confinity merged to create a new company – PayPal.

[41] Tett (2012), Haldane (2011).

Even as traffic across the site grew, the stage seemed set for Levchin to make it four failures in a row as two of the world's biggest banks entered the market. Wells Fargo and eBay together launched a new venture, Billpoint, for web-based payments. Citibank, too, entered the market with c2it. But, remarkably, PayPal saw both off. The key was superior fraud detection technology developed by Levchin using the information embedded in the web. eBay acquired PayPal in 2002 for $1.5 billion and closed Billpoint. Today, it processes over $300 million in payments globally each working day.

In large parts of Africa, a different type of payments technology has also disintermediated banks – mobile phones. In March 2007, the Kenyan mobile phone company Safaricom launched M-Pesa, a service for making payments between phones. Today, it has around 15 million users reaching over 60% of Kenya's adult population. The model has spread to a number of countries including Bangladesh, Uganda and Nigeria. In response, incumbent banks have been forced to lower significantly their payment costs.

And it is not just payments. Lending is the new frontier. Kiva is a developing world micro-finance organisation with a difference: it is based in San Francisco. Person-to-person financing is provided remotely using borrower information stored on Kiva's website. Credit assessment and tracking are done by Kiva's field partners. Each of these is ranked, eBay-style, using information on their historical default and delinquency rates. This disintermediated market has so far avoided both banana skins and lemons. Kiva has a 99% repayment rate.

The model may be set to spread into advanced economies. Commercial peer-to-peer lending, using the web as a conduit, is an emerging business. For example, in the UK companies such as Zopa, Funding Circle and Crowdcube are developing this model. At present, these companies are tiny. But so, a decade and a half ago, was Google. If eBay can solve the lemons problem in the second-hand sales market, it can be done in the market for loans.

With open access to borrower information, held centrally and virtually, there is no reason why end-savers and end-investors cannot connect directly. The banking middle men may in time become the surplus links in the chain. Where music and publishing have led, finance could follow. An information web, linked by a common language, makes that disintermediated model of finance a more realistic possibility.

Conclusion

Steve Jobs described his approach to innovation as "trying to expose yourself to the best things that humans have done and then trying to bring those things into what you are doing. Picasso had a saying: good artists copy, great artists steal. And we have always been shameless about stealing great ideas". Language is the original great idea. Finance should steal it.

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