

Andrew Hauser: Building the market infrastructure of tomorrow – CREST, RTGS and the Bank of England, 20 years on

Speech by Mr Andrew Hauser, Executive Director for Banking, Payments and Financial Resilience of the Bank of England, at the CREST Twentieth Anniversary Conference, London, 20 September 2016.

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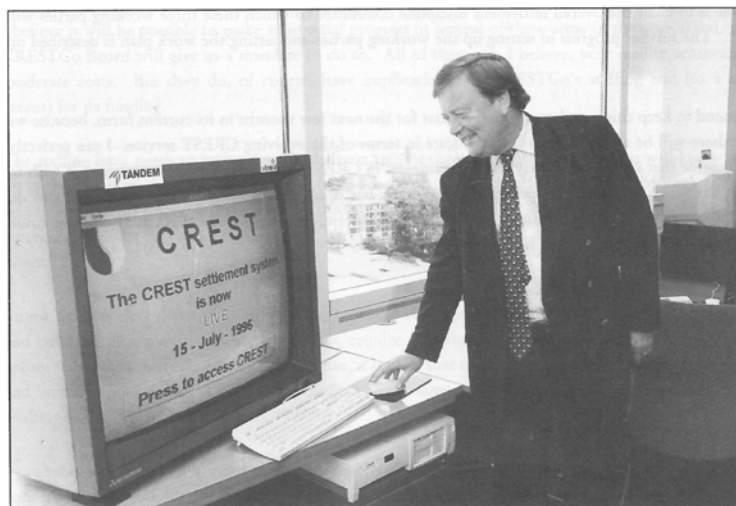
I am grateful to Sana Siddique for her help in preparing this speech, and to David Bailey, Jo Clennell, Toby Davies, Rachel Greener, Chris Redmond, Iain Saville, Hugh Simpson and Paul Symons for their input and guidance.

Introduction

July 1996 was an eventful month. Dolly the world's first cloned sheep was born. Boris Yeltsin was re-elected as President of Russia. The Spice Girls' first single, "Wannabe", was riding high in the charts. And the summer Olympics opened in Atlanta. By the time the Games closed in early August, Great Britain had won only 15 medals in **total**, finishing 36th in the rankings – three places behind North Korea, twelve behind Kazakhstan and 32 behind China. As that song of 1997 had it, "things could only get better".

But there **was** one rather more upbeat event that month back in the summer of 1996. On 15 July, in a crowded room high up in Trinity Tower, Wapping, Chancellor Ken Clarke picked up a computer mouse – then still a relative novelty – and, waving it towards a large computer screen like a wand, declared the CREST settlement system open for business. Frantic Treasury officials tried to correct the Chancellor's mouse-handling technique – but they needn't have bothered because the equipment had wisely been disconnected from anything that mattered. Indeed, CREST had already been running for some hours...

Figure 1: The official launch of crest (15 July 1996)



CREST itself was far from a publicity stunt, however. Its introduction finally enabled the much-needed dematerialisation of equity settlement into electronic form, sweeping away the antiquated paper-based Talisman system, bringing some of the UK's most important financial market plumbing into line with its front office systems, and catapulting it towards best-in-class internationally. Today, CREST accounts for half of the payments processed through the Bank's RTGS system – around a quarter of a **trillion** pounds every day.

The launch of CREST was a particularly important moment for the Bank of England, because the team that designed and built CREST was drawn predominantly from the Bank's own staff, hurriedly called into service after the disastrous collapse of the Stock Exchange's own project to dematerialise equity settlement, "TAURUS". Indeed that time also has an important place in my memories. My first job at the Bank was in its Financial Markets and Institutions Division, one of the areas from which the CREST team was taken. I vividly remember the gaping hole left in the office, complete with empty coffee cups and discarded paper files, when the team left for their new premises.

Building such systems, with all their attendant costs and risks, is not something any central bank undertakes lightly. For much of the twenty years since the launch of CREST, the Bank of England has focused on building up its capacity to analyse and set monetary and macro-prudential policy, and carry out prudential supervision. But the financial crisis and its aftermath have once again reminded us all of the role central banks globally must also play in ensuring that the "soft" and "hard" infrastructure of the financial system¹ is fit for purpose, delivering both systemic stability and efficiency.

The Bank of England of today takes that role seriously. And that is why, last week, we launched a consultation paper on our vision for a new generation of Real Time Gross Settlement here in the United Kingdom². "RTGS", as it is known, is the system that manages the Bank's electronic liabilities – or "central bank reserves" – and hence lies at the heart of everything we do, from setting monetary policy through official interest rates and quantitative easing, to the settlement of the most important interbank payments in central bank money for seven payment systems, including that embedded in CREST. This is an exciting, but also challenging, time of change, in payments and settlements more broadly, reflecting dramatic developments in technology, demand and regulation, coupled with a relentless push to reduce costs.

Against that backdrop, I want to do three things in this speech today. First, I want to look back to some of the lessons the Bank drew from the building of CREST twenty years ago. Second, I want to explain how we have applied those lessons to our current strategic review of RTGS. And, third, I want to ask what lies ahead for securities market post-trade infrastructure over the *next* twenty years.

Why was the building of CREST such a success?

Ironically for a project designed to do away with paper, the Bank's work on CREST left behind great slabs of dusty paper files! Reading those files is a fascinating reminder of a remarkably bygone age – but it also throws clear light on the steps the Bank took to ensure CREST succeeded where TAURUS had not. Those steps remain hugely valuable lessons today, and can be summarised under three key headings: first, establish early strategic direction and momentum for change; second, secure close industry engagement; and third, keep it simple, focused and open – both in your project team and in your system design.

In the interests of time, and because they relate most closely to our current work on RTGS, I am going to concentrate on the first of these themes in my remarks today – but **Table 1** sets out the full set of lessons from our own analysis, and I look forward to hearing more from the

¹ "Soft" infrastructure refers to the rules, principles and standards by which markets operate. "Hard" infrastructure refers to the physical equipment, software and networks supporting those markets. See "Open Forum: Building real markets for the good of the people", <http://www.bankofengland.co.uk/markets/Documents/openforum.pdf>.

² <http://www.bankofengland.co.uk/publications/Pages/news/2016/071.aspx>.

independent CREST research project later in the day, which has reached very similar conclusions³.

Table 1
Key lessons for success from the crest project

ESTABLISH EARLY STRATEGIC DIRECTION AND MOMENTUM FOR CHANGE
1) Identify a clear platform for change
2) Ensure a common purpose across authorities, rooted in public policy objectives
3) Draw up a clear set of agreed high level policy principles for change: <ul style="list-style-type: none"> - What 'hard infrastructure' is needed? - What 'soft infrastructure' is needed? - What is the role (if any) for the central bank balance sheet? - What is the co-ordinating or delivery role for the central bank?
SECURE CLOSE INDUSTRY ENGAGEMENT
4) Ensure buy-in of key users (and dispute resolution) through senior-level steering group
5) Maintain industry input through working groups and regular consultation on key design decisions
6) Ensure industry is committed financially to the final product
KEEP IT SIMPLE, FOCUSED AND OPEN
7) Have a narrow, focused project scope; ensure core code is simple; build on proven technology
8) Ensure business, technology and legal project teams work closely together
9) Have a small core delivery team, committed to a highly open, collegiate working culture

All successful projects need a clear **platform for change** – and CREST had a burning one! The collapse of TAURUS on 11 March 1993, followed by the resignation of Peter Rawlings, the Chief Executive of the Stock Exchange, was front page news. The huge rancour, reputational damage and cost (estimated by the FT at £400mn all-in, in mid-1990s money) cast a pall over the UK financial system, already reeling from the failed attempts to defend

³ "From Paper to Automation – Streamlining UK Securities Settlement", at http://www.globalservices.bt.com/static/assets/pdf/products/financial_markets_settlenet/CREST-BISS-Industry-Report-final-for-publication.pdf.

sterling on “Black Wednesday” and the publication of the BCCI Report in 1992, and facing renewed competition from financial centres in continental Europe and elsewhere.

Without TAURUS, the UK was left with what one leading fund manager gloomily described as a “Third World settlement system in a first-rank financial centre”. Equity settlement relied entirely on paper certificates, passing through an average of 25 pairs of hands for each trade, each time running the risk of getting lost, misfiled or stolen. Settlement occurred only once a fortnight, and on a fixed rather than a rolling timetable. Unsurprisingly, a fifth of all trades failed to settle on time.

If the case for change was clear, so too was the **common purpose shown by the public authorities**. As Pen Kent, the Bank’s Executive Director in charge of CREST said at the time, “TAURUS gave the Bank the legitimacy to step in and get on with the job: it needed a market failure to get everyone pointed in the right direction.” The Bank of England, called upon privately to act by the Chairman of the Stock Exchange, had two main goals: first, to reduce the material risks to financial stability posed by such an extended and uncertain settlement process; and, second, to ensure the UK had an efficient and internationally competitive market infrastructure.

There is no doubt that the second of these goals weighed particularly heavily with the Bank’s Governors of the day. Not everyone agreed that the Bank should become closely involved, worrying that it could be a costly and reputationally risky distraction from the post-ERM project of repositioning the Bank as an organisation capable of taking on independent responsibility for setting monetary policy for the country as a whole. But the majority view won out, bolstered by the active support of the UK Government, notably HM Treasury, which took responsibility for ensuring that the complex and extensive legislative changes required were delivered in a timely and effective way.

A Securities Settlement Task Force, led by the Bank, met for the first time on the morning after the collapse of TAURUS to begin the task of translating these broad objectives into a **clear set of policy-based principles for change**. Three months later, after extensive consultation with market participants and users, it set out its recommendations⁴ – in many ways a classical statement of the full range of ways in which a central bank can become involved in infrastructure design:

1. Settlement processes should be streamlined and automated, moving from paper to electronic media (**hard infrastructure**);
2. Settlement times should be reduced dramatically over time, moving from fixed to rolling T+10 in mid-1994, to rolling T+5 in 1995, and to T+3 over a longer time horizon (**soft infrastructure**)⁵;
3. Sterling settlement should be against central bank money at the Bank of England, through so-called “Delivery Versus Payment (DVP)” (**use of central bank balance sheet**); and
4. The Bank should prepare a detailed design for a new system, to be called “CREST”, within 9 months, and the system should become operational 2–3 years after completion of that design (**central bank as co-ordinator of market interests**).

It is remarkable how prescient this simple, but challenging, set of policy goals turned out to be. But there was still much to do to make this a reality.

First, the project needed to **secure and maintain close buy-in from the industry** that would use the new system. The Bank did this by: setting up a senior level Steering

⁴ Summarised in <http://www.bankofengland.co.uk/archive/Documents/historicpubs/qb/1995/qb950107.pdf>.

⁵ Today, the standard settlement times in CREST are T+2 for equities and T+1 for gilts.

Committee to oversee the development of the design; forming many working-level working groups and consulting on all major design decisions; and ensuring that the industry bore the cost of the overall project. The Steering Committee was for making decisions and knocking heads together. According to a “senior banker” quoted by the Independent newspaper, Pen Kent (as Chair) and Iain Saville (as Chief Executive) were a “Mr Nice and Mr Nasty’ duo ... bludgeoning the vested interests which sank TAURUS into submission”⁶. The consultations were voluminous, had short turn-rounds (some as little as two weeks), and respondents received personalised replies (much to their initial surprise): a strategy christened “choking the cat with cream”. And the financial commitment sought by the Bank was broad-based: when CRESTCo was first established, 69 institutions were asked to subscribe £12m in share capital, giving them skin in the game from the start.

Second, the project team committed to an ***approach to building CREST that was simple, focused and open***: in the design of the system itself, and in the composition and work practices of the project team. From the start, the November 1993 “Green Book” set out a deliberately minimal blueprint, excluding non-critical functions required only by a few, or which could be performed by users in their own systems. This approach was consciously at odds with that adopted for TAURUS, which had tried to be all things to all people⁷. But it also focused minds in the industry, forcing them to make difficult tradeoffs, and creating a clear incentive to market providers to produce “add ons” for extra user functions. The project team itself projected a similarly minimalist, open approach in its work – building on their own past experience of having developed the Bank’s system for dematerialised settlement of gilts (the “Central Gilts Office”), involving a full range of disciplines (including policy, IT and legal) in all outreach and design meetings, and embracing a robust attitude to analysis and self-criticism, perhaps best summed up in their T-shirt logo “Purist and Bloody-Minded”.

Not everything went to plan. Some early project management structures were found wanting. PWC’s audit of the project in Spring 1994 identified what might be euphemistically termed “a range of unfinished business”, but allowed the project to go forward. And the early months of operation after that launch day in July 1996 faced technological challenges and setbacks. But it is remarkable to think that this basic approach delivered a system that, at its core, remains with us twenty years later.

How has the Bank applied the lessons from the building of CREST to the strategic renewal of RTGS?

It is striking, too, to find how many of the lessons of the CREST project remain relevant today, as the Bank begins its consultation on a new RTGS service:

- We set out the strategic drivers for change in a speech by the Deputy Governor for Markets and Banking in January this year: a combination of aging core technology and an unprecedented pace of change in the external payments environment. We secured the broad support of others in the public sector, including HM Treasury and the Payments Services Regulator. And we set out a clear set of policy goals: to maintain or enhance stability and resilience, whilst also delivering a system better able to enable change, innovation and competition.

⁶ The “nasty” description of Iain Saville owes more than a little to journalistic licence: a somewhat later interview with him at the time of CREST’s launch paints a rather sweeter picture – his car, a Vauxhall Carlton Estate; his passion, singing with the Dulwich Choral Society; and his reason for shaving off his bushy moustache in 1994 not the pressures of the project but his wife’s (firmly stated) wishes!

⁷ According to the FT, a computer manager at one of the big four banks described TAURUS as “like building a car that had air conditioning, a fancy stereo and electric windows ... we should have built a straightforward production car first, then added the bits on later.” Expectations of automotive technology have clearly moved on since the 1990s.

- We have remained close to the stakeholders in RTGS throughout the first phase of the project, holding meetings with over 100 users (old and new), infrastructure providers, policymakers, academics and technologists, consulting on a vision for the next generation of the service, and confirming that the new system will be paid for by the users of the system through the future RTGS tariff (through which we also gather current running costs).
- And we have stayed true to the principles of “simple, focused and open”, conducting the review using a small, dedicated, multi-disciplinary team of policy and technology experts.

The consultation paper sets out our proposals in detail, which affect everyone with a stake in sterling payments and settlement. With that in mind, I hope that as many of your firms as possible will respond to the questions in that document by the deadline of 7 November.

What next for securities infrastructure?

Impressive though the achievement of building CREST was, it is a sad fact that the persistent delays that pre-dated the project meant the UK came late to the party. Today, as the industry again faces enormous pressures for change, it is important that it responds more proactively than it did in those pre-CREST days, avoiding the twin perils of complacency or over-ambition, embracing innovation to deliver a service to users that is both more efficient and more resilient than ever before.

The case for reform is easy to state. Although most countries now have well-functioning modern Central Securities Depositories, the structures below this top layer for providing post-trade services in securities markets remain in many cases extraordinarily complex and balkanised. Multiple tiers of custodians and sub-custodians, issuing agents, correspondent banks, clearing members, registrars and brokers – many operating on a solely national basis – provide an overlapping web of services to separate pools of market participants, using different operating procedures, systems and databases. That siloed model delivers settlement and collateral movements which, though much smoother than they were twenty years ago, are still typically measured in days rather than minutes or hours, and require multiple reconciliations – posing fixed costs, raising settlement and operational risks, tying up collateral, reducing transparency and posing barriers to entry.

These segmented structures have not arisen by chance – in many cases they reflect the differing needs of market participants, variations in national practice and regulatory rules, and legacy systems. But they stand in the way of establishing a genuinely efficient international capital market. And they are now under unprecedented pressure from three sources: **demand**, **technology** and **regulation**.

The strongest **demand** pressures come from the largest users of capital markets, who need to find further sharp cost savings if they are to deliver improved return on equity to investors. Amongst other things that means: they want settlement that occurs closer to real time (ie T+0) to minimise settlement and operational risk exposures and economise on collateral usage; they want to deal with fewer separate intermediaries, systems and data protocols – getting closer to a single seamless experience across sectors, border, currencies and timezones; and they want to be able to control a single global pool of collateral and assets, with access to a single comprehensive view of their data in real time. An important question is how far this demand for convergence is met through further industry consolidation, and how far it is met through improving the ability of still-separate systems to operate seamlessly with one another (so-called “interoperability”).

A key enabler of this change will be new **technology**. This may take many forms, including real-time computing, the cloud and messaging standards. But of course discussion at the moment is dominated by the potential of Distributed Ledger Technology, or “DLT”. At its most extreme, DLT is quite revolutionary. The “utopia” described in Euroclear and Oliver Wyman’s

recent paper⁸ would replace the current cat's cradle of systems with a single, distributed network in which single pools of stock moved seamlessly in real time against central bank money, between and across borders, with only one set of reconciliations to perform, a single global data set available to each user, with integrated reporting and regulatory oversight and spectacular resilience characteristics. The paper envisages that whole classes of intermediary, such as custodians and CCPs, could become redundant, replaced by smart contracts.

There is no likelihood of such an extreme revolution occurring any time soon: much more work is needed across a whole range of issues, including: speed and scalability; confidentiality protections; developing common protocols; integrating cash and securities movements; and establishing regulatory and legal norms. In many cases, reform to outmoded business processes will need to precede any application of the technology itself. But there is clearly scope for less ambitious but still potentially transformational applications in specific markets, not least those where current infrastructure is less well developed. A key challenge for incumbent firms is whether to take on competition with challenger firms head-on, or partner with them to develop and implement the most promising forms of technology internally. But doing neither is a risky approach.

The final driver for change is **regulation**, which since the financial crisis has greatly increased the focus on centralised post-trade infrastructure as a means of promoting transparency and reducing system-wide risk. Amongst other things, banks and other financial intermediaries have been required to hold more high-quality collateral and be ready to mobilise rapidly across a wide range of businesses in response to margin calls. They have faced much stronger incentives to use centralised clearing and avoid settlement fails. And they have faced the need to support an increasing range of account types and reporting requirements. In turn, supervisors have increasingly expected infrastructure operators to act as systemic risk managers. Taken together, these requirements are designed to bring about a material increase in the stability of the system as a whole – but in terms of their influence on the structure of the market, they also amplify the impact of the demand and technology drivers, further intensifying the pressures towards rationalisation and convergence.

What is the Bank of England's role in all of this? Our primary objective is, as it has always been, to maintain monetary and financial stability. But that does not mean holding back innovation or competition. Far from it: our role should be to help enable these things, where that can be done in ways that do not compromise stability. That could include: modernising risky, out-of-date systems; reducing single points of failure by increasing interoperability and reducing concentration; strengthening protections against cyber attack; improving risk management; and reducing operational and settlement risk by reducing settlement periods.

We pursue our objectives in three ways:

- First, through the use of our balance sheet. Ensuring that settlement occurs in central bank money has been a major achievement of the past twenty years, and it is important that this should continue, however the structure of the market develops in future years. That is a central design principle of the proposals we recently announced for the new generation of RTGS, and will be delivered through broader access for infrastructures, adoption of ISO 20022 as the new messaging standard, maintenance of the existing DVP link for CREST and regular FX settlement for CLS,

⁸ <http://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf>. Two other excellent papers on this topic are the ECB's "Distributed ledger technologies in securities post-trading" at <https://www.ecb.europa.eu/pub/pdf/scpops/ecbop172.en.pdf>; and ESMA's "The distributed ledger technology applied to securities markets" at https://www.esma.europa.eu/sites/default/files/library/2016-773_dp_dlt.pdf.

and consultation on new functionality to deliver synchronisation with innovative technologies.

- Second, as regulator and supervisor, we will ensure that financial market infrastructures are subject to high standards of resilience and soundness, whatever technological form those infrastructures take in the future. That in turn means developing a supervisory net that is sufficiently flexible to cover the risks posed by new technologies, in a proportionate manner, as they develop.
- Third, we will continue to act as a catalyst for change – through our research work on the policy and technical questions raised by the distributed ledger and central bank digital currencies⁹; and working with innovative firms on applications of new and existing technology to central banking topics through our new Fintech Accelerator¹⁰. It is not our job to second guess the market where innovation is rife. But where direction is required on standards, consistency with regulatory needs or policy requirements, we will play our full part, alongside other national central banks through the FSB, G20 and Basel processes.

Conclusions

We have come a long way from those mouse-jabbing days in Wapping. But the themes of that time are remarkably topical – embracing new technology to improve risk mitigation and innovation in financial market infrastructures and working together between public and private sectors to achieve common goals.

Fairly or otherwise, the post-trade sector does not always have a reputation as being the most forward-thinking when it comes to reform. In a speech in November 1996, the Bank's then-Governor said the following:

“For many years, payments and settlements risk was largely disregarded as an administrative matter for the “back office”. Perhaps not surprisingly, as the numbers have grown there has ... been a growing awareness – among both commercial and central bankers – of its crucial importance, so that it has moved up the agenda, from the back office to the board room.”

I am not sure those issues have been neglected quite as badly in recent years as they were then – but, given the changes afoot, we are I believe entering another period where central banks and market participants will again need to show real ambition, and work closely together to harness the potential benefits of another wave of innovation in ways that maintain stability for all.

Thank you.

⁹ See <http://www.bankofengland.co.uk/banknotes/Pages/digitalcurrencies/default.aspx> and <http://www.bankofengland.co.uk/research/Pages/onebank/cbdc.aspx>.

¹⁰ <http://www.bankofengland.co.uk/Pages/fintech/default.aspx>.