Mathematics behind the digital transformation in banking

A journey in search of the goal

Alexander Lipton
Stronghold Labs, Numeraire Financial, MIT & EPFL

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Quote

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- The only saving grace is that banks are not unique in this respect.
- For instance, as was revealed by a recent government report, the US nuclear weapons force still relies on a 1970s-era computer system and 8-inch floppy disks.

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- The main determinants of their quality and reliability are the amount of capital and the level of liquidity (essentially central bank money) they keep.
- In general, a bank would like to maintain the right levels of both –if it has too little, it becomes fragile, if it has too much, it becomes unprofitable and hence unable to fulfill its purpose of paying dividends.

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- It happens because old-fashioned banks are far behind the latest technological breakthroughs; they also have a poor handle of the risks on their books.

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  - The rise of the internet also saw the rise of the internet bank –most prominently NetBank in 1996.

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  - These "digital hybrids" still use centralized databases, cloud based storage and primitive user data protocols.

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  - A new business model will arise.

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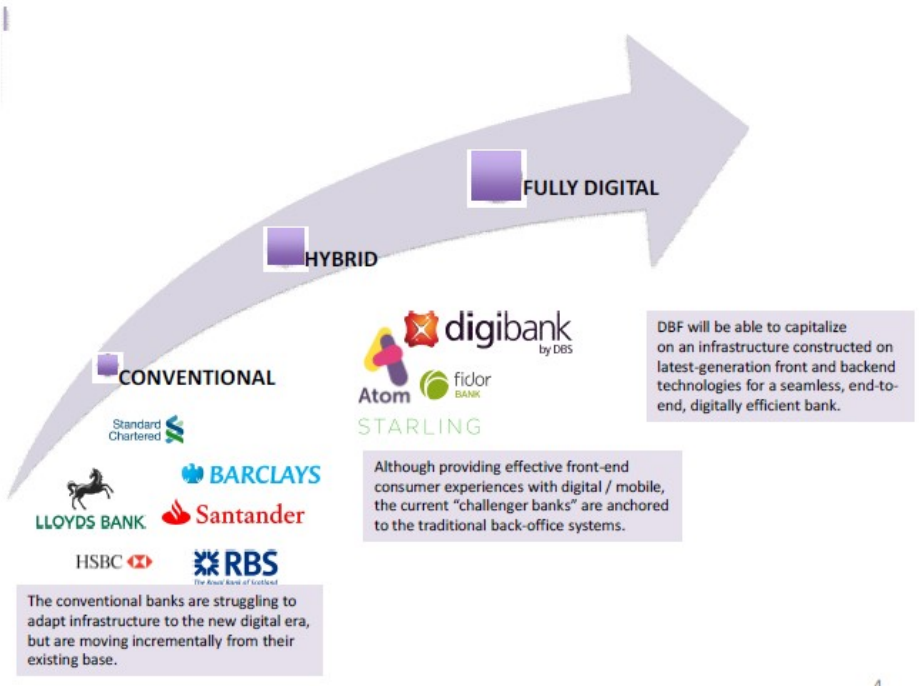
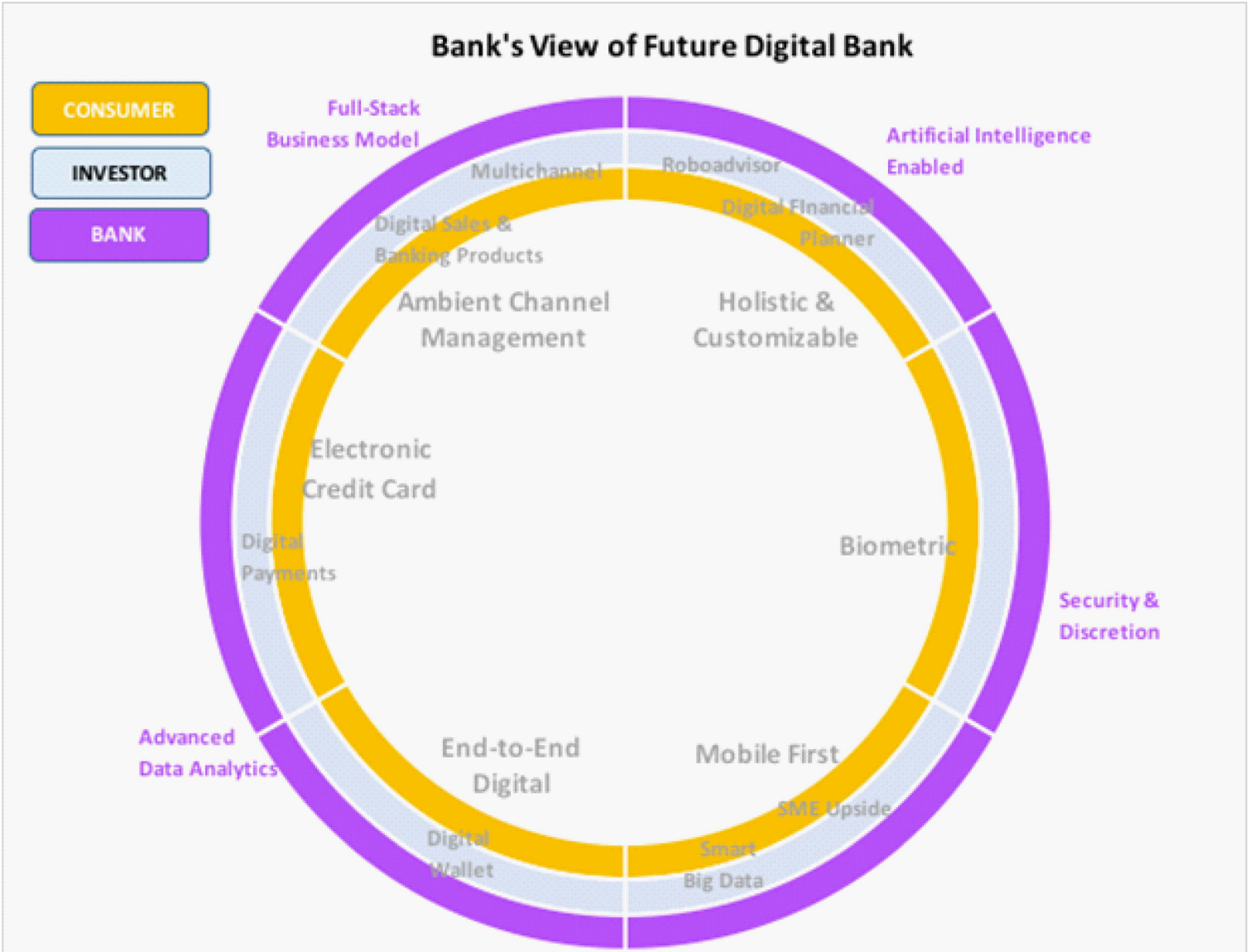


Bank's perspective



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- Database Design:
  - The bank IT is based on the state-of-the-art database technology, including DLT, which can cope with the exponential growth in data

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  - Fraud prevention can be massively improved.

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  - They naturally include implementation of new cryptographically secured distributed data management.

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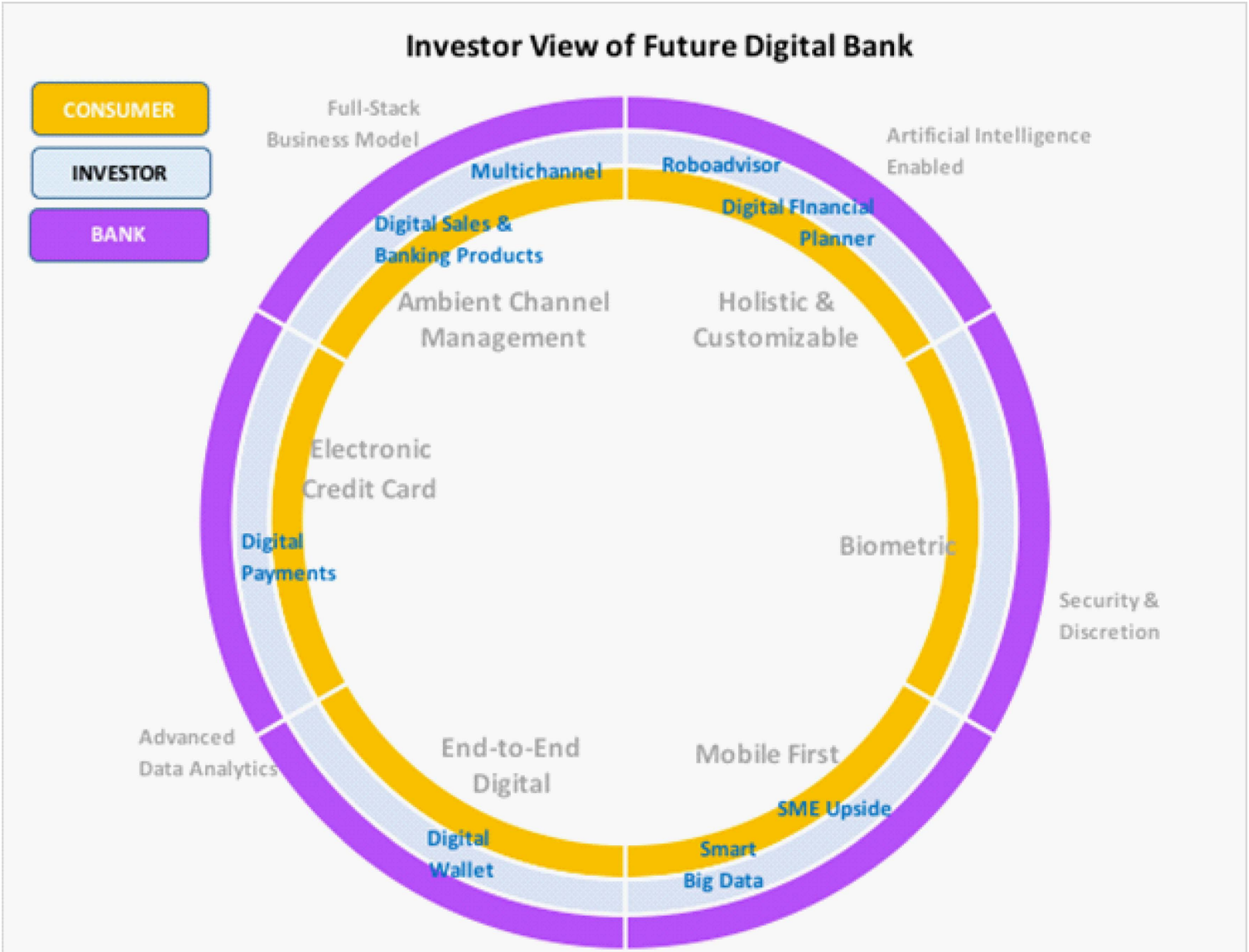

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  - The majority of digital banks' staff will be engineers and data scientists, although, as always, the role of sales and marketing should not be underestimated.

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  - An integrated and seamless multichannel approach to sales increases the bank's share of customers' wallet, boosts customer loyalty, thereby making a significant difference in customer adoption rates.

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  - Logical continuation of the circle of trust between the digital bank and customers, where customers rely on the Roboadvisory services to optimize investment portfolios based on individual goals and preferences, properly allocate resources for each phase of the customer's financial life

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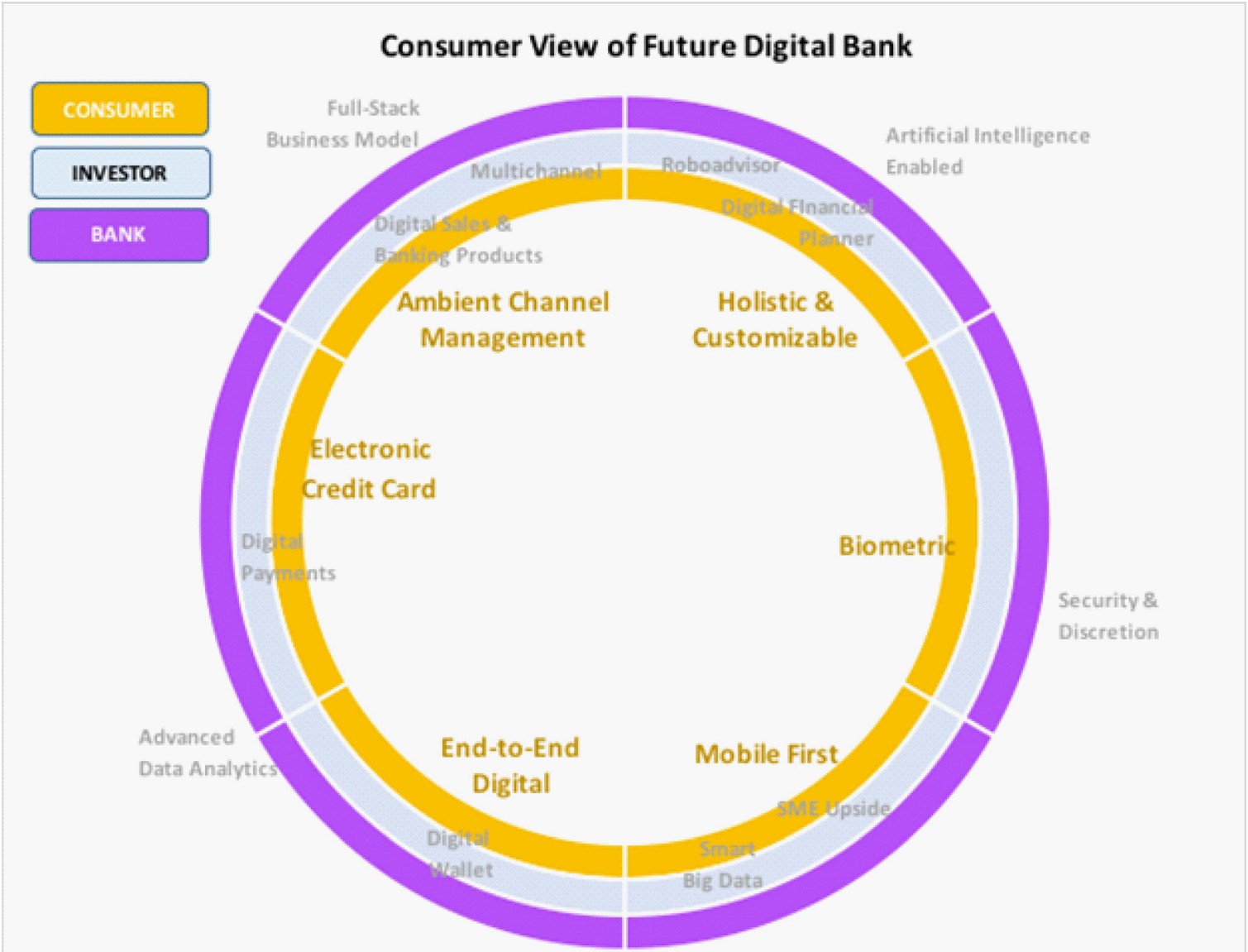
  - By 2018, banks in Scandinavia, the United Kingdom, and Western Europe are forecast to have half or more of new inflow revenue coming from digital related activities in most products, such as savings and term deposits, and bank services to SMEs.

Customer's perspective



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  - SMEs that go mainstream using a digital banking platform designed for their needs; potentially banking 45 million underbanked or unbanked SMEs globally.

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  - At MIT we are actively developing such an asset-based currency, which we call Digital Trade Coin (DTC)

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- Using this central, panoptic data, WeChat can integrate services from the whole range of life opportunities in a seamless and consistent manner.
- As a result, customers get fully integrated payments, credit and banking, unbelievable advising capability and amazing KYC and AML, all in a form that is completely transparent.

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- A similar future is unfolding for SMEs: customers are shepherded to buy and money ‡ow issues like credit, payments, KYC and AML go away virtually completely.
- Is there a future that is NO banking versus "digital banking"? Instead, banking functions are just integrated invisibly everywhere.

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- Will WeChat (or the next WeChat) want to take its high flying tech company stock market multiple, and burden it with a financial services discount?
- If financialization of a tech company is done in a deliberate and measured way, it can actually increase the shareholder value.

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- Despite these challenges, is there a model that we could call “invisible banking” that integrates into our daily lives without friction?
- The answer is yes and no –the legacy banking model will unquestionably disappear over time, but in the transition period, digital banks will have a role in daily life for the foreseeable future as transaction lubricants and enablers.

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- It is not sustainable in the long term.
- In order to survive, the industry needs to adapt and change.
- Digitization is a way to do it.
- There is no time to lose!
- Come join the party!

Further reading

- Alex Lipton, David Shrier, Alex Pentland, 2016, Digital Banking Manifesto: The End of Banks? In Frontiers of Financial Technology

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  - https://www.getsmarter.com/career-advice/wp-content/uploads/2017/07/mit_digital_bank_manifesto_report.pdf
- Alex Lipton, 2017, Blockchains and Distributed Ledgers in Retrospective and Perspective. To appear in Journal of Risk Finance

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  - https://arxiv.org/abs/1703.01505

 Alexander Lipton is Founder and CEO of StrongHold Labs, Partner at Numeraire Financial, Co-Founder of Distilled Analytics, Connection Science Fellow at MIT Media Lab and Visiting Professor of Financial Engineering at EPFL. He is an Advisory Board Member at UCL Centre for Blockchain Technologies, Clearmatics and Numerix.

In the end of May 2016, he left Bank of America Merrill Lynch where he served for ten years as a Managing Director. During this time, Alex worked in various senior managerial roles including Quantitative Solutions Executive and Co-Head of the Global Quantitative Group. Earlier, he was a Managing Director and Head of Capital Structure Quantitative Research at Citadel Investment Group in Chicago; he has also worked for Credit Suisse, Deutsche Bank and Bankers Trust.

While working full time as a banker, Alex held several prestigious academic appointments, including Visiting Professor of Quantitative Finance and Advisory Board Member at Oxford-Man Institute, and Visiting Professor of Mathematics at Imperial College London and the University of Illinois. Before switching to finance, Alex was a Full Professor of Mathematics at the University of Illinois and a Consultant at Los Alamos National Laboratory. He received his undergraduate and graduate degrees in pure mathematics from Moscow State University.

His current professional interests include digital banking, robo advisor investing, FinTech, applications of distributed ledger technology to banking, digital currencies, and payment systems, and industrial-strength risk management systems for large systemically important financial institutions. His scientific interests are centered on quantitative development of modern monetary circuit theory, mechanisms of money creation, interlinked banking networks, balance sheet optimization, and related topics.

In 2000 Alex was awarded the first Quant of the Year Award by Risk Magazine. Alex is the author of two books (“Magnetohydrodynamics and Spectral Theory” and “Mathematical Methods for Foreign Exchange”) and the editor of five more, including, most recently, “Quant of the Year 2000-2014, All Award-Winning Papers”. His next book “Financial Engineering - Selected Works of Alexander Lipton” will be

published by WSPC in 2017. In addition, Alex has published more than a hundred papers on hydrodynamics, magnetohydrodynamics, astrophysics, chemical physics, and financial engineering.

Alex is a frequent keynote speaker at Quantitative Finance and FinTech conferences and forums worldwide.

Alex is a founding patron of the 14-10 Club at the Royal Institution (jointly with David Harding). He is an avid collector of military optics and is currently working on a book on the history of military binoculars.