



Orientation

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford AI in Fintech and Open Banking

Orientation



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1.0 Oxford AI in Fintech and Open Banking Syllabus

Welcome to Oxford AI in Fintech and Open Banking! Take a few minutes to explore this page for information about this programme.

About This Programme

Key programme objectives

Through the programme, you will:

- Examine the potential and power that AI can bring to the financial services industry.
- Learn to think strategically about AI and understand the business impact as access to financial data becomes more open.
- Explore what is happening in the major financial centres and regions that are leading the way in Open Banking.
- Develop a deep understanding of the AI-driven data economy and how it impacts Open Banking.
- Learn how Open Banking emerged, the need for it, and how AI is driving and delivering new services and products.
- Earn a certificate of attendance from Saïd Business School, University of Oxford, and join a global network of financial innovators.

Who Should Take This Programme

This programme is designed for:

- an entrepreneur, business leader, or executive who wants the strategic insight and actionable knowledge to create new ventures or develop both short and long-term business strategies for Open Banking driven by AI;
- a manager, director, or professional in either a private or public sector financial services organisation;
- intellectually curious and motivated and in the midst of, or aspiring towards, a career transition or looking for future-fit skills in financial tech or banking
- Wanting to learn alongside, and build a network with, fellow participants whose titles include:
 - Chief Executive Officer
 - Chief Information Officer
 - Senior Manager
 - Programme Manager
 - Managing Director
 - Digital Innovation Officer or Manager
 - Director
 - Financial Analyst
 - Vice President
 - Project Manager
 - Digital Product Director

About the Curriculum

The Oxford AI in Finance and Open Banking Programme is designed and built to give participants the knowledge and insight they need to analyse and strategise AI solutions.

You will form groups to discuss and reflect on course material, identify an existing problem in your businesses that could be solved by AI, and create a recommendation on how to implement an AI solution to solve the problem. You will obtain guidance from programme instructors and tutors, including discussions and webinars outside of core videos and exercises.

By the end of this programme, you will be able to:

- Formulate a strategy to deal with data privacy, data bias, and data access issues for an AI solution.
- Develop a plan for launching an AI solution inside an organisation.
- Evaluate the benefits and risks of the platform model in financial services.

How You'll Learn

Our programmes interpret advanced topics into small, understandable modules that carry you on a curated learning journey to a new kind of understanding.

Each week you will engage in a mixture of:

- Digital videos or audio content, augmented by material which you can download in full to review as you have time
- Quizzes and exercises designed specifically to help you understand and retain new information
- Dialogue with expert instructors and your peers via discussion forums and small group sessions
- Real-life examples that help you understand how concepts delivered in the course material can be applied to your work environment

The AI in Finance and Open Banking programme is designed for approximately seven to ten hours per week of effort, including a mix of videos, reading, and exercises. Supplemental or optional reading is offered for those who wish greater depth in assimilating the subject matter.

Most of the material can be self-paced; that is, the executive can choose when during each week to consume material and complete assignments. Some work is synchronous in small groups, which has been demonstrated to deliver to executives better understanding of material and superior learning outcomes.

Schedule

Programme materials become available weekly on Wednesdays at 11:00 UTC. (Try the [Time Zone Converter](#) to get your local time.)

Module	Description
Orientation (8 June, 2022) Time estimate: 2 hours	Explore what you will learn and how you will learn in the programme. Learn about the Riff platform. Meet your group. Group Activity: Meet your group. Live Kick-off Webinar: 9 June, 2022 12:00 UTC Assignments Due: 21 June, 2022 23:59 UTC
Module 1 (15 June, 2022) Time estimate: 7–10 hours	Differentiate between the use of machine learning (ML) and artificial intelligence (AI) in the banking industry. Describe how data-based decision-making affects end consumers, data availability, and data governance. Recognise the ethical dilemma of data availability and data governance. Group Activity: In preparation for the group work you will be doing in this programme, you will complete a short exercise where you will get to know the strengths and personalities of your group members in order to create an effective group dynamic. Assignments Due: 21 June, 2022 23:59 UTC
Module 2 (22 June, 2022) Time estimate: 7–10 hours	Explain what policy needs to address regarding AI in finance. Compare open banking regulations of the EU, China, Australia, and Saudi Arabia. Describe how Open Banking promotes innovation throughout the market, which can benefit both financial institutions and consumers. Group Activity: Identify a few problems in your businesses that could potentially be solved using AI. Choose 3 use cases to focus on. Assignments Due: 28 June, 2022 23:59 UTC

Module	Description
Module 3 (29 June, 2022)	<p>Describe how new technology has fueled a shift in power in the finance industry driven by data centralisation. Identify the opportunities and challenges for AI startups in finance. Formulate ideas to address the cultural challenges of emerging technology and banking cultures. Develop a plan for launching an AI solution inside an organisation.</p>
Time estimate: 7–10 hours	<p>Group Activity: Analyse the project scope and feasibility of implementation of your proposed AI solution.</p>
	<p>Assignments Due: 5 July, 2022 23:59 UTC</p>
Module 4 (6 July, 2022)	<p>Explain how the platform business model is so successful. Describe how platforms are disrupting the financial sector with data. Hypothesise how platforms may shape the future of banking.</p>
Time estimate: 7–10 hours	<p>Group Activity: Weigh the value of AI-analysed data versus that which is analysed by humans, and determine which of your use cases would be the best—and most cost-effective—option to implement for your business.</p>
	<p>Assignments Due: 12 July, 2022 23:59 UTC</p>
Module 5 (13 July, 2022)	<p>Describe why it is important for organisations to establish and uphold clear guidelines for data availability and data governance. Recommend ways to avoid discrimination and privacy issues in data usage. Identify privacy and ethical issues in data usage.</p>
Time estimate: 7–10 hours	<p>Group Activity: Work through all the legal and ethical issues that may come up with your AI solution.</p>
	<p>Assignments Due: 19 July, 2022 23:59 UTC</p>
Module 6 (20 July, 2022)	<p>Recommend an AI solution to a challenge in the finance industry. Apply the Oxford AI framework within a business.</p>
Time estimate: 7–10 hours	<p>Group Finale: Build out a video pitch to deliver a recommendation to the business for using AI.</p>
	<p>Assignment Due: 26 July, 2022 23:59 UTC</p>

2.0 Meet Your Instructors, Guest Instructors, Tutors, and Success Managers

Our programme brings together thought leaders from the University of Oxford and guest industry experts, facilitating the rapid application of theory to practice. Our Tutor and Success Teams are here to support you throughout the programme.

Please Note: Programme Directors, Academic Directors, Faculty, Guest Speakers, and Tutors cannot provide academic references to learners of this programme. You may contact registrar@esmelearning.com to request proof of attendance once you have completed the programme.

Instructors



Pinar Ozcan

Oxford AI in Finance and Open Banking Co-Programme Director

Professor of Entrepreneurship and Innovation, Saïd Business School, University of Oxford

Pinar Ozcan is Professor of Entrepreneurship and Innovation at Saïd Business School, University of Oxford. She is also the academic director of the Oxford Future of Finance and Technology (Fintech) Initiative. Pinar specialises in strategy, entrepreneurship, and technology markets. Her current research includes AI and business models in fintech, open banking and digital disruption in banking, and the rise of big tech and sharing platforms. Pinar holds a Ph.D., MSc, and dual bachelor's degrees from Stanford University. She has been the recipient of numerous awards, including selection to the Top 40 Under 40 Management Professors List by Poets and Quants, the Global Thinkers 50 list for emerging thinkers with the potential to make lasting contributions to management theory and practice, and the British Academy Mid-Career Fellowship.

Teaches in: Modules 1–6



Martin Schmalz

Oxford AI in Finance and Open Banking Co-Programme Director

Professor of Finance and Economics, Saïd Business School, University of Oxford

Martin Schmalz is a tenured Professor of Finance and Economics at Saïd Business School, where he currently teaches an elective for Oxford's MBAs, MFEs, and MLFs on Big Data and Machine Learning in Finance. His research areas include entrepreneurship, corporate finance and governance, behavioural finance and asset pricing, and various studies of the asset management industry. Martin has contributed to a range of global publications and co-authored the book, *The Business of Big Data: How to Create Lasting Value in the Age of AI*, and his research on how the ownership structure of firms affects firm behaviour and market outcomes has affected policy-making and antitrust enforcement worldwide.

Teaches in: Modules 1–6



Thomas Hellmann

DP World Professor of Entrepreneurship and Innovation, Saïd Business School, University of Oxford

Thomas Hellmann has taught numerous undergraduate, MBA, doctoral, and executive courses in the areas of entrepreneurship, finance, and strategic management. His research focuses on entrepreneurial finance, entrepreneurship, innovation, and public policy, and his academic writings have been published in many leading economics, finance, and management journals. He has been an advisor consultant to a variety of clients, including the World Economic Forum, Barclays Bank, the Government of British Columbia, and numerous startup companies. Thomas is also the Academic Advisor of the Oxford Foundry, the Academic Director of the SBS Entrepreneurship Centre, and Academic Director and Site Lead of the Creative Destruction Lab, Oxford.

Teaches in: Module 6



Gina Neff

Professor of Technology & Society, Oxford Internet Institute & Department of Sociology, University of Oxford

Gina Neff is Professor of Technology and Society at the Oxford Internet Institute and the Department of Sociology at the University of Oxford. She is author of the award-winning book *Venture Labor: Work and the Burden of Risk in Innovative Industries* (MIT Press 2012). New York Review of Books called her book *Self-Tracking* (MIT Press 2016) one of the best books about the politics of personal data. She holds a PhD in sociology from Columbia University, where she remains an external faculty affiliate. Named as one of the 100+ Brilliant Women in AI Ethics, she serves as an advisor to the Women's Forum on the Economy & Society, GMG Ventures, the Reuters Institute for the Study of Journalism, and the Royal Society's commission on online information.

Teaches in: Module 5



Felipe Thomaz

Associate Professor of Marketing, University of Oxford

Felipe Thomaz' research focuses on empirically modelling marketing strategy issues, including the incorporation of social networks into the understanding of black markets (digital or otherwise) and strategies developed to stunt their growth and proliferation. His research also involves questions of social networks' impact on brand and firm performance, the behaviour of consumers in digital marketplaces and interactive marketing channels, and the development of managerial metrics that rely on abundant and timely social media data. This research on social media, digital markets, and strategic firm and brand networks includes publications in the *Journal of Marketing* and *Journal of Service Research*.

Teaches in: Module 5



Nir Vulkan

Oxford Fintech Programme Director, Associate Professor of Business Economics, Saïd Business School, University of Oxford

Nir Vulkan is a globally recognised author of one of the leading texts on the microeconomics of e-commerce, *The Economics of E-Commerce: A Strategic Guide to Understanding and Designing the Online Marketplace*. Nir has been at Saïd Business School since 2001, and his current research focuses on market design, e-commerce, automated negotiations, personality and strategic behaviour, and entrepreneurship. He was the Director of the Oxford Centre for Entrepreneurship and Innovation (OxCEI) and the Co-founder and Director of OxLab, a laboratory for social science experiments, both at Saïd Business School. Nir wrote and developed the core Managerial Economics course for the MBA and EMBA programmes and, until recently, taught the module. He has also been involved in designing and developing the Entrepreneurial Project at Saïd Business School.

Teaches in: Modules 1, 2 & 5

Guest Instructors



Ajay Agrawal

Geoffrey Taber Chair in Entrepreneurship and Innovation and Professor of Strategic Management, University of Toronto

Ajay Agrawal is the Geoffrey Taber Chair in Entrepreneurship and Innovation and Professor of Strategic Management at the University of Toronto's Rotman School of Management. In addition, he is a Research Associate at the National Bureau of Economic Research in Cambridge, MA, and Faculty Affiliate at the Vector Institute for Artificial Intelligence in Toronto, Canada. Professor Agrawal is founder of the Creative Destruction Lab (CDL), a not-for-profit program for early stage, science-based companies. CDL's mission is to enhance the commercialisation of science for the betterment of humankind.

Teaches in: Modules 4 & 6



Maria Axente

Responsible AI Lead, PwC Frontier Lab

In her role as Responsible AI and AI for Good Lead at PwC, Maria Axente advises partners across industry, academia, governments, and more, on how to harness the power of AI in an ethical and responsible manner. She has played a crucial part in the development and set-up of PwC's UK AI Center of Excellence, the firm's AI strategy, and most recently the development of PwC's Responsible AI toolkit, firms methodology for embedding ethics in AI. Maria is a globally recognised AI ethics expert, Advisory Board member of the UK Government All-Party Parliamentary Group on AI, member of BSI/ISO & IEEE AI standard groups, a Fellow of the RSA, and an advocate for gender diversity in AI, children, and youth rights in the age of AI.

Teaches in: Module 5



Ajay Bhalla

President, Cyber and Intelligence Solutions, Mastercard

Ajay Bhalla is president of cyber and intelligence solutions for Mastercard. He leads the team that develops product solutions to ensure the safety, security, and experience of our products and solutions for consumers, merchants, partners, and governments around the world. Prior to this role, Ajay was president of the Digital Payment Services business for Mastercard and led the development and growth of the business in e-commerce and innovative payments processing, establishing Mastercard as a pioneer and leader in many markets in this space. Previously, Ajay was president of Mastercard for South Asia and Southeast Asia, where he led the business in 18 markets.

Teaches in: Modules 1 & 3



Steve Bradford

Co-Founder and CCO, OpenWrks Group and Co-Founder, Tully

Steve Bradford co-founded Tully in 2018 and leads OpenWrks in its mission to help everyone understand what they can afford to invest, save, borrow and repay. With more than twenty years of leadership experience at FICO, Experian, TDX, and other firms, Steve focuses on data and technology to open new markets, launch new products and build high-performing teams that radically improve financial lives.

Teaches in: Module 3



Cristina Caffarra

Senior Consultant, European Competition, Charles River Associates

Cristina Caffarra is a Senior Consultant to CRA in Europe (a team of economists based between London, Brussels, Munich, and Paris). Dr. Caffarra holds a PhD in Economics from Oxford University and is an expert in the application of applied theory and industrial economics to competition law, as well as the empirical analysis of markets in the context of competition investigations. She has provided economic advice to companies on landmark cases in merger control, assessment of vertical restraints, finding of dominance, evaluation of abusive conduct, and several other competition/antitrust issues, including bundling, tying, rebates, price discrimination, other forms of potentially exclusionary conduct, intellectual property rights, information exchanges, collusion, and the assessment of damages.

Teaches in: Modules 1 & 5



Megan (Caywood) Cooper

Chief Platform Officer; Barclays

Megan Cooper serves as Chief Platform Officer at Barclays. She was awarded an Exceptional Talent Visa for her work in tech in San Francisco to move to the UK to help start Starling Bank as Chief Platform Officer, where she was subsequently awarded Forbes 30 under 30 in recognition of her work. In addition to her work at Barclays, she also serves as Co-Chair of the Digital, Tech, and Cyber board at UK Finance, and mentors women with up-and-coming talent in finance and technology.

Teaches in: Module 3



Max Flötotto

Senior Partner, McKinsey & Company

Max Flötotto leads McKinsey's work for the banking sector in Germany and co-leads our European fintech service. He has supported clients in building multiple businesses. In his M&A role, Max has supported companies in more than 40 integrations around the world, particularly in Europe, Africa, and the Middle East. He focuses on deals involving financial institutions from start to finish, from M&A strategy, target identification, and due diligence to integration design, planning, and execution. Max writes extensively on M&A, banking, and fintech trends and leads research projects on European banking. He speaks regularly at conferences in the banking and fintech communities.

Teaches in: Module 3



David R. Hardoon

Senior Advisor for Data and Artificial Intelligence, UnionBank of the Philippines

David Hardoon is the Senior Advisor for Data and Artificial Intelligence at UnionBank of the Philippines. Concurrently, David is an external advisor to Singapore's Corrupt Investigation Practices Bureau (CPIB) in the capacity of Senior Advisor (Artificial Intelligence) and to Singapore's Central Provident Fund Board (CPF) in the capacity of Senior Advisor (Data Science). Prior to his current roles, David was Monetary Authority of Singapore's (MAS) first appointed Chief Data Officer and Head of Data Analytics Group reporting to the agency Deputy Managing Director for Financial Supervision and subsequently Special Advisor (Artificial Intelligence) reporting to Deputy Managing Director for Markets and Development. In these roles, he led the development of the AI strategy both for MAS and Singapore's financial sector as well as driving efforts in promoting open cross-border data flows.

Teaches in: Module 3



David Heike

Managing Director & Head of Risk Modeling, Consumer & Community Banking, JP Morgan Chase & Co.

David Heike is the Head of Risk Modeling for Consumer & Community Banking at JPMorgan Chase. Prior to this role, he was the Global Head of Financial Modeling at BlackRock. He also led fixed income research teams at Lehman Brothers, and worked as a Finance Professor at Ivey Business School in Canada.

Teaches in: Modules 3 & 5



Ho Chee Wai

Singapore Country Head and Vice President of Neobanking and Cards Strategy, Nium

Ho Chee Wai is the Singapore Country Head and Vice President of Neobanking and Cards Strategy for Nium, an advanced global payments platform redefining how consumers and businesses can send, spend and receive funds around the world. Chee Wai is responsible for spearheading the acquisition and usage of Nium's consumer and SME business arm, Instarem. He is now charting the next wave of growth initiatives in neobanking and consumer cards within the retail business. Prior to joining Nium in 2018, Chee Wai worked for Singtel as a founding member of its Dash programme, which provided digital payments, mobile remittance, and banking services.

Teaches in: Modules 2 & 3



Husayn Kassai

Co-Founder and Advisor, Onfido

Husayn Kassai is the Onfido Co-Founder and Advisor. Onfido uses AI to verify any government ID and then compares it with the person's facial biometrics. Founded in 2012, Onfido has grown to a team of 400 across SF, NYC, and London; received over \$200m in funding from TPG, Salesforce, Microsoft, and others; and works with over 1,500 fintech, banking, and marketplace clients globally—helping them onboard more users while reducing risk. Husayn is a WEF Tech Pioneer; a Forbes Contributor; and Forbes' "30 Under 30". He has a BA in Economics and Management from Keble College, Oxford.

Teaches in: Module 3



Paula Cipierre

EU Data Protection Lead, Palantir Technologies

Paula Cipierre is an EU Data Protection Lead at Palantir Technologies. She works at the intersection of privacy engineering, legal compliance, and public affairs. Paula holds a Bachelor of Arts summa cum laude in French, European Cultural Studies, and Near Eastern Studies from Princeton University, a Master of Public Policy from the Hertie School of Governance in Berlin, and a Master of Arts in Media, Culture, and Communication from New York University. She is a certified Data Protection Officer and Information Security Auditor. Paula lives and works in Berlin.

Teaches in: Module 5



Michael R. King

Lansdowne Chair in Finance, Gustavson School of Business, University of Victoria

Michael R. King is the Lansdowne Chair in Finance at University of Victoria's Gustavson School of Business. Prior to joining UVic, he held the Tangerine Chair in Finance at Western University's Ivey Business School (2011–2019), where he co-founded Canada's first fintech research centre (the Scotiabank Digital Banking Lab). Before joining academia, he worked in investment banking in Zurich, New York, and London from 1990–1998 (Credit Suisse, RBC Dominion Securities) and central banking in Ottawa and Basel from 2001–2011 (Bank of Canada, Bank for International Settlements). Michael completed his PhD at the London School of Economics in 2001 and his CFA designation in 1999. He has taught finance to undergraduates, MBAs, and executives. His research focuses on fintech, banking, international financial markets, and corporate finance.

Teaches in: Modules 2 & 3



Simone Koo

Founder & Chief Operating Officer, Team Credit & Finance

Simone Koo is the founder and COO of Team Credit & Finance, which provides efficient funding solutions to developers and promoters in the Commercial Real Estate planning application process in the UK. Simone also spent 16 years in asset management and investment banking trading floors at JPMorgan, Credit Suisse, Morgan Stanley, and Goldman Sachs. She is an angel investor and advisor to a number of global fintech startups and is a frequent speaker in fintech, banking, and women's circles in London.

Teaches in: Modules 3 & 6



Gavin Littlejohn

Director and Non-Executive Chairman, FDATA Global

Gavin Littlejohn serves as Chairman of the Financial Data and Technology Association and is a leader of the open banking movement, championing common technical standards and consistent liability models across the world. Gavin was appointed as Convenor of the Fintech Stakeholder Group of the UK Open Banking Implementation Entity in 2016, and in 2013 he successfully led the campaign to add account aggregation to PSD2. Gavin also founded Money Dashboard in 2009.

Teaches in: Modules 2 & 6



Rita Liu

Chief Commercial Officer, Mode Global Holdings PLC

Rita Liu joined Alipay in 2010 and was initially responsible for driving partnerships with major Chinese banks. In 2011, she became one of the founding members of the Alipay International Business department and has since held senior roles in business development and partnerships in Asia, the US, and Europe. From 2015 to 2017, Rita was based in London while serving as Head of EMEA (Europe, Middle East, and Africa) for Alipay, overseeing the company's overall business in the region, including business development, operations, and marketing activities. In early 2018, she was named Head of Canada, to build the firm's business and strategy from scratch in Canada. She later returned to London to take up responsibility as a leading member in the newly signed Alipay—UEFA global partnership, driving the firm's new venture into sports as a platform for globalisation. She was also appointed as CEO of Alipay (UK) Limited, serving on the board of the company. Before joining Alipay, Rita was business development manager at American Express.

Teaches in: Modules 4 & 6



Paul Lucas

Executive IT Architect and Distinguished Engineer, IBM

Specialising in core banking and payments transformation, and large-scale systems integration, Paul Lucas is passionate about tackling the challenges created by PSD2 and Open Banking. He has deep experience in systems integration, application architecture, and software design and development. Paul has also served as CTO for the UKI Financial Services Sector of IBM Services.

Teaches in: Module 6



Leon Muis

Chief Business Officer, Yolt /YTS

As the Chief Business Officer at Yolt—an ING venture—Leon has built and is leading the Yolt Technology Services (YTS) proposition—one single and secure API connecting businesses to the main banks across Europe. In this perspective, Leon is heavily involved in Open Banking in the UK and PSD2, where YTS has paved the way thus far. Leon has been instrumental in leading YTS as the first third-party provider to connect to Open Banking in the UK.

Teaches in: Modules 1 & 3



Alexandra Mysak

Director of Financial Services, Databricks

Alexandra Mysak is a sales leader driving growth of the Financial Services business vertical for Databricks—the SaaS platform for data + AI. She is an enterprise advisor on cloud, big data, and advanced analytics. Formerly, she was the Regional Head for Sales & Accounts at Symphony—a secure messaging and collaboration platform initially aimed at financial services—where she led the new business and account teams across the Americas and worked in an advisory capacity to Symphony's customers on innovation, technology, and change management strategies. Prior to working in technology, Alexandra worked for over 14 years in financial services and in sales as a PanAsia equity advisory to US and European investors.

Teaches in: Module 6



Iain Niblock

CEO, Money Dashboard

Iain Niblock is an entrepreneur with five years' experience being a technology startup CEO and founder. Before taking on the role of CEO at Money Dashboard, Iain was the Head of Product & Acquisition, during which time the company's user base doubled in size. Iain has a passion for business, with a particular interest in developing and marketing software products.

Teaches in: Module 3



Ian Pollari

Global Co-leader, KPMG Fintech practice, KPMG International

Ian Pollari is the Head of KPMG's Banking & Capital Markets Sector in Australia. He is also the Global Co-Lead of KPMG's Fintech practice (which extends to over 50 countries globally). Ian is on the Board of the fintech hub, Stone & Chalk, and financial services professionals body, Finsia. Ian has over 20 years' experience servicing clients in the financial services industry and brings deep knowledge and insights into the experiences of local and international banks, payment providers, and fintech companies in areas such as strategy development, market entry, regulation, governance, and risk management practices. In 2019, Ian was recognised in the Australian Financial Review's annual Power issue as one of the five most influential people in consulting for his leadership in the banking and financial services industry.

Teaches in: Module 2



Bill Roberts

**Assistant Director Remedies, Business and Financial Analysis,
Competition and Markets Authority**

Bill Roberts is the Head of Open Banking at the CMA. He led the design and implementation of the open banking remedies adopted as part of the package of measures adopted by the CMA, intended to address the competition concerns arising from its market investigation into retail banking. Bill is also a member of the BEIS Smart Data Working Group, which investigates data sharing solutions in the regulated sectors and the FCA's Open Finance Advisory Group. Before entering the world of regulation (initially at the Competition Commission), Bill held a number of senior commercial positions within the information businesses of what is now Thomson Reuters.

Teaches in: Module 2



Andra Sonea

Head of Solution Architecture, FintechOS

Andra Sonea is a transformation executive with a deep expertise in leading diverse, highly specialised teams on projects ranging from large systems implementations to new technology evaluations or roadmap advice. Andra's experience with the architectural landscapes of some of the biggest banks in the world has allowed her to move between financial services providers and the Fintech market in roles ranging from startup advisor to market analyst to advisor for innovation programmes in Europe and Asia. In January 2020, Andra joined the FintechOS team, helping drive its mission to change the way people engage with financial technology.

Teaches in: Module 3



Yasin Rosowsky

CO-CEO, Arabesque AI

Yasin Rosowsky is co-CEO of Arabesque AI, a tech company based in London that provides its clients a platform for creating customised, actively managed investment strategies powered by artificial intelligence. Previously, Yasin headed up AI Research at Arabesque Asset Management before he and his team were spun out to form Arabesque AI. Yasin's research interests are in distributed intelligence and he holds a PhD from University College London in the field of machine learning applied to financial forecasting.

Teaches in: Modules 3 & 6



Michael Salmony

Executive Advisor, equensWorldline SE

Dr. Michael Salmony is an internationally recognised leader on digital financial service innovations. He is board-level advisor to major international banks, industry associations, regulators, and finance bodies across the world and regularly helps shape future directions in all key European decision-making bodies (for example, European Commission, EPC, ERPB), and further national and international boards. He is Executive Adviser to the Board of equensWorldline SE, Europe's largest (and the world's 4th largest) financial processor of transactional services, which handles over €17 trillion per year.

Teaches in: Module 2



Karen Smith

Partner, IBM Global Business Services

Karen Smith is a Partner at IBM responsible for data sales and delivery across the financial services sector. Karen has had extensive experience in selling and delivering complex data platforms and front-end analytics, not only in her role at IBM but as the Head of Business Solutions and Projects at City and Guilds Center for Skills Development.

Teaches in: Module 6



Alan Walsh

Director of Partnerships, Trade Ledger

Alan Walsh has bridged his 15-year corporate banking career with fintech over the last 5 years, building out many successful partnerships with banks, insurers, fintechs, and the government. An entrepreneurial connector of people, Alan hones his craft in partnerships. As part of the founding team at Bud, a market-leading open banking platform, Alan was instrumental in building the product, brand, and distribution while selling the vision of open banking across the financial ecosystem. Prior to Bud, Alan spent 15 years delivering commercial growth at some of the largest and most respected financial services brands, including American Express, Barclays, GE, and Santander. Alan is now Director of Partnerships at DueDil, a real-time company intelligence platform powering hundreds of the top financial service brands.

Teaches in: Modules 2 & 6



Barry West

Head of Emerging Technology, Abu Dhabi Global Market (ADGM)

Barry West is a fintech/regtech expert who leads the exploration, design, and implementation of ADGM's FinTech strategy and initiatives focusing on equipping the Regulator with tools necessary to be effective in the digital age. He is instrumental in the creation and execution of projects such as the "Digital Lab" (an online platform that enables Regulators, Financial Institutions, and fintechs to rapidly experiment and prototype in a controlled environment) as well as "Digital Regulations" (an initiative that's using natural language processing [NLP], machine learning, and graph analysis to convert the current analogue regulation into a more fluid digital medium).

Teaches in: Module 2

Tutors



Fredric Hallgren

Head Tutor

Fred Hallgren recently completed a PhD in statistics and machine learning at UCL, before which he worked for four years at a quantitative hedge fund developing computer models to trade the financial markets. During his PhD he worked as a data science consultant at HSBC, Shell and the Department of Health, as a research assistant in the Department of Economics at SOAS and as a quantitative risk analyst at Citi. He holds a BSc and MSc in Engineering Physics from the Royal Institute of Technology (KTH) in Stockholm, which included exchange studies at the Ecole Polytechnique in Paris, and a BSc in Business and Economics from the Stockholm School of Economics. Fred is based in Aberdeen, Scotland.



Lehlohonolo Moche

Tutor

Lehlohonolo is an industrial engineer and social data scientist by training. She is currently a Data Scientist at the Discovery Group Data Science Lab. Her specialisation and work focus on causal machine learning and network analysis. Her academic interests are lie in the impact of digital and data-driven technologies on economic and social organisation. She completed the Oxford1+1 (MSc Social Data Science and MBA) at the Said Business School. Lehlohonolo has also previously interned for the BCG Digital Venture's Digital Boost, Oxford University Innovation and The South African Post Office. Lehlohonolo is based in South Africa.

Success Team



Gabriel Smith

Lead Success Manager

Gabriel Smith has worked with Oxford Programme learners as a Success Manager since the summer of 2020, and prior to that worked as programme coordinator for Pioneer Academics, and as a freelance tutor for high school and university students. He has overseen online classes in subjects ranging from Greek philosophy to business leadership strategy, and guided students to top grades in their coursework. His own academic record includes a BA from the University of Exeter and an MA from the University of Edinburgh. He has also spoken at literary conferences in London and Paris, and published work in a peer-reviewed academic journal. Gabriel is based in Yorkshire, UK.



Trish Brolly

Success Manager, EMEA

Trish is a Chartered Member of The Chartered Institute of Personnel and Development in the UK. She has a background in Human Resources, Management Training, and Lecturing in the public and private sectors, namely Nissan, The Environment Agency, and The Insolvency Service, where she devised and delivered training programmes to senior managers. Her most recent role has been as a University Support Worker, where she was a coach and mentor to undergraduate and postgraduate students. She thoroughly enjoys working with learners and strives to help them achieve their very best whilst enjoying their studies.



Jennye Stirlen

Success Manager, AMER

Jennye Stirlen started her career in education as a high school Math teacher in Chicago. After she decided that the “Windy City” was too “windy”, she relocated to Raleigh, NC, and continued her career in education, transitioning into educational software. She has spent the last five years supporting teachers all over the country with learning and implementing educational software. Jennye is based in Raleigh, NC, with her two Siamese cats, Dante and Delilah.



Paris Chung

Success Manager, APAC

Paris Chung has been supporting Oxford Programme learners as a Success Manager and technical writer since Summer 2020, and is a certified executive coach and mentor with degrees in Computer Science and Business Administration. She holds her BS and MBA degrees from Assumption University of Thailand. Paris has spent time as a quality assurance tester, and has technical proficiency and leadership experience. She is an agile coach who has a proven record of supporting and guiding individuals to learn effectively. Paris is based in Bangkok, Thailand.

3.0 About Riff

AI-enabled Knowledge Acceleration to Build Collective Intelligence at Scale

Guest Video: Introducing Riff

In this video, Beth Porter discusses the benefits of using Riff Edu platform to enhance collaboration during your programme experience. She explains how Riff Edu gives you personal feedback on your group meetings. This feedback raises your awareness of group dynamics and helps you improve your collaboration skills.



Hi, my name is Beth Porter, and I'm going to be talking to you about how we use the Riff platform in this programme. You will use Riff to meet in small groups to collaborate on shared tasks, and you will connect with other programme participants to share ideas in a community of practice.

Collaboration is an important element of the course experience. When you work together towards shared goals on group assignments, you're modelling what you do in a work environment. Riff is a communication platform designed to foster collaboration.

In the Riff platform, you will use video chat and text chat to communicate in real time, and throughout the programme. In peer learning groups, you will work on structured activities, but we hope and expect you to build social connections with other participants and course staff. Collaboration is a hallmark of this programme. Connecting with others will help you stay engaged, build workplace skills, and forge lasting connections with new colleagues across industries that we hope will last well beyond this course.

When you're in a Riff video meeting, Riff is measuring vocal activity; not what you say, but when and how you say it. This vocal activity tells us a lot about the dynamics of the group. We can measure: dominance, who is speaking the most and how often; influence, who is speaking after whom; interruption, what happens when another person grabs the mic; and affirmations, which are little vocal gestures that usually indicate how engaged people are. These are just some of the different kinds of human signals that people give off when they're meeting and collaborating together.

When you meet in person, you exhibit a lot of human signals. This helps you understand whether somebody trusts you, whether they're listening to you, whether they're engaged in what you're saying. When you're on a video, it's much harder to pick up on these signals.

In Riff, we give you an onscreen indicator which tells you who is dominating the call in real time, among other things. Immediately after the call, we surface additional metrics that give you more detailed information. Armed with this information, you and all your teammates will start to understand when to interject and when to hold back. This awareness will help your team become more effective, accomplishing shared goals such as complex, challenging tasks that give you a reason to work together.

The Riff Platform

Using artificial intelligence, we are re-architecting the experience of group collaboration through a new breakthrough technology.

The most effective learning experiences occur within small groups engaged in problem-solving exercises. However, in a digital/distributed work environment, how does one make this effective? Video conference calls cause people to tune out of the discussion.

Using artificial intelligence, we are redesigning the experience of group collaboration. This new capability changes the way your team members interact with one other in real time, as the video call is happening. We find that using Riff has enabled us to provide digital learning (online course) experiences with a Net Promoter Score more than 12x higher than conventional MOOCs on platforms like edX or Coursera, with a completion rate (% of those who start, versus those who finish the programme) 18x greater.

With a simple on-screen cue, people can have more effective team interactions.

Personalised Feedback

The Riff Platform analyses interactions to create a confidential, personalised dashboard that you can use to assess your own work. This report will not be shared with anyone, but allows you to better understand your work, interactions, and group dynamic.

Riff Chat

When you log into Riff, you will enter a chat application, much like Slack. Riff's chat feature is powered by Mattermost, an open-source chat platform.

Riff's chat features three different types of channels.

Public Channels are channels that everyone can join. You will be automatically enrolled in a number of public channels. For example, "Town Square" is where informal conversations about the programme can happen. There will also be a public Programme Support channel for general questions about the programme.

Private Channels or Small Group Channels are channels that only invited members can access. This is where you will do your small group work. The channel activity can only be accessed by your small group, but will be monitored by a Success Manager, a Tutor, and some other Programme staff.

Direct Messages are conversations initiated by a learner with one (or more) other users on Riff. These may also be monitored by the Programme Team.

Any messages you send in Riff Chat should follow the learner behaviour guidelines outlined in the Learner Handbook and Honour Code.

You can receive and respond to your chat messages on your mobile device by using Mattermost, a third-party app that is available from Google Play and the Apple Store. When you open the app, enter <https://said-oxford.riffedu.com> as the URL, and enter the user name and password that you created the first time that you accessed the Riff platform.

Updating Your Personal Settings

To change your personal settings, click the main menu next to your name, and then click **Account Settings**. On this page you can specify how you'd like to stay informed of Riff chats throughout the course, add your profile picture, and customise other settings.

Riff Video

You will use Riff Video to conduct video meetings with your small group, connect with tutors, success managers, and each other. You'll be able to start a video meeting from within the chat window. More information on how to do that is below.

System Requirements

- A modern desktop or laptop computer with the following features. (Other devices are not supported.)
- The Windows or MacOS operating system.
- The latest version of Google Chrome, Mozilla Firefox or Microsoft Edge.
- An enabled camera and microphone, to use with Riff.
- An internet connection with a minimum speed of 3 mbps for both upload and download (10 mbps is recommended).

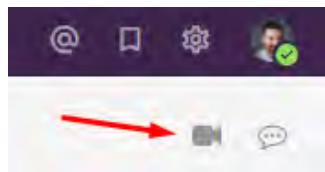
Please note: If you experience a loss of bandwidth during a Riff video meeting, Riff will automatically mute your video feed to improve performance.

Starting and Joining a Riff Video Meeting

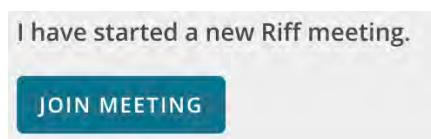
Usually, your small group leader will start the video chats for your team, though any member of the team can start a chat.

- Launch Riff Edu via any of the group exercises in the course, from the link at the top of this page, or by going directly to the Riff website.
- Open the channel where you want to have the video chat—usually that's your small group channel or in a direct-message window.

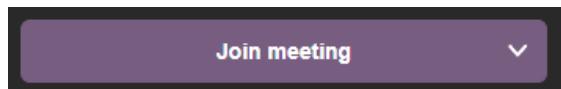
- In the top-right corner of the page, click the video icon.



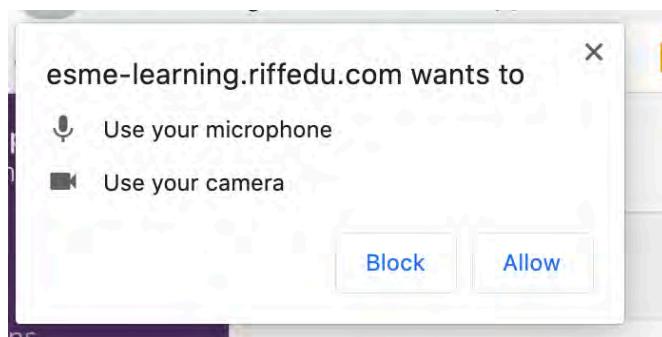
- If you are first to start a meeting, the video screen will overtake your chat screen and prompt you to join the meeting with video and audio on or muted.
- A **Join Meeting** button appears in the center of the channel page. **Note:** Anyone in the channel may join the meeting in progress. No one will be allowed to create a NEW meeting in the same channel while a meeting is already in progress.



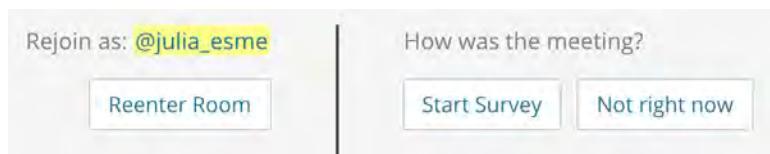
- Click Join Meeting to enter. You'll get a prompt asking you to confirm entry into the room.



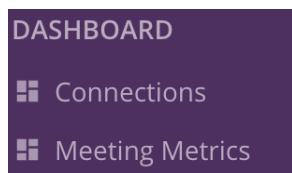
- Make sure your camera and mic are working. The first time you join a video meeting in Riff, you'll be prompted to allow camera and microphone access. Click Allow.



- While in the meeting, you can expand your screen to see more of your group members or shared document, or collapse your screen to see the channel text chat window by clicking the expand-collapse icon in the top right
- If you leave the meeting, you'll be given an option to re-join the meeting or view your meeting metrics



- After the meeting, look at your Riff metrics in the Dashboard by clicking the **Riff Metrics** channel on the left side of the Riff Edu page or explore your connections to classmates by clicking **Connections**.



That's it! Enjoy your meeting!

A word on privacy

Riff Video doesn't record any content. MIT research reveals that the pattern of communications between individuals and within a group are far more predictive of outcomes than the content. So Riff tracks who speaks, not what they say, to help optimise group performance while preserving personal privacy.

Troubleshooting

A number of external factors can influence Riff's performance. If you have trouble, try the following suggestions before you contact support.

- Check your internet connection, including the speed. Riff requires at least 3 mbps of upload and download speed. Search for "internet speed test" on Google to find utilities that test your connection speed.
- Close all unnecessary applications.
- Use Chrome. Chrome limits the frame rate of the video without significantly degrading picture quality.
- If you've tried these suggestions and are still having trouble, email oxfordsuccess@esmelearning.com.

Using Riff Metrics

Riff Edu provides feedback in two ways: During your video calls in the Meeting Mediator, and after your meetings on the Riff Edu dashboard. In the Meeting Mediator or on the dashboard, click the info button on any metric for details about what it measures and how to use it.

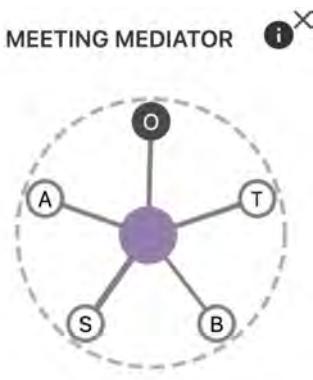
To learn more about Riff metrics, download [this document](#).

Meeting Mediator

The Meeting Mediator measures your conversations in real time and gives passive feedback to the group.

Use the Meeting Mediator to see:

- How the conversation changes as it's happening: The central node moves towards whomever is speaking the most. Consistent thick lines and close proximity to a single user indicates conversational dominance.
- If people are over- or under-contributing: Hover over a user node to see how much a person has spoken recently.
- How engaged participants are: Hover over the center node to see how many exchanges your group has had. A higher number represents a more energetic conversation, indicated by a darker shade of purple.

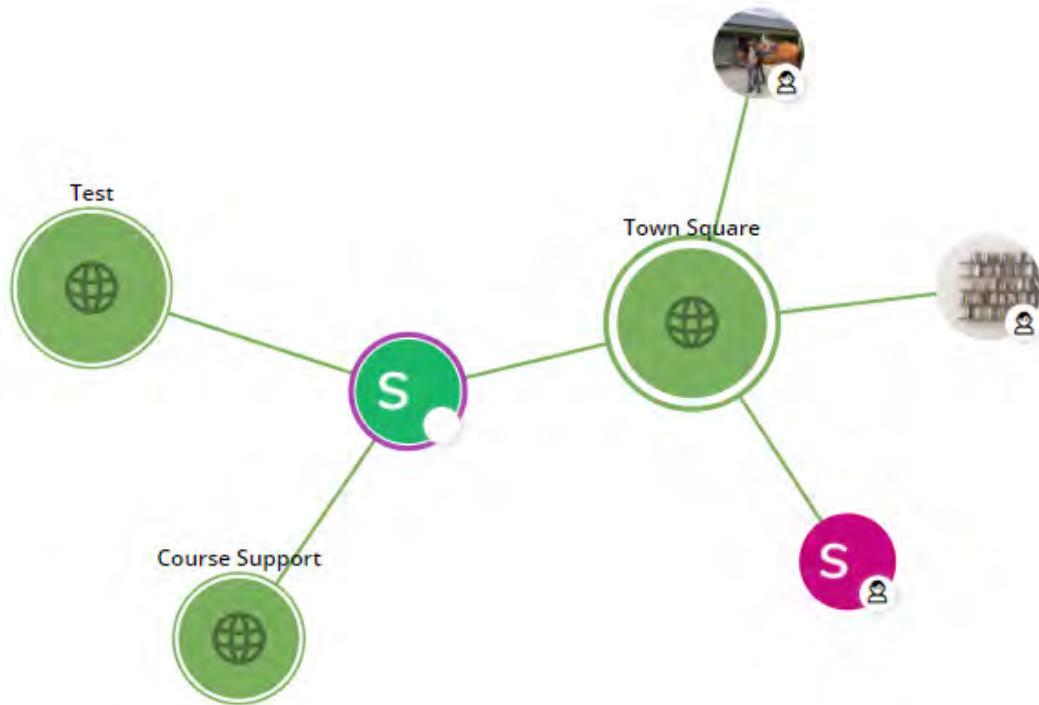


Dashboard

The **Connections** link from the Riff Metrics dashboard shows you how your connections grow over the duration of the programme, and **Meeting Metrics** provides data about each of your video meetings.

Connections

The network graph shows you how connected you are with your teams and others in the programme, and in which channels you are most active.



Meeting Metrics

After each Riff video call, Riff will display a set of metrics about the conversation. Use this data to see:

- How balanced your speaking time was - whether you or other group members dominate the conversation, or need to speak up more.
- Do you engage with each group member equally or if there are some individuals you have a relatively strong connection with.
- Information about your interruptions and interjections.
- Did your meeting have a lot of turn taking (Energy) and if your entire group was engaged for a majority of the time.



4.0 Welcome to the Oxford AI in Fintech and Open Banking Programme

4.1.1 Getting Started

Welcome to the Oxford AI in Fintech and Open Banking Programme!

You are embarking on a journey that is so much more than ordinary professional development. Using next-generation artificial intelligence (AI)-enhanced learning, you will gain actionable knowledge from experts in the field and build your professional network through engaging with other learners. Upon completing the **Oxford AI in Fintech and Open Banking Programme**, you'll receive a prestigious certificate and join a global network of e-lumni with access to opportunities and events through Saïd Business School, University of Oxford.

As you pursue this certificate, we are invested in seeing you upskill, develop, and succeed! Throughout the programme, you will have a dedicated success team supporting you and cheering you on. You will learn more about this team and the Oxford AI in Fintech and Open Banking Programme in the orientation.

Let's get started!

Goals for the Week

Remember, if in doubt, just use the < Previous or Next > buttons located at the top and bottom of the page. This will ensure you're accessing every lesson.

Goals for the week are to:

- Verify your **identity**.
- Accept the **Honour Code, Terms of Service, and Privacy Policy**.
- Understand **what you will learn** in the programme, and **how you will learn**.
- Document your **expectations** for the programme.
- Understand the **Capstone project**.
- Meet your **Success Manager** and **Tutor** and find out how to get support throughout the programme.
- Familiarise yourself with the **Riff Edu** collaborative platform.

Have questions? Need support? You can reach us at oxfordsuccess@esmelearning.com.

Faculty Video: Welcome to the Oxford AI in Fintech and Open Banking Programme

In this video, your Programme Directors, Pinar Ozcan and Martin Schmalz, welcome you to the programme and give you an overview of what to expect.



Welcome to our program on AI in fintech and open banking. My name is Pinar Ozcan, I'm a professor of Entrepreneurship and Innovation at Said Business School, University of Oxford. I'm also the academic director of the Oxford future of finance and technology initiative. Welcome learners also to the wonderful world of the University of Oxford where you'll meet top researchers and entrepreneurs working on wonderful ideas related to AI in finance and open banking. This is a program in which we will explore very important concepts related to AI such as machine learning, their uses within the world of finance, and finally how the financial sector is transforming through these new technologies.

As we explore these interesting topics, we'll take different perspectives, such as what an incumbent — large incumbent firm that wants to implement AI into its organisation both in terms of its products and processes must do, what challenges lie ahead, and what the firm can do in order to overcome these challenges. And of course, we'll also take the perspective of fintech ventures, and we'll explore what AI-related products they're trying to bring to the market, what challenges they face in the process, and how they can overcome them and bring more innovation into the financial sector.

We will also take the perspective of regulators and explore what they must do in order to allow data driven technologies to come into the market faster and smoother. Together with my wonderful partner in crime, Martin, our goal is for you to not just build an awareness of these critical concepts and changes in the world, but also to develop the tools in order for you to adopt AI in the financial industry. And of course, in the process we also want you to take advantage of the network that you're building as you learn.

You'll meet amazing other industry actors, you'll meet researchers, you'll meet entrepreneurs, both in front of the camera, but also in your group. We want you to take advantage of this network in order to push your ideas forward and implement them and create wonderful new products and businesses. Martin, over to you.

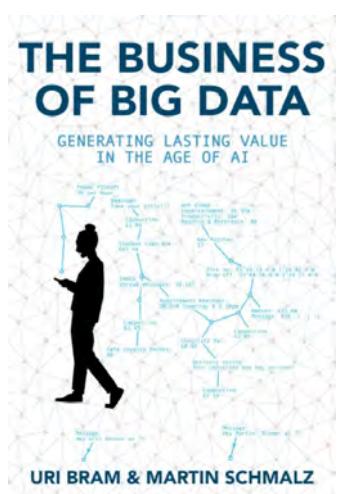
- Thanks very much, Pinar, and welcome to the program. I'm Martin Schmalz, I'm a professor in the finance unit at the Saïd Business School at Oxford. I'm German by birth, an engineer by training, and my PhDs in Economics from Princeton. Before joining Saïd, I taught for seven years at the University of Michigan before moving back over the pond and teaching at Saïd. I learnt AI and machine learning by force.

A few years back, I was a partner in a hedge fund that employed some of these technologies, and I needed to understand what was happening in the background and learn the engineering and the plumbing of it. But then I realised that the applications of the technology go far beyond making trading decisions and risk management decisions, but apply to pretty much all businesses combined. So I look for textbooks but didn't find good ones, so I wrote one. It's called The Business of Big Data. It's written in a popular rather than academic style, and I hope it's fun and easy to read.

I'm very excited to have you in the program and can't wait to hear about your experiences with data driven business models — ML and AI — and how it shapes your industry and your firms. So why did we create this program? I started teaching machine learning and AI to a business students a few years ago because I felt it was negligent not to. I feel strongly that not employing students with some understanding of the technology behind AI and the economics of AI driven business models would be a death sentence to having a successful career in financial services and frankly elsewhere as well. Good luck with the program, and I very much hope you enjoy it.

Additional Reading

If you want to dive a bit deeper into applying big data and AI, Programme Director Martin Schmalz has published a book on the subject that is available on Amazon, [The Business of Big Data: Generating Lasting Value in the Age of AI](#). Purchasing this book is not required for completing the programme, but it will give you deeper insight into the topics we are covering.\



4.1.2 What Oxford AI in Fintech and Open Banking Will Cover

What the Programme Will Cover

The Oxford AI in Fintech and Open Banking Programme is designed and built to give participants the knowledge and insight they need to analyse and strategise AI solutions. In this six-week, hands-on, project-based programme, you will:

- Examine the potential and power that AI can bring to the financial services industry.
- Learn to think strategically about AI and understand the business impact as access to financial data becomes more open.
- Explore what is happening in regions that are leading the way in Open Banking.
- Develop a deep understanding of the AI-driven data economy and how it is impacted by Open Banking.
- Be guided through your own AI-enabled Capstone project where you will develop your own AI solution.

Programme Learning Outcomes

At the end of this programme, you will be able to:

- Recommend an AI solution to a challenge in the finance industry.
- Formulate a strategy to deal with data privacy, data bias, and data access issues for an AI solution.
- Develop a plan for launching an AI solution inside an organisation.
- Evaluate the benefits and risks of the platform model in financial services.
- Explain how AI and Open Banking promote innovation throughout the market, which can benefit both financial institutions and consumers.

4.1.3 Your Capstone Project

Overview: Capstone Project

Group Work

Starting in Module 1, you will work with a group of your peers to complete a Capstone project. You and your group will identify an existing problem in your businesses that could be solved by AI. You will then create a recommendation on how to implement an AI solution to solve the problem. Week to week, you will meet with your group to complete exercises together that will lead into the final Capstone project in Module 6. This will allow you to get feedback along the way from the programme tutors as you develop your ideas.

Each week, a group exercise will build toward completing your Capstone project:

Module	Group Exercise
1	In preparation for the group work you will be doing in this programme, you will complete a short exercise where you will get to know the strengths and personalities of your group members in order to create an effective group dynamic.
2	The group will identify a few problems in their businesses that could potentially be solved using AI, and will choose three use cases to focus on for the Capstone project.
3	The group will consider the scope and feasibility of each of the three uses cases identified in Module 2.
4	The group will weigh the value of AI-analysed data versus that which is analysed by humans, and determine which of the three use cases would be the best—and most cost-effective—option to implement for their AI project.
5	The group will consider the legal and ethical issues with their AI project and formulate a viable strategy to deal with these issues.
6	The group will pull together all the work that was completed in Modules 2–5 and use it to prepare a presentation (slide deck and video pitch) recommending their AI project to internal stakeholders.

Faculty Video: Capstone Project

In this video, your Programme Director, Martin Schmalz, introduces the Capstone project you'll work on throughout this programme.



In this programme, you will be working in teams to complete a Capstone project. You and your team will identify an existing business problem that could potentially be solved using AI. And you will work together to create a recommendation on how to implement your AI solution.

As you work through the modules in the programme, you will complete a team assignment each week to help you develop your ideas. You'll start in Module 2 by brainstorming problems in your business that could be solved using AI and by choosing three use cases to focus on. In Module 3, you'll narrow your project scope by answering key questions around resources, data, and prediction, and around what it takes to get a machine to make predictions, rather than a human.

In Module 4, you and your team will weigh the value of data analysed by AI versus data analysed by humans. And you will determine which of your use cases would be the best, most cost-effective option to implement for your business. In Module 5, you'll discuss issues around data privacy, data bias, and data access for your

proposed AI solution. And you'll formulate a strategy to deal with each one of these issues. And, finally in Module 6, you will submit a brief video pitch to present your solution.

Working through your Capstone project is a great way to build collaboration skills and apply what you've learnt in the programme to real-world business problems. We hope you will find the experience rewarding.

4.1.4 How You Will Learn

Guest Video: Pedagogy

In this video, Beth Porter, President & COO of Esme Learning Solutions, describes the various ways you will learn in this programme, including reinforcement exercises, a collaboration that consists of peer learning and exercises with your group, and experiential learning modelled on real-life scenarios.



In this video, I'll be talking about some of the pedagogy that guides this course. This programme is based on cognitive science to help you remember concepts long after the programme is over. We use techniques such as reinforcement learning, collaborative work, peer learning, and experiential learning to guide the development of our exercises.

You will work repeatedly in peer groups on real-world problems that mimic workplace conditions, such as time simulations, in order to help you develop relationships and build communication skills.

When people watch videos or read materials online, they tend to forget concepts very quickly. We use reinforcement learning to let you apply what you have watched, heard, or read immediately. You will then have a much higher likelihood of remembering it later and being able to apply it to your work scenarios.

We also incorporate topically relevant, realistic activities into the course, like those you're likely to encounter at work. Whether you're working through an interactive simulation, putting together a case study, or preparing for a group presentation, you'll get to experience things collectively with other course participants, and you'll be able to practice skills like immediate application of concepts, communications, and team building.

The Esme approach combines lessons from peer-reviewed research in cognitive and neuroscience on such topics as attention span, varied practice, memory and retention, activity-based learning, scaffolding, and worked examples. These approaches result in better learning experiences and lead to better outcomes.

4.1.5 Live Event Information and Registration

Attend the (Optional) Live Online Kick-Off Event

We would like to formally invite you to the Oxford AI in Fintech and Open Banking Programme Kick-Off Event, occurring on **Thursday, 9 June, 2022** from **12:00 to 13:00 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

The optional but recommended online live kick-off event will:

- Welcome you to the programme.
- Introduce you to the key members of your support team.
- Allow you an opportunity to connect and network with other learners in the programme.

[Registration](#) is required to attend. Once you register, you will receive an invitation with your unique URL to join. The event will be recorded for those who are unable to attend. We hope to see you there!

Attend the (Optional) Live Mid-Programme Q&A Event

Academic Programme Directors Pinar Ozcan and Martin Schmalz will host an Oxford AI in Fintech and Open Banking Programme Live Q&A Event, occurring on **Thursday, 7 July, 2022** from **12:00 to 13:00 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

In this optional-but-recommended online event programme faculty will answer questions we've collected in the Riff Edu platform.

[Registration](#) is required to attend. Once you register, you will receive an invitation with your unique URL to join. The event will be recorded for those who are unable to attend. We hope to see you there!

5.0 Programme Requirements and Grading

5.1 Requirements and Grading

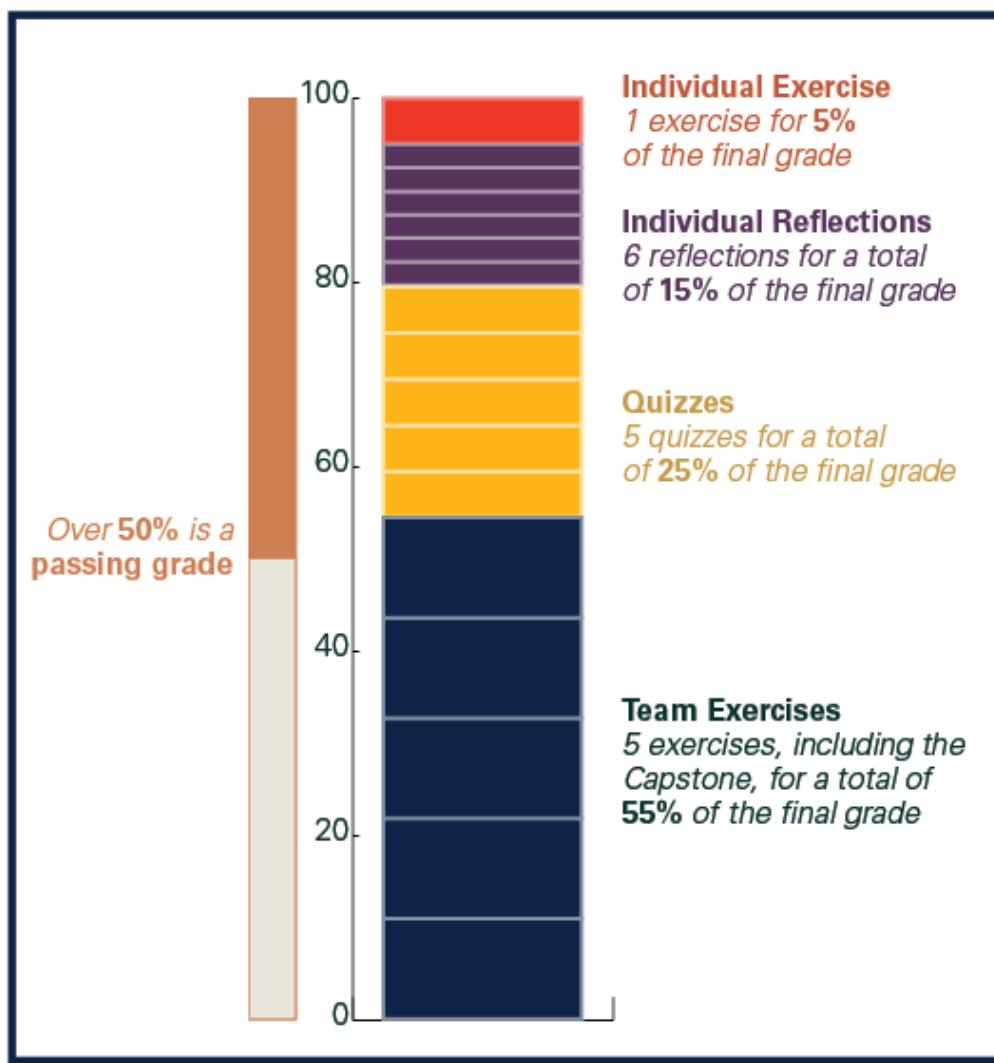
Programme Requirements

Your participation in the periodic quizzes and written reflections is required.

Throughout the programme, you will also find optional discussion questions and prompts, which are not required but are encouraged.

As part of this programme, you will work with your group on a Capstone project. The Capstone is to be a proposal for a new product or service that addresses one or more of the fintech challenges discussed in the programme.

Each week, a group assignment will build towards completing your Capstone project.



Grading

The following table shows how grading is calculated for the programme. You can see your grades in the **Progress** tab.

Group Exercises 5 exercises for a total of 55% of the final grade (Plus 1 non-graded building group dynamics exercise)	Longer essays (1,000 words or fewer) or other content, created in collaboration with your group. Submitted in Modules 1–6. The Capstone project is a culmination of the group exercises, and submitted as a video and presentation in Module 6. Group exercises are graded by programme tutors. Assignments will be returned with tutor feedback and a grade (0% to 100%) one week after they have been submitted.
Quizzes 5 quizzes for a total of 25% of final grade	Answers to questions about key concepts and takeaways. Submitted in Modules 1–5. Answers are automatically graded.
Individual Reflections 6 reflections for a total of 15% of the final grade	Short essays (200 to 300 words) that allow you to reflect on, and put into your own words, the content of the module. Submitted in Modules 1–6. Programme staff review your reflections. You are not graded on the specifics of your reflection; you are graded on whether you submitted a response that shows thoughtfulness and a reasonable effort, for which you can receive: <ul style="list-style-type: none">• 5 points (100% for the assignment) for a full effort.• 3 points (60%) for a partial effort.• 0 points (0%) for no submission.

Individual Exercise	Short essays (200 to 300 words) in response to prompts.
1 exercise for 5% of the final grade	Submitted in Module 1. Exercises are graded by programme tutors, and feedback is provided.

For you to pass the programme and receive a certificate, your final score must be at least 50%.

The 50% pass rate does not mean that this is easier than the equivalent US course. In many (but not all) US institutions, a 70% grade is a “C” or “D” and is a low passing grade. Different systems are used across the US. In the UK, the passing grade in many (but again, not all) institutions is 50%, and 70% is considered an “A”.

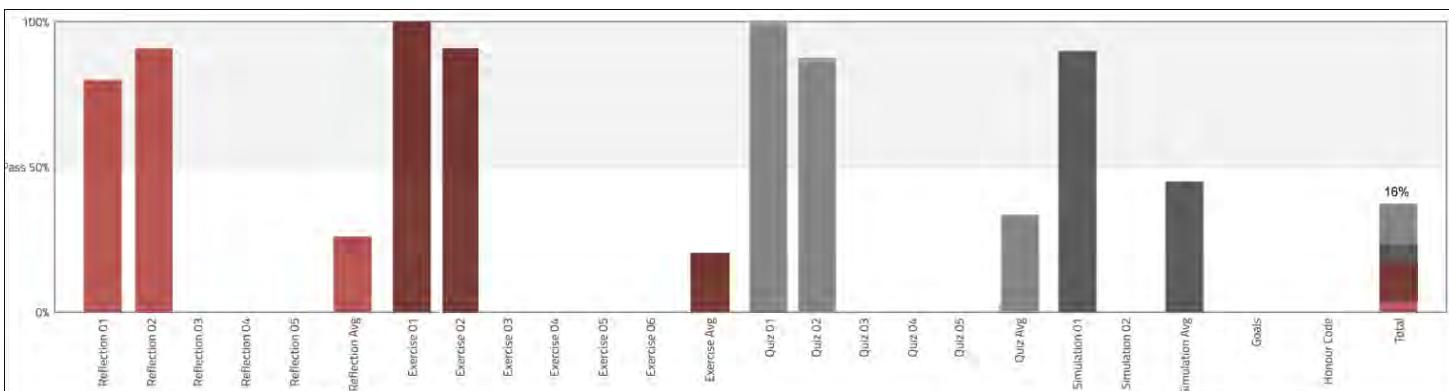
This does not mean one system is harder than the other—it just means that grade is awarded on a different scale. If you took the same class in the US, for example, a passing grade could 70%; in the UK, it could be 50%.

Viewing Your Grades

You can see your scores for graded assignments on the **Progress** page. The **Progress** page contains a chart of all graded assignments in the course. (Ungraded assignments, such as Knowledge Checks, are not shown in the graph, but are listed beneath it.)

You see the score for each graded assignment you have submitted. Note that the scores are grouped by type of assignment (Reflection, Exercise, Quiz), not by the sequence in the programme. Each bar shows your score on that assignment, from 0% to 100%. In this programme, each assignment is worth 10 points; therefore the bars will show scores in 10% increments.

In the following example, the learner has completed different assignments: the Reflection, Exercise, and Quiz through Module 2.



The “average” for each type of assignment and “Total” column at the right end of the progress chart are **additive**. This means that the “average” and “Total” columns reflect those amounts as if all assignments (whether completed or not) are graded. The Total column is calculated based on the weighting of the different types of assignments, described in the table above.

When the total score goes over the **Pass** line (50% in this programme), you have earned a certificate.

Interpreting Your Progress Page

Below the **Progress** graph, you’ll see a breakdown of the entire programme. This breakdown lists every single section in the programme, and lets you know which sections have assignments:

- A section that says “No problem scores in this section” has no assignments.

Module 1: Introduction to Fintech

1.1 About Module 1

No problem scores in this section

- Practice scores represent Knowledge Check problems. They are scored but do not affect your grade. You’ll see whether or not you attempted these, and how you did.

1.2 Foundations of Fintech I (0/1)

Practice Scores:

0/0 0/0 0/0 0/1

- Problem scores represent the quiz and written assignment scores that count toward your final grade. You’ll see whether or not you attempted these, and how you did.

1.10 Quiz (0/13)

Quiz due Nov 10, 2020 18:59 EST

Problem Scores:

0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1

Note: Scores for tutor-graded assignments, such as the individual exercise and group exercises (not the individual reflections), will appear on your **Progress** page by the Wednesday a week after the assignment due dates. Feedback for group assignments will be provided in your group’s Riff channel. Feedback for individual assignments will be emailed to you.

6.0 Resources and Quick Help

Orientation Recap

In this orientation, you learnt:

- About the expectations for learner behaviour in the programme.
- How to navigate the online programme.
- About the content and pedagogy in the Oxford AI in Fintech and Open Banking Programme.
- How to use Riff to meet with your peers through chat and video.
- Ways to get support throughout the programme.
- About the Capstone project.

We hope you are looking forward to diving into AI in Fintech and Open Banking in Module 1.

Downloads

[Orientation Module Content](#)

[Honour Code](#)

[Terms of Service](#)

[Privacy Policy](#)

[Learner Handbook](#)

Quick Help

You may reach your Success Manager by emailing oxfordsuccess@esmelearning.com.



Module 1: Introduction to AI and Data Basics

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford Artificial Intelligence in Fintech and Open Banking

Module 1: Introduction to AI and Data Basics



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1.1 About Module 1

1.1.1 Overview

Overview

Welcome to Module 1 of the AI in Fintech and Open Banking Programme!

This week, we will examine the rise of artificial intelligence (AI), and explore how it has transformed companies across a number of diverse sectors—sending the valuations, market share, and consumer bases of those firms that have most successfully harnessed it skyrocketing. In particular, we will focus on machine learning (ML), the now ubiquitous subset of AI that is responsible for powering many of the most commonly used AI applications, including voice assistants, facial recognition, and product recommendations.

We will look at how the falling prices in big data and processing have fuelled the use of ML, and how ML is revolutionising financial services by turning data into valuable predictions. Finally, we will delve into how data-based decisions are already changing consumer behaviour, and the benefits and challenges that the financial world faces as AI is more widely adopted.



Faculty Video: Introduction to AI and Data Basics

In the following video, Professor Pinar Ozcan shares what to expect this week.



Welcome to Module 1, where we will introduce you to the basics of data and AI in finance. In this module, we will talk about how data is becoming the new gold in the financial sector, how AI based services based on this data are being unleashed and they are changing the world of customers and the financial services that they can enjoy. And we will also understand the basics of AI and differentiated from machine learning and deep learning. When we talk about AI in finance, it's important to understand not just the opportunities, but also the limitations of it and understand also how it can complement human intelligence.

What are some of the AI based services that are going to change the world of consumers in financial services? We're going to be exploring all of that in this module.

Objectives

At the end of this module, you will be able to:

- Differentiate between the use of machine learning and AI in the banking industry.
- Describe how data-based decision-making affects end consumers, data availability, and data governance.
- Recognise the ethical dilemma of data availability and data governance.

Graded Assignments

You will complete individual and group assignments, which count towards your completion of the programme. This week, you will:

- Explore how machine learning and/or AI could be implemented in your own organisation.
- Complete a quiz on the module's content and key takeaways.
- Reflect on what you have learned this week by applying it to your personal or professional experiences.

You must submit all graded assignments in Module 1 by **21 June, 2022, 23:59 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

Additional Activities

In each module, we present additional activities related to the core learning. This week, you will:

- Discuss how Yolt, the money management smart app from Dutch bank ING, uses AI to understand a consumer's spending habits and help them stay focused on their expenses and saving goals.
- Meet with your group in the Riff platform to complete an ungraded group exercise ahead of starting on your Capstone project in Module 2. See 1.8 for more information. We suggest you start a discussion in your small group channel soon to identify possible times for a 1-hour meeting this week.

Vocabulary Check

The terms below are industry-specific terms that appear in this module. Before beginning the module, check your knowledge of these words, and, if you need to, review the definitions in the programme glossary.

[algorithm](#)

[fintech](#)

[incumbent](#)

Time Commitment

Plan to spend seven to ten hours on Module 1 this week. As there is a lot of reading material, and many videos, you might want to divide up your work into several sessions. The module is broken up into sections by theme, giving you potential break points.

Make sure you plan time to meet with your group and to complete the assignments.

1.2 Introduction to AI

1.2.1 The Data Business

Section Objectives

In this first section, we begin to explore the competitive advantage of harnessing data using AI techniques, which Professor Martin Schmalz refers to as “the business of big data”. We demystify what AI is, and examine how machine learning is used to inform the decisions of AI.

The Business of Big Data

Readers of the business press, and especially of technology stories, will be familiar with this scenario: out of nowhere, a little-known tech startup, sometimes only months old, will raise what appears to be a baffling amount of venture capital for an unknown and untested business, with no revenues. Take, for example, the Berlin-based startup Gorillas. By the end of March 2021, within a mere nine months of launch, the fast grocery-delivery startup, which promises to deliver an order within 10 minutes, had raised €245 million (Partington & Lewin, 2021). Added to an earlier round of €36 million, the total funding was enough to propel Gorillas to the mythic status of tech unicorn, reserved for those startups whose valuation has reached one billion dollars.

Gorillas CEO and founder Kağan Sümer said in a statement:

We have a simple goal: to change the game in the grocery retail market, which has been slow to implement new and speedier technological solutions. By effortlessly enabling immediate access to fresh and healthy food at retail prices, we essentially simplify the process of doing groceries.



Detractors may not see the need for 10-minute grocery delivery, but Gorillas, should it succeed, won’t just upend the business models of incumbent supermarkets and their digital-only rivals—the company could impact the food supply chain as well. Its investors are placing their bets behind the startup’s ability to digitise the grocery shopping experience and to set in motion a flywheel of data capture, deep analysis, prediction, and automated decision-making that continuously learns and adapts, helping the company make faster, cheaper, and better decisions that will let the business scale quickly.

In the data business, the story of the venture-fuelled, rocketing startup has played out over and over again for the last two decades, from one strikingly different sector to another, spawning businesses from challenger banks to scooter-sharing startups, from food delivery firms to smart bicycle and fitness platforms. In 2000, for example, SoftBank backed a little-known Chinese ecommerce startup called Alibaba with an early investment of US \$20 million—a stake that in 2020 was worth US \$150 billion

(Alpeyev & Hyuga, 2020). Alibaba would go on to become one of the world's most successful data businesses and would spawn numerous other businesses, including one of China's dominant payment apps, Alipay. Alipay would in turn lead to more financial services products, now under the Ant Group umbrella.

1.2.2 Machine Learning and AI

Machine Learning: Powering Routine Prediction to Extraordinary Profit

The ambition of these startups is made possible by a dramatic fall in the price of big data and computation power, as well as the use of AI—and in particular, by the subset of AI called machine learning (ML). Machine learning powers the vast majority of the most common AI applications used by billions of people around the world today. It's what helps autocorrect messages on smartphones, suggests the next movie to watch on Netflix, serves up products a user might want to buy on Amazon, or enables Siri or Alexa to carry out a voice command. In the financial services industry, ML-driven algorithmic trading has surged, in part to help traders deal with market volatility (McDowell, 2021). It's also what has helped propel the likes of Meta (formerly Facebook), Google, Amazon, Apple and Tesla to the ranks of the most valuable companies in the world.

Machine learning's "intelligence" is in routine prediction, or finding underlying patterns in large and complex data sets where past data consistently predicts the future, and in its ability to continuously learn and adapt (Schmalz & Bram, 2019; Candelier et al., 2020). In *Prediction Machines*, authors Ajay Agrawal, Joshua Gans, and Avi Goldfarb note that prediction takes the information you have, or past data, and turns it into information you don't have (2018).

Extraordinary value is being created as routine prediction has become exponentially cheaper. Cheaper means that more problems—from the most mundane to the seemingly impossible—are being scrutinised as a prediction problem. Take transportation. As Agrawal, Gans, and Goldfarb note, the ability for autonomous vehicles to exist outside a controlled, predictable environment was impossible until engineers boiled navigation down to a single prediction problem: "What would a human do?" Now, the authors note, billions of dollars are being invested into training machines to drive autonomously on city streets and highways (2018, pp. 14–15).



According to Marco Lansiti and Karim R. Lakhani in *Competing in the Age of AI*, however, the true power for businesses lies in turning these predictions into the "AI factory", or the "scalable decision engine that powers the digital operating model of the twenty-first century firm" (2020, p. 53). If the corporate giants of the twentieth century owed their dominance to their expertise in industrialising mass production, the data businesses of the twenty-first century, the authors note, will owe their success to their ability to industrialise AI—to turn data gathering, analytics and decision-making into

a factory that bypasses humans completely. For example, human dispatchers don't assign cars and riders on Uber or Grab; humans do not choose the content served up to Facebook users, and humans do not select products to recommend on Amazon. The processes are completely digitised and the decision-making has been turned into an automated, industrial process, changing the very way the firm operates, and completely upending the competitive dynamics of its sector. While they may operate in different sectors, Uber, Grab and Facebook are all data businesses, and it is their data, and ongoing ability to collect new data to parse, execute and learn from that has pushed their valuations ever skyward.

Faculty Video: Machine Learning

In this video, Professor Martin Schmalz explains machine learning and how it is used to provide predictions, which drive the decisions of AI technology. He also introduces a subset of machine learning called deep learning.



So what is machine learning, and how is it used to make predictions? Let's demystify this a little. You can think of machine learning simply as a subdiscipline of statistics. It's a tool to describe and analyse large data sets. In particular, machine learning can be used to make predictions. Now, what does that mean? By contrast to the colloquial use of the word, machine learning predictions are not necessarily about the future. They are not necessarily forecasts. Instead, the goal can be to predict the present. And what does that mean? Think of it as simply making educated guesses.

Say you're looking at a data set describing all kinds of features of a man in his mid-30s. Living in Brooklyn, no children, who goes to a yoga studio every morning at 6 o'clock. You might guess that this person is more likely than the average to be interested in the vegan restaurant that just opened around the corner. Not because there's some deep underlying theory of human behaviour behind machine learning, but simply because it tends to be true on average for people with these characteristics. And that insight is useful among other reasons, to target advertisements.

Or, take another man this time in his mid-40s, who lately displays an increased likelihood to go to bars on Friday nights in the neighborhood. You know that from his cell phone location data. And after the bar, the cell phone tends to be in another person's home for a few hours. This person is likely to need a divorce attorney soon and is more likely to default on his loans. And I'm not trying to be funny here. These are inferences actually made by tech companies already using the data that is available. So that's machine learning.

How are these machine predictions then used to power Artificial Intelligence or AI? Machine learning technically is a subset of AI, but the distinction I make is whether the machine predictions help human decisions? Or whether the decisions are automated as well? In which case, I call it AI. So, for example, Facebook's machine learning algorithms make predictions about which persons are in the picture you just uploaded. It becomes AI when Facebook also automatically tags the photo with the names of these people. That is, it uses a prediction about who it thinks is in the picture to make a decision, namely labeling the picture as well.

Or, and financials, a machine learning algorithm makes loan default predictions using a variety of characteristics or features. But it becomes AI, when the loan-granting decision, is also made by a computer.

And that distinction is very important because it determines how well a particular business model scales. It scales a lot better when not only the predictions are fast, cheap, and of high quality. But when in addition, the decisions are automated, and simply no human beings are involved.

Now, deep learning is one particular subset of machine learning algorithms. That's particularly useful for very clearly defined tasks in narrowly defined, controlled environments, where huge amounts of data are available. Think playing chess. So technically, deep learning stacks layers of non-linear transformations on top of each other and then makes predictions based on both the original features and the transformed variables as well.

That makes it particularly good at detecting non-linear relationships in the data. That's useful, for example, in image recognition. So is this a storefront, or is it a fire hydrant in this picture? By contrast, it's not necessary and often not even useful to make out of sample predictions in a lot of commercially successful applications today, where lower-tech, less energy-consuming, and less data-intensive machine learning techniques are used.

1.2.3 Demystifying Machine Learning

Faculty Video: How Does Machine Learning Work?

We will now join Professor Martin Schmalz as he takes a deep dive into how machine learning works from the technical side. Below this video is a link to the coding environment Professor Schmalz used in the video, so you can follow along and explore the technology for yourself.



In this lesson, we're going to take a look at a simplified version of the machine learning application to really understand how it works.

Here we have a code sample that uses a bank loan account records as training data, and you will see how the application learns how the data points correlate with each other. For example, if an account holder is of a certain age, she's more likely to have a certain salary than account holders who are significantly younger. So the application can use that correlation to make predictions.

In the example we're going to look at we will be predicting an account holder's credit rating based on other information about him or her. For this exercise we're going to use something called a Jupyter Notebook. The notebook lets you run code, modify it and reset to the original state if you need to. We'll walk you through to manipulate the code in this video, and then I encourage you to try it yourself.

For each block of code below, we provide a brief explanation. You need to run each code block in sequence to execute the program. Running a code block is easy. Just select it then click the Run button in the toolbar. Note that if you change any code and then get errors, you can always start over. Just go to the Actions menu in the upper right and select Reset Assignment.

In the first code block we import all the necessary libraries and packages to build our program. To do this, select

the code block and click the Run button. Now we're going to load the training data from the CSV file listed in the first line. This sample training data contains loan records, including the credit amount, the account holder's age and the account holder's credit rating. After we load the training data, the program will analyse the relationships and patterns between the different data points. Then, having been trained, the program will be able to make predictions, as we will see next.

So let's go ahead and load the data. To do this, you're going to select the block and click the Run button. Now, the data is loaded and displayed in a table, as you can see here. To simplify this exercise we're going to run the code block below to see the first 25 records of the training data. If you like, you can change the number within the parentheses and run the code block again to see a different set of the training data. You might want to change the variables used in later code blocks. If you do this, just remember that the names of variables must exactly match the column names in the training data. To see the column names in the training data, run the following code block.

Now we will predict the credit rating of an account holder based on his or her savings amount and credit history. But first, we're going to run the following code block to see how many account holders out of the 1,000 applicants in the training data had a good credit rating of 1, and how many had a bad credit rating of 0. Next, we're going to run the next code block to tell the program to use an account holder's savings and credit history for the prediction model.

You can always come back to this block and change the variables used to build the model. To change the variables, change the column name values in brackets. Be sure to use the exact names of the columns listed in step 4. If you do decide to come back to this step and change the code, you will need to run each code block below in sequence to get results that reflect your changes.

Run the following code block to tell the model to predict the account holder's credit rating based on the variables you specified in the previous code block. You can also come back to this block and change the variable to predict. To change the predicted variable, change the column name value after the period, such as 'y = credit_data.Credit_rating'. Be sure to use the exact name of a column listed in step 4. If you come back to this step and change code, you must run each code block below the changed code block in sequence to get results that reflect your changes.

Run the following code block to build the prediction model. Run the following code block to see credit rating predictions for the first 10 account holders in the training data. You can change the number of accounts that predictions are made for by changing the number in parentheses.

Now it's time to review our results. Note that the predictions are decimals, while the real values of 'credit_rating' are one and zero. The closer the predicted value is to one or to zero, the higher our confidence level in the prediction made by the application. Scroll back up to step 3 to see if the program's predictions were accurate, by comparing the prediction to the actual value in the credit_rating column for that account.

The program was originally set up to predict credit rating based on account holders' savings and credit history. We encourage you to experiment with this application on your own by changing the variables used to build the model, as well as the variable to predict. To change the variables used to build the model go to step 6 and change the column name values in brackets such as 'savings', 'credit_history'. Be sure to use the exact names of the columns listed in step 4. To change the predicted variable go to step 7 and change the column name

value after the period, such as 'y = credit_data.Credit_rating'. Be sure to use the exact name of a column listed in step 4. Again, remember that if you go back and change code, you must run each block below the changed code block in sequence to get results that reflect the changes.

We hope you find this exercise useful in understanding how machine learning works in the real world.

1.2.4 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Financial institutions of all types constantly produce massive transactional data sets that provide insight into their customers, and banks can leverage this data to predict customers' future behaviours.
2. Machine learning's "intelligence" is in routine prediction, or finding underlying patterns in large and complex data sets where past data consistently predicts the future, and in its ability to continuously learn and adapt.
3. The data businesses of the 21st century will owe their success to their ability to industrialise AI—to turn data gathering, analytics and decision making into a factory that bypasses humans completely. In these businesses, the processes are completely digitised and the decision-making has been turned into an automated, industrial process, changing the very way the firms operate, and completely upending the competitive dynamics of their sectors.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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1.2.3 Demystifying Machine Learning

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Optional Resources

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For AI, data are harder to come by than you think (Economist, 2020): <https://www.economist.com/technology-quarterly/2020/06/11/for-ai-data-are-harder-to-come-by-than-you-think>

How to Win with Machine Learning (Ajay Agrawal, Josh Gans, and Avi Goldfarb, 2020): <https://hbr.org/2020/09/how-to-win-with-machine-learning>

Gorillas, the on-demand grocery delivery startup taking Berlin by storm, has raised \$44M Series A (Steve O'Hear, 2020): <https://techcrunch.com/2020/12/11/gorillas>

1.3 Examples of Data Businesses

1.3.1 Examples of Data Businesses Overview

Section Objectives

In this section, we will examine the social video app TikTok and the car maker Tesla, and consider how AI and data have been used in each of these companies to help them dominate their market. These organisations are not financial services companies, but they offer up good lessons to any startup looking to use AI and data to their advantage. We'll also examine Google's purchase of Fitbit, and how regulators and detractors worry that Google's purchase was a play for the trove of personal data that Fitbits collect—and that Google could easily monetise.

Faculty Video: Examples of Successful Data Businesses around the World

In this video, Professor Pinar Ozcan introduces some of the examples of data businesses that will be covered in this section.



Before we dive into what AI can do in finance, it's important to consider some good examples of data businesses that have swept the world in terms of their success. We will consider two of these examples in this module. The first one will be TikTok, which is a company that has built its algorithm in just a few weeks and today can count with 700 million users per month for its videos. The main success of TikTok comes from its ability to match the right videos with the right users. We will dive into this case and see what data businesses can do in terms of going viral in the world.

The second powerful example of a data business that is changing the world is Tesla. Tesla is known as the maker of the vehicle that will be the first autonomous vehicle in the world. It already can drive on the streets in some places in the world. What is powerful about Tesla is its extreme ability to turn data into a successful algorithm that is safe enough for someone to be in the car and go safely from one place to the other, even safer than if a human would drive that car. It is considered to be the future of transportation, and it is important for us to understand what makes Tesla so successful today.

1.3.2 TikTok

Quick Fact

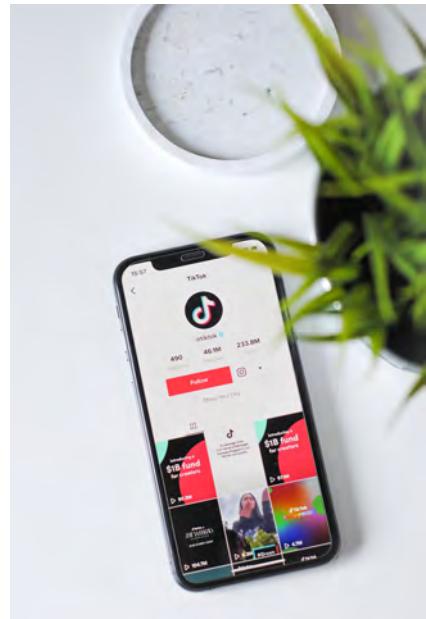
According to *CB Insights*, the top 50 creators on TikTok have a follower base larger than the combined populations of Mexico, Canada, the UK, and Australia (CB Insights, 2020).

TikTok

TikTok, the Chinese social media app that lets its users create, watch, and share short videos, is one of the world's most viral apps, with over one billion active users (Iqbal, 2022). The app, highly popular with the young, is owned by private Chinese tech company ByteDance, which founded a similar service called Douyin in China in 2016. That app, built in 200 days with an eight-person team, managed to amass 100 million users within its first year, with more than one billion video views a day (Graziani, 2018). To capitalise on this success, ByteDance decided to take Douyin global. In 2016, the company bought another Chinese music video sharing app, Musical.ly, folded this app into the company, and launched TikTok to global audiences in 2017 (CB Insights, 2020). Today, TikTok's success has made its owner, ByteDance, the world's most valuable private company, said to be valued as high as US \$250 billion—worth more than Exxon Mobile or Coca-Cola (Chen et al., 2021).

TikTok owes much of its rapid growth and its addictive user experience to its powerful content recommendation algorithms. Much like those that power YouTube or Facebook, these algorithms predict what users want to view next. But as Bloomberg notes, TikTok goes beyond Meta or Snapchat in its use of AI and the data points it considers, ranging from what websites users are browsing down to the patterns and rhythms of how a user types (Chen et al., 2021).

Additionally, TikTok's algorithms don't stop at just recommendations on what to watch. They also suggest what content to create, serving up suggested challenges, hashtags and memes that users can copy. The result is that the app's highly engaged user base of young people (60% of US TikTok users are 16–24) spends on average 52 minutes a day on the app, on par with Instagram (53 minutes) and Snapchat (50 minutes) and outpacing YouTube (40 minutes) (CB Insights, 2020).



TikTok's parent company earns most of its revenues through advertising, again powered by AI; in 2020, ByteDance expected to amass around US \$27 billion in ad revenue from its businesses in China (Zhang & Dotan, 2020; Zhu & Yang, 2020). While the company expects TikTok's US revenues to amount to a mere US \$500 million, as CB Insights notes, "One way to think of ByteDance is not so much as a creator of content platforms, but as an artificial intelligence laboratory that specialises in developing algorithms that can match users with content, from video and music to news and e-commerce" (2020).

1.3.3 Tesla

Quick Fact

According to *Forbes*, the Tesla Model S is "so structurally sound, that the NHTSA's roof crush resistance testing machine actually broke when they tried to test the Model S under it" (Dua, 2013).

Tesla

Though Tesla sells a variety of sustainable energy products, the company is best known for its popular electric vehicles (EVs) and Elon Musk's vision to get those cars to drive autonomously one day. Since Tesla launched the Model 3, the least expensive of its EVs, the company has captured a 58% and growing share of the US EV market—and in the process, as the *Financial Times* notes, “turned 112-year-old GM into an underdog” (Bushey, 2021).

How? Instead of thinking of itself as a mere car maker, Tesla has positioned itself as a tech company—one that prizes data first and foremost, and uses big data and AI to inform refinements in its products, what product lines it might pursue, and even completely new business lines. Each vehicle that Tesla has sent out since its earliest days has been equipped with sophisticated sensors and computers to collect data. Vehicles collect location data, and thus hold valuable information around where consumers live, work, shop, and eat—even about whether they do school pickups or go to church.

Not only that: The vehicles also collect information on how operators drive. Does the driver speed? Brake often? Take overly wide turns? Furthermore, the vehicles collect short videos on the external environment of the car to better recognise objects and obstacles. All of this data gives Tesla a growing advantage as it builds towards its goal of autonomous vehicles. In an earnings call, Elon Musk said, “Every time the customers drive the car, they’re training the systems to be better. I’m just not sure how anyone competes with that” (Musk, as quoted in Muller, 2019). The company could also potentially use this valuable data to sell auto insurance. This is just some of the data that Tesla collects. Because the company also offers financing for their cars, it most assuredly collects customer data when providing loans.



Faculty Video: AI in Insurance (Tesla Example)

In this video, Professor Martin Schmalz talks about how Tesla may one day sell you not just your next car, but the insurance you'll need to drive it.



One particular illustration I like a lot might be in the insurance business. Insurance traditionally has two problems. One is moral hazard and the other one is asymmetric information. What does it mean?

Moral hazard refers to the idea that once I give you insurance, your behaviour changes. If you take out full insurance when getting a rental car, you might just take a little bit less care of where you park it, how fast you drive it, because it's somebody else who's paying for the damage.

Asymmetric information refers to the question of which potential applicant for an insurance product has higher risk, right? So younger people tend to cause more accidents in driving than older people. But of course, with enough data, you could make individual-level forecasts of the riskiness of a particular driver.

Suppose you had the data of how aggressively a driver accelerates and brakes, how close the driver drives to the car in front of her, that would be rather interesting data to use to predict future accidents and therefore the costliness of having that individual in your insurance pool. And think about it. Who has the data to do that? Of course, Tesla is a forerunner here. No company has more data on driver behaviour and therefore a huge head start in being able to price insurance products.

So I would not be surprised if Tesla will soon offer insurance products, in particular car insurance. In fact, Tesla already bought an insurance company and with that a certificate to be able to operate one.

1.3.4 Google's Fitbit Acquisition

Google's Fitbit Acquisition

We've looked at two good examples of businesses that have successfully used AI. Now, let's take a look at the ethical side of being in the business of big data. What happens when a single company owns vast amounts of data, including intensely personal data?

In November 2019, Google announced that it was acquiring Fitbit, the fitness wearables company, for US \$2.19 billion (Osterloh, 2019). The deal alarmed many, including EU regulators, who opened an investigation into the proposed merger. In particular, regulators were concerned that Google would have access to the intensely personal data that Fitbit devices track, and would use this data to sell consumers more targeted ads (European Commission, 2020). Rick Osterloh, Google's Senior Vice President, Devices & Services, declared more than once that the deal was "always about devices, not data", and pledged that Google would not sell ads using Fitbit data (2020). He did not, however, make any promises around other products.

Guest Video: Google Fitbit Acquistion

In this video, Cristina Caffarra, an antitrust and competition expert at Charles River Associates, describes what worried her about Google's Fitbit acquisition. It isn't so much about the individual data, but the aggregate data that can be used to draw inferences.



You mentioned Google Fitbit as a recent example as you know well. I've animated a big group of people that included economists. You were also involved in the privacy experts, and they were civil liberties people, there was a huge groundswell of interest in that deal, people with certainly privacy concerns, data protection experts because there we all saw the potential for Google, which of course, controls this enormous amount of data on all of us in various dimensions being able to add to that enormous data firehose also very specific useful information about health signals, the stuff that can be collected through a wearable, and the potential for that data to be used in applications that are particularly concerning from a citizen point of view.

So the potential there curiously in fact, not so curiously, but disappointingly the discussion in the case was mostly about Google using that data to further its targeted advertising. That wasn't so much what worried us. I mean, targeted advertising is a worry and it is something we don't like. But the potential here was the ability to combine the data that Google has locational search data that Google has on us with additional signals on the kind of things that of course grown in our body, which opens up potentially the possibility for application user cases that are incredibly attractive.

At this point, health tech application is a huge and growing market insurance, potentially employment. And in ways that can be really detrimental to privacy and ultimately in ways that consumers can [INAUDIBLE] The big concern was really that the data was going to be combined in this way. And this was going to lead to outcomes that effectively where further discrimination. So I'm going to get an insurance offer, which is not quite what I would get otherwise on the basis of certain information which has been gleaned, including from the wearable, and without really my understanding or consent fundamentally.

And that, we worked hard to explain and to argue with the European Commission that that was a concern because the harm was going to be directly exploitation of consumers. The harm to us as consumers was that we were going to face a reduction in quality and a discrimination in the offers that we were going to receive.

1.3.6 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. TikTok is a Chinese social media app that lets its users create, watch, and share short videos. TikTok is not so much a creator of content platforms, but an artificial intelligence laboratory that specialises in developing algorithms that can match users with content.
2. Instead of a car maker, Tesla is a tech company—one that uses big data and AI to inform refinements in its products, what product lines it might pursue, and even completely new business lines. Each vehicle that Tesla has sent out since its earliest days has been equipped with sophisticated sensors and computers to collect data.
3. In November 2019, Google announced that it was acquiring Fitbit, the fitness wearables company, for \$2.19 billion. Regulators were concerned that Google would have access to the intensely personal data that Fitbit devices track, and would use this data to sell consumers more targeted ads.
4. By exploring the examples of TikTok, Tesla, and Google/Fitbit, we have discussed how each company has used AI and data to its advantage.

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1.4 Data and AI in Finance

1.4.1 The Rise of Data and AI in Finance

Section Objectives

Now that you are familiar with how AI works, and some of the ways it is being used, we are going to begin our exploration of AI in finance. In this section, we look at some examples of how AI is already being used, and examine the potential of AI to transform the finance industry. We also discuss alternative data and the ethics behind who “owns” this data.

Big Data and AI

The BBC’s Tim Harford recounts the story of a vast trove of ancient clay tablets unearthed in Uruk, a Mesopotamian settlement located in what is now Iraq, in 1929 (2017). Imprinted with abstract script, or cuneiform, the 5,000-year-old tablets were some of the world’s first examples of writing. But for decades, what they represented puzzled archaeologists. Were they poems? Tributes to the gods? Or letters to or from distant lands?

It turned out the cuneiform tablets represented the first recorded financial data: They recorded sales and debts of such traded commodities as sheep, grain and jars of honey, and the future obligations of what was to be repaid. The clay tablets were the world’s first contracts, and they helped the Sumerians build a complex economy that turned Uruk into a powerful city.

In financial systems from millennia ago to those of the present day, the significance of data cannot be overstated. Moreover, as financial services have digitised, data has grown so much in both volume and value that it is now referred to as “big data”. According to business consultancy Gartner, big data has three particular characteristics: high volume, high variety, and high velocity (that is, rate of creation) (2012). Through the right technology, companies can use big data to enable deeper insight, faster and better decision-making, and increased process automation, ushering in more efficient ways of operating and even spawning entirely new lines of business. In the 1980s, for example, increasing data volumes and better computing power led to the rise of algorithmic trading.

Today, the adoption of AI in the financial services to analyse big data has dramatically increased the ability to derive and create even more value. The emerging uses of AI in both incumbent banks and new entrants reveal the enormous opportunity waiting to be tapped, both in improving existing services and in creating new ones. At long-standing powerhouse JP Morgan, for example, machine learning helped cut down the time human lawyers and loan officers spent on commercial loan agreements from 360,000 hours a year to mere seconds, whilst cutting



the error rate significantly (Son, 2017). For new entrants, the rapid rise of China's Ant Group shows how swiftly data and AI can propel new players to dominance (Guest, 2020).

As the adoption of AI increases in financial services, the centrality of data to the sector is, as Deloitte notes, "so self-evident as to become a cliché" (World Economic Forum, 2019). Data fuels AI, and the higher the volume and the better the quality of the data, the more accurate the machine learning algorithms and the better the predictions. The uniqueness of the data matters, too, as do novel combinations of data sets that AI can analyse for even more insights, which in turn can fuel new product lines or improve existing services or practices.

Faculty Video: Algorithmic Trading

In this video, Professor Nir Vulkan—Co-Programme Director of the Oxford Fintech Programme and Associate Professor of Business Economics—talks about the rise of data, from algorithmic trading to the introduction of AI.



So hi, everyone. I want to talk to you about algorithmic trading and the importance of big data in this area. So I've been involved with algorithmic trading since 2002. I'm almost embarrassed to say how long that's been going. And by that, I mean I've been working, creating algorithms that then are used by hedge funds to trade in financial markets.

So the idea of using data in algorithmic trading is, to some extent, very comfortable. That's what we've been doing for a long, long time. It started, if you like, in the '80s people have started. So firms like Man AHL, in fact, A-H-L are the initials of three statisticians from Cambridge who started one of the early black box trading.

The reason this work is because there is clean, available data to work with. So that's the key for everything. And financial markets has price data. We always had that. And we had that in a clean way. And it's not too expensive. In fact, most of it is free now. You can obtain that kind of data and then start building models that trade off that.

What we've seen in the last few years is that there is a lot more data. First of all, there is tick data. That's been with us for a while. That's information about exactly who sends what order. So you have kind of microstructure around the book or the limit order book or the kind of trading in microseconds. And people have learned to build models around that.

But also there is non-price data in a more clean way that you can work with. I keep using the word clean. It's important if you are going to build a model, then you have to train it on past data. And you have to have a bit of that data, as we call it, unseen or out of sample, if you know what that means, and where you test the model.

So all these things are necessary. And all these things can only work if you have reliable, clean data that you can trust, because otherwise, especially with the computing power we have now and with the real sophistication in machine learning we have, any mistakes in the data, the machine would learn them. And you would have something that, on paper, has fantastic performance, but it's not real because it kind of learned that one trade that was a mistake because there's something wrong with the data.

So this is something you learn the hard way. And I've been doing this, as I said, for a long time. So I'm kind of smiling, thinking about all the times we discover these amazing systems and then discovered, actually, they're not real because there has been a mistake in the data. So the cleanliness of the data and the consistency of the data over the years is crucial.

And we're beginning to see this. So there's a lot of alternative data available now, for example, satellite images of car parks or of movements of containers. So I suppose that gives you an indication of the supply and demand movements for things like commodities. Or if you look at car parks, it gives you an idea of the demand—how many people are shopping in that place.

Also you have now data when CEOs speak with analysts, the verbal contact is being analysed. And we have all kind of sentiment data, how many positive words they use, how many negative words they use. And can we trade off of that? So it's all really, I think, exciting. And it goes hand-in-hand, the availability of data, with having better, more sophisticated models that are able to analyse that data.

So I think it is an exciting time in the world of algorithmic trading because of these changes. Having said that, you always have to be careful. The beauty of price data is we know it's meaningful. Prices somehow summarise all the relevant economic things that are happening in the world. The things that are relevant for this commodity or for this stock is kind of summarised in the price. So it's a really useful piece of information.

And a lot of other information, a lot of other bits of information may look important but end up being more like noise. So it's more difficult to extract a kind of meaningful signal out of them.

I've mentioned already there's a lot of improvement in the models themselves. Machine learning models have improved. Computing power as improved. So we can have these programs that analyse enormous amount of data really quickly and also self-adjust. And so that really is helpful.

How helpful is it in terms of generating alpha? I don't know. There is a debate around that. There are some people who are saying that actually, the models that generate the best alpha are based on relatively small, simple principles. They don't use over-sophistication.

But I think machine learning, sophisticated machine learning have a place. In particular, I'll give you one example is in understanding the kind of world that the markets are in at the moment. That's something a machine learning model is very good at. And so it doesn't actually give you the prediction. But it tells you that we moved from this kind of market to this kind of market. That's something that machine learning does really, really well. And once you understand what market you're in, you know what kind of model to use to base your trades on.

1.4.2 Competition for Data

Competition for Data

The competitive scramble for data is everywhere. No set of data is too mundane to be potentially combined with another data and mined for hidden value. Even whether a consumer types or copies and pastes their name into a loan application, for instance, is being used to help determine fraudulent behaviour and credit worthiness (Vasagar, 2016).

The hunger for additional data has spawned a rapidly growing market in alternative data, or “alt data”, such as satellite photography or weather reports. This data has not typically been collected in the past, but could potentially provide information that could turn into a competitive advantage (Drenik, 2019). As markets react to the impact of Covid-19, investors and hedge funds have increasingly sought out alternative data to provide more signals on company performance. Estimates predict the global alternative data market could reach US \$11.1 billion by 2026 (KBV Research, 2020).

The race for data supremacy has both incumbents and fintech start-ups casting a wary eye at Big Tech, whose vast troves of data and ongoing collection of that data are being seen as a deep, potentially insurmountable competitive advantage (World Economic Forum, 2020). Amongst US fintechs and incumbents, competition has kicked off a bitter battle over who owns consumer data—the banks, or the consumers themselves (Popper, 2017)?

EU regulators settled the question of data ownership in Europe by announcing the creation of PSD2 regulation in 2015, which then came into effect in 2018. The UK announced similar measures, under the name of Open Banking regulations. PSD2 ruled not only that a consumer's financial data belongs to them, but also that the consumer could authorise the sharing of that data with any third party they chose—forcing incumbents to open up their transaction data to third parties and paving the way for the growing movement known as open banking. We will be exploring open banking extensively in Module 2.

Meanwhile in the US, fintechs—most typically personal budgeting apps or data aggregators—have increasingly incurred the wrath of banks for their use of screen scraping to obtain a consumer's financial data. In screen scraping, the fintech or data aggregator obtains the sign-in credentials from the customer and logs in to the customer's account. Once the fintech or aggregator has logged in, its software robots copy all the data they find. As this method incurs security risk, more banks are now using APIs to allow fintechs to access the data, but these APIs often come at a cost and are not standardised from bank to bank (Popper, 2017).



Faculty Video: Importance of Data in Finance

In this video, Professor Martin Schmalz talks about the importance of data and AI in finance.



So why does data matter in finance? Like everywhere else, data and information is important to make decisions. And in finance more than everywhere else, decisions need to be made at scale. So that's obviously, true in trading, but it's also true in making loan underwriting decisions. It's true in fraud detection.

It's true in client relationship management and many other domains. It's also true in insurance. In insurance, you have to decide whether a claim is fraudulent or legitimate. You have to predict how expensive a particular claim is. In your underwriting decisions you have to anticipate how costly a particular individual is going to have in your insurance pool.

So and in all of these domains, traditionally decisions were made by humans as the agents that processed the information. They made an assessment about how risky a particular loan application was likely to be, and you call these people loan officers. In insurance similarly, you had insurance salesmen that made an assessment as to how risky a particular person was.

The problem with that is that involving humans in business processes is costly. Everything that involves human time is costly. So to the extent one can optimize that with machine this process. Companies tend to be able to have the same processes speed up to become faster, become better, and become cheaper. And machines now are faster, better, and cheaper at making underwriting decisions in loans, in making fraud detection algorithms, and so forth.

For example, N financials model of making consumer loans has a 210 rule. The 210 zero rule goes like that, it takes you 2 minutes to apply for a loan, it takes them 1 second to make a decision, and there are zero humans involved. And you can easily see how that business model scales a lot better than if you have a human involved that works for several hours on a loan underwriting decision.

And therefore they have a large cost advantage compared to traditional lenders in that space. And why is it cheaper than ever to use machines to make these decisions? It is because data has become so cheap. Simply because for technological reasons it has become so much cheaper to collect, store, and process information with machines that's why people do so much of it.

In economics we call it downward sloping demand curve, when things are cheaper, people use more of it. Information is cheaper, data is cheaper, therefore people use more of it in their business processes. So what all of that means is that companies that are particularly good at analysing data, making predictions based on this data, and making automated decisions based on these predictions are particularly well equipped at competing in financial services.

And that is true even if traditionally they did not compete in traditional services, in other words, if they're tech companies. Tech companies are those that are particularly well equipped at making automated decisions based on large data sets. And this is why you see, first perhaps in China, but increasingly also in the West, that tech companies to encroach on the traditional business models of financial services companies in making loans, in

facilitating payments, in offering escrow services, in underwriting insurance, in processing insurance claims, and so forth.

So this is the fundamental reason why there's a huge competitive threat for the financial services industry from the rise of machine learning and artificial intelligence. And the reason why everybody who wants to have a career in financial services over the next few years needs to be educated on these topics and understand both the technology and the economics behind these business models.

One more reason why tech companies have an edge over traditional financial services companies and insurance companies at offering financial services and insurance products, is because they have more data about the individuals.

It's rather intuitive that it is more fun to decide on a health insurance underwriting decision if you know more about the health history of the particular person. About the person's genetics, about the person's lifestyle choices, sleep patterns, and so forth, which is something insurance companies don't traditionally know. But the large tech companies do know and increasingly know more about.

So the use of data in order to make these decisions gives tech companies increasingly, an edge over the traditional providers of these services. So where does that lead us? So left to its own devices, tech firms stand to threaten, to append retail banking and retail insurance and financial services as we know them. And if you want to know where the journey is going, you just have to look at what happened in China over the last 5 or 10 years.

In China the various subgroups of Alibaba and Tencent, by now have more retail banking and insurance customers than the largest Chinese bank. And absent regulatory constraints or other reasons that go beyond the technology in economics of data driven business models, you would expect the same to happen in the West. Now, there are legal constraints in Europe and in the US that do not equally apply in China, which does make the analysis slightly more complicated, and that's what we will do in the future models.

So I have a strong sense of how, one could say desperate some of the traditional banks are in meeting these competitive threats. Because some of my most eager consulting clients are precisely those banks that do want to understand how it is that their tech competitors are able to offer the same products at a fraction of the cost, at a faster speed, and often at higher quality than they themselves are able to do. And which kind of cultural and technological changes they would have to make in order to be able to compete effectively with the tech companies.

1.4.3 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. As financial services have digitised, data has grown so much in both volume and value that it is now referred to as "big data".

2. Through the right technology, companies can use big data to enable deeper insight, faster and better decision making, and increased process automation, ushering in more efficient ways of operating and even spawning entirely new lines of business.
3. The emerging uses of AI in both incumbent banks and new entrants reveal the enormous opportunity waiting to be tapped, both in improving existing services and in creating new ones.
4. Data fuels AI, and the higher volume and the better quality of the data, the more accurate the machine learning algorithms and the better the predictions.
5. The hunger for additional data has spawned a rapidly growing market in alternative data, or “alt data”, such as satellite photography or weather reports. This data has not typically been collected in the past, but could potentially provide information that could turn into a competitive advantage.
6. The race for data supremacy has both incumbents and fintech start-ups casting a wary eye at Big Tech, whose vast troves of data and ongoing collection of that data are being seen as a deep, potentially insurmountable competitive advantage.

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1.5 Data and AI: Benefits and Challenges

1.5.1 Challenges with AI in the Workplace

Section Objectives

In this section, we compare the benefits and challenges that data-based decision-making brings to the consumer. We also discuss the complex challenges of discrimination and data privacy that the use of AI increasingly introduces.

Challenges with AI in the Workplace

AI-driven decision-making isn't without its challenges, however. It has kicked off a debate on what the future of work will look like, especially as machine learning is increasingly applied to an ever widening number of industries and tasks, from the mundane to the more highly skilled. JP Morgan was able to parse financial deals "in seconds" using machine learning, a task that had taken its loan officers and lawyers 360,000 hours a year. As Bloomberg quipped, the software doesn't just make fewer mistakes—it also "never asks for vacation" (Son, 2017).

Indeed, the rise of AI-driven platforms, from Uber to Upwork, is helping "unbundle" jobs across the wage and skill spectrum, decoupling workers from their employers, who once had responsibilities to workers beyond wages, including health insurance, sick pay, or pensions.

There is no way to avoid the fact that AI will lead to job losses, and in areas where white collar workers were once assumed to be safe. Writing in an editorial in the *Guardian*, theoretical physicist Stephen Hawking said, "The automation of factories has already decimated jobs in traditional manufacturing, and the rise of artificial intelligence is likely to extend this job destruction deep into the middle classes, with only the most caring, creative or supervisory roles remaining" (2016). The flip side of the argument is that while AI may take away the more routine jobs, it is also helping workers take on more responsibilities, and augmenting the human skills that machines can't yet tackle. Freed of having to make routine predictions, workers can focus on judgement, the skill that machines are not yet capable of mastering. Accenture notes that as financial decisions are becoming increasingly automated, CFOs are reinventing themselves into a more strategic partner, using AI to make better decisions with more tailored forecasting and early warning systems (Accenture, 2019).

In *Prediction Machines*, however, authors Ajay Agrawal, Joshua Gans, and Avi Goldfarb warn that while jobs will arise that push workers toward judgement, rather than prediction, this potential outcome



could see wages fall (2018). The authors note that many of today's highest paying jobs, including doctors, lawyers, and financial analysts, have prediction as a core skill. Once machines can be used for predictions, these professions will see a wave of initial job losses. The remaining jobs will push workers into complementary jobs, or ones where judgement is a core skill. While this may eventually lead to a recovery in employment, the likelihood is that there will be a surplus of workers with judgement-related skills, and that wages will decline.

This could have a knock-on effect of increasing inequality. Agrawal, Gans, and Goldfarb continue, "If the machines' share of work continues to increase, then workers' income will fall, while that accruing to the owners of the AI will rise" (2018). For policy makers and for society, the rise of AI will necessitate a dialogue on the distribution of the benefits brought on by the technology.

Declining wages for these workers could have a knock-on effect of increasing inequality. Agrawal, Gans, and Goldfarb continue, "If the machines' share of work continues to increase, then workers' income will fall, while that accruing to the owners of the AI will rise" (2018). For policymakers and for society, the rise of AI will necessitate a dialogue on the distribution of the benefits brought on by the technology. Many of these companies, therefore, see the benefit of using AI at the intersection of fintech and employee financial wellness. Employers are using app-centric approaches to help employees manage their finances, encourage savings, and even pick up extra shifts as labour markets shift to more gig-based roles. However, combating the job and income losses through apps alone, no matter how good the AI, will be complex, and stark choices lie ahead for policymakers and sociologists alike.

Faculty Video: Will AI Replace Humans?

In this video, Professor Pinar Ozcan talks about the unavoidable trend in AI replacing humans.



One of the biggest fears that many people have about AI is whether it will replace humans and just make us redundant. This is a critical question also from an ethical point of view. But practically, when we think about what AI can do and what humans can do, we realize that, at least at this point in time, humans and AI work best together rather than just AI and just humans in many situations.

Let's give an example. In the famous CAMELYON Grand Challenge in 2016 where humans and AI models were asked to detect cancer in actual images, what we saw was that humans were able to detect cancer, meaning doctors and radiologists were able to detect cancer, in 96% of the cases, while AI was able to detect in only 92%.

What was interesting to find out then was that humans and AI together reached an accuracy of 99.5% in cancer detection. This is a great example of how humans and AI can work together in order to complement one another to reach high levels of prediction, which can save lives and which can give great financial wellness to masses in the world.

When we think about why humans and AI can be complementary in prediction, we see that humans can have a really holistic understanding of the situation, take account of different factors, like the weather at that point in time in a situation or whether there might be something unusual that the machine might miss because it just

doesn't have the data. Humans can use five senses in order to collect data. And machines can only process the type of data that is given to them.

On the other hand, machines are very good at processing large amounts of data and can miss very few details. And so overall, when you have lots of data and the data is standardised and clean, machines have better prediction power.

So when you put machines and humans together, you get a situation where you have the computing power in order to handle large sets of data. However, when there are imperfections in the data, when there are ambiguous cases, then the human can step in and actually make the right call that the machine cannot do.

1.5.2 Benefits of Data and AI to Consumers

Benefits of Data and AI to Consumers

We've spoken about how data-based decision-making is affecting businesses, but how is it affecting the consumer?

On the positive side, data-driven decision-making has made the world more convenient for consumers, ushering in voice assistants, shopping or streaming recommendations, ride-sharing and food delivery. It has lowered the cost of content by enabling ad-supported business models. It has fuelled advances in medicine and healthcare by quickening the pace of drug discovery and cancer detection. In the finance industry, data-driven decision-making is opening up access to services and products that consumers were once locked out of, including bank accounts and credit.

At China's Ant Group and Tencent, data-driven decisions scaled to an industrial level have created two of the most highly valued companies in the world, whilst radically reshaping the behaviour of the once predominantly cash-based Chinese consumer. Thanks to this ability to quickly and accurately access their creditworthiness, Chinese consumers are accessing loans where they would have once had to save, and are spending more or starting their own businesses (Economist, 2019). In Brazil, challenger bank Nubank, which uses ML to help it assess the credit risk of its customers, is opening up banking services to the country's 45 million unbanked, who are unable to pass more traditional credit checks administered by incumbent banks (Schipani, 2020).

1.5.3 Unintended Consequences of AI

Unintended Consequences of AI

Another issue for consumers is the possible discrimination of AI models, which are only as good as the data that feeds them. ImageNet, one of the most influential and widely used data sets for AI, created by researchers at Princeton and Stanford in 2009, had 600,000 images removed after its racial bias was exposed (Small, 2019; Solly, 2019). In 2020, after a consumer alleged on social

media that the Apple Card was granting women lower credit limits than men, the New York Department of Financial Services launched an investigation to see if an inherent bias existed in algorithms for the card's credit limits. While Goldman Sachs, who issues the Apple Card, was eventually cleared, the case did highlight that AI, increasingly criticised for being a "black box," is an opaque tool that few understand (Ennis, 2021). In Module 5, we will examine more deeply how the choice of data can exacerbate bias in AI algorithms, and how this can lead to discrimination.



Finally, data privacy, security and growing consumer wariness around the use of their personal data has become another challenge in the age of AI. As more companies handle consumer data, how can we ensure that the data is protected, and that consumers remain in control of it? What happens as our biometric data is increasingly used? Passwords can be changed; faces and fingerprints can't. Moreover, will our biometric data be used against us?

The EU, UK, Australia, and Brazil have passed regulation that places the ownership squarely in the hands of the consumer. On a practical, logistical level, however, questions remain on how this data is stored, shared and even accessed (Deloitte, 2019). In Module 2, we will delve more deeply into these data challenges, and we will examine how different jurisdictions and countries are tackling the question of data sharing, the cornerstone of any AI-driven task.

1.5.4 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. On the positive side, data-driven decision making has made the world more convenient for consumers.
2. However, AI-driven decision-making isn't without its challenges. It has kicked off a debate on what the future of work will look like, especially as machine learning is increasingly applied to an ever widening number of industries and tasks, from the mundane to the more highly skilled.
3. While AI may take away more routine jobs, it is also helping workers take on more responsibilities, and augmenting the human skills that machines can't yet tackle.
4. Another issue for consumers is the possible discrimination of AI models, which are only as good as the data that feeds them.
5. Data privacy, security and growing consumer wariness around the use of personal data has become another challenge in the age of AI.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

AI, Automation, and the Economy (Exponential View podcast, 2017): <https://hbr.org/podcast/2017/03/ai-automation-and-the-economy>

Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages (James Manyika et al., 2017): <https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages>

Tackling AI's Unintended Consequences (Chris Brahm, 2018): <https://www.bain.com/insights/tackling-ais-unintended-consequences>

Stuart Russell on losing control of AI (Tech Tonic podcast, 2019): <https://www.ft.com/content/7dc1e3ea-7954-4488-b89d-5746361f0f02> (requires a subscription)

1.7 Case Study: Yolt

1.7.1 Case Study: Yolt

Case Study: Yolt

In October 2016, Dutch bank ING announced plans to introduce a new banking app in the UK, a market the company had exited four years earlier. The app was called Yolt, and at the time, it was unusual: it wasn't a challenger bank, and it wasn't a payments app. It was a "read-only" aggregator app that would show users their various bank accounts in one place, even if the accounts were held by rival banks, giving users a more complete picture of their spending and saving.

At the time, Yolt's new app was considered revolutionary. It was one of the first apps to take advantage of the new open banking rules that the EU and the UK were in the process of adopting. These rules sought to inject competition into the market, which would lead to better consumer services in banking. In fact, Yolt was one of the very first bank apps to be built based on how consumers' viewed their money, rather than how banks organised their services (Arnold, 2016).

Yolt, set up as a separate company from ING, tapped into the consumer data feeds that the top nine banks were forced to open up to third parties. In fact, Yolt was such an early open banking adopter that the app was both a way to get closer to the customer and a means to understand what products customers wanted. From its earliest days, Yolt employed machine learning to analyse the spending patterns of its customers so the app could provide feedback on where their money was going. For example, once a customer linked all of their financial accounts to the Yolt app, they could track all of their outgoing purchases, set a budget for various goals, and get a clear picture of how their money was being spent. Ignacio Vilar, ING's Chief Innovation Officer, told the Financial Times, "We built the aggregator in the way that people think about money; how long is it before their pay date; how much are they spending and what is the risk of them going overdrawn?" (Vilar, as quoted in Arnold, 2016). Since 2017, Yolt has expanded to several countries and has begun to offer more products, including Yolt Pay in 2019 (Yolt, 2019). As of March 2021, Yolt had 1.6 million registered users (FintechFutures, 2021).



In September 2021, Yolt announced that it was pivoting away from consumer services, and moving instead into providing other businesses with API access to the bank data that consumers agree to share under open banking rules (Ing.com, 2021). Yolt's new business model is similar to that of the US-based Plaid and Tink, recently purchased by Visa for US \$1.8 billion (Sifted, 2021).

Guest Video: The Story of Yolt

In this video, Leon Muis of Yolt talks about data as key to the app, and describes how the company uses AI to serve the customer better.



Pinar Ozcan: Leon, thank you so much for being with us today. Can you tell us the story of how Yolt got started?



Leon Muis: Yes, thanks Pinar it's great to be here. So Yolt was essentially started back in January 2016 from a sheet of paper, an idea out of the ING bank innovation centre back in Amsterdam and the assignment was basically to build a money management app, leveraging the account aggregation capabilities that were already existent, leveraging old technology at the time, but also knowing that the promise of open banking was coming. And that's how the team started building the app, essentially. And then we went through very quick iteration phases so launching an internal version already after four months and launching to a beta group of 2,500 users in October of 2016.

Pinar Ozcan: What were some of the initial challenges that you faced in building the Yolt app?

Leon Muis: Some of the challenges in building the app we faced in the beginning was on the one hand how to get access to the account data so for example getting the customers, adding their bank accounts into the app which at that time could only be done via screen scraping and then also finding the right partner in that space. And on the other side the challenge initially was being part of the big bank, though we were placed on the edge of the organisation still we had to get some of the approvals to do things differently than the bank would normally have done.

Pinar Ozcan: What were some of the things that you wanted to do differently from ING?

Leon Muis: What we tried to do from a Yolt perspective was to really give users and customers a way to have an integrated view of their finances. And though some of that was existent in the market I think we tried to make sure that we actually did it in a way that it felt really intuitive for users to see how they're doing financially and see how they're making the end of the month. Then where the real innovation also kicked in is when open banking was launched in January 2018. And we wanted to bring these API connections to our customers as quickly as we could and the only way to do that was to make the connections ourselves. And that made us the first and also the biggest third-party provider to actually leverage open banking.

Pinar Ozcan: In your opinion, why was what Yolt did at that time so revolutionary?

Leon Muis: So within the Yolt business model, the data is key. I mean it's the key element that we are actually providing back to the user and especially under open banking and PSD2 across Europe this whole legislation exists to give customers the power and control over their data and then they can decide who they want to share it with. So we leverage this data on behalf of the customers when they have consented to share it with us to give them insights on how they have been spending their money. And we have a data science team in-house who leverage machine learned models, AI models to actually get as much insights out of the data on a per-customer basis as possible.

So for example if you've been spending money at Tesco in the UK, we categorise that transaction as groceries. But we can also give a customer a universe of one meaning that if a customer changes that category from Tesco to fuel because in his case it's always a fuel transaction then the model will learn automatically looking backward and looking forward that those transactions go into those categories. And that is why data is the basis essentially for the Yolt business model because we also have for example,a recommender engine which recommends based on the behaviour of the account, certain partner integrations which we have, for example switching energy provider via our moneysupermarket integration.

Pinar Ozcan: What was the role of data in AI in your business model?

Leon Muis: Yes so indeed we need the data access from the big banks. Luckily in the UK, there was the open banking initiative which made sure that there was some alignment at least amongst the CMA9 so the big nine banks in the UK though even though there was one specification, one of the problems we faced is that each bank still had little differences in their API specification or they provided different fields.

So one difficulty for example was that Barclays as an example might only provide what they called the expected balance, that HSBC provides what they call the available balance Lloyds provides the interim available balance and then the definition of that balance could differ per bank so we then have to apply logic to make sure that we send something to the customer in the Yolt app that actually makes sense to them. So those were some of the hurdles and apart from that, I don't envy the big banks having to have built these API technologies on top of their old technology stacks.

Case Analysis

Having explored this case, consider the following questions:

- Why do you think the Yolt data-based business model has been successful?
- How is machine learning being applied in the Yolt app?
- How is Yolt using data to make predictions?
- Thinking about your own organisation, what would it take to launch a project like Yolt? Would it make more sense to spin the project out of your organisation or remain part of it?

References

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Module 2: Open Banking

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford Artificial Intelligence in Fintech and Open Banking

Module 2: Open Banking



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2.1 About Module 2

2.1.1 Module 2 Overview

Overview

Welcome to Module 2 of the AI in Fintech and Open Banking Programme!

This week, we will examine open banking, one of the main drivers for innovation in financial services. We will start by defining what open banking is. Next, we will examine what open banking does on a practical level: how it has decoupled consumers' financial data from the institutions that collect that data, what opportunities it has created, and what new challenges are emerging. Finally, we will delve into the ethos and vision for open banking, and look at the EU and UK regulations that ushered it into the market.

As you learnt in Module 1, AI is the transformative technology that can help deliver new products and services from large data sets. This week, as we begin our discussion on open banking, we will also look at what regulators will need to address around data sharing as AI becomes a more powerful force in financial products.

Faculty Video: Open Banking

In the following video, Professor Pinar Ozcan shares what to expect this week.



Welcome to module 2, where we will dive straight into the wonderful world of open banking. In module 1, we've talked about the rise of data, and how AI which is based on data, is unlocking a bunch of new services and products in the financial sector. In order to understand the context in which AI is becoming extremely important for the financial sector, it's important for us to also understand the regulatory environment in which AI is flourishing, which is open banking.

Open banking and its siblings, open finance, and open data regulations, are a set of regulations that are coming up around the world in different countries, and really putting the focus on data sharing, and how without, data AI and related new products and services cannot flourish. In this module, we will first talk about what motivated open banking and related regulations, how they came about, how they were implemented, and perhaps most importantly, how the market players are responding to them. It's important to understand what open banking means for a financial organization, because for an incumbent, this means that the financial data that they possess doesn't just belong to them anymore. And for a newcomer, it's also important to understand what open banking brings in terms of opportunities because it allows data access, which can be the basis of new products and services using AI.

Open banking is a wonderful development for sure. However, it doesn't come without challenges. In this module, we will look realistically into what opportunities open banking will bring to the markets around the world, and what challenges still lie ahead.

Objectives

At the end of this module, you will be able to:

- Explain the centrality of data to open banking, and the policy concerns and risks that come with sharing and using data, especially as AI is increasingly used to create new products and services.
- Compare open banking regulations across different parts of the world.
- Describe how open banking promotes innovation throughout the market, and how it can benefit both financial institutions and consumers.
- Hypothesise how open finance and open data could transform financial services.

Graded Assignments

You will complete individual and group assignments, which count towards your completion of the programme. This week, you will:

- Meet with your group to identify problems in your business that could be solved with AI, which will begin your focus for the Capstone project.
- Complete a quiz on the module's content and key takeaways.
- Reflect on what you have learnt this week by applying it to your personal or professional experiences.

You must submit all graded assignments in Module 2 by **28 June, 2022, 23:59 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

Additional Activities

In each module, we present additional activities related to the core learning. This week, you will:

- Discuss how Brazil is using open banking to tackle poverty and financial exclusion, and in the process, is helping create and encourage a new multi-billion dollar opportunity for companies to serve the under- and unbanked. One new entrant in the field is Nubank, a challenger bank valued at US\$25 billion in January 2021 (Fine, 2022).
- Consider the opportunities and challenges access to new data may have for your business, and the businesses of your peers.

Vocabulary Check

The terms below are industry specific terms that appear in this module. Before beginning the module, check your knowledge of these words, and, if you need to, review the definitions in the programme glossary.

[Application Programming Interface \(API\)](#)

[policymakers](#)

[regulation](#)

[regulators](#)

[third-party providers \(TPPs\)](#)

Time Commitment

Plan to spend seven to ten hours on Module 2 this week. As there is much reading material, and many videos, you might want to divide up your work into several sessions. The module is broken up into sections by theme, giving you potential break points.

Make sure you plan time to meet with your group, and to complete the assignments.

2.2 Introduction to Open Banking

2.2.1 What Is Open Banking?

Section Objectives

We will start our exploration of open banking in this section by explaining what it is, and examining how and why it came about.

A New Vision of Banking

Following the global financial crisis (GFC) of 2008, as public trust in banks plummeted to all-time lows, and governments and politicians wrangled over both saving and sanctioning the financial sector, a new vision of banking began to emerge.

This vision called for moving the industry from an opaque, closed model, where power was derived from hoarding customer information, to an open one, in which customers were in control of their financial data and could authorise its use by other financial institutions or third-party providers (TPPs). Banks would have to provide the financial data to these third-party providers, even if they were a direct competitor. This radical idea, which sought to shift control over personal financial data from the banks to consumers, became known as “open banking”. By freeing data, open banking would enable more competitive, innovative services to enter the market, in turn giving consumers better control over their financial information and, ultimately, their money and their lives.



Faculty Video: What Is Open Banking?

In this video, Professor Pinar Ozcan discusses the meaning behind open banking.



You can think of open banking as the ability of a new player, imagine a new fintech, to be able to reach your data in order to analyse it upon your consent. However, because regulators realise that this would not be in the interests of large banks who used to be your sole financial service providers, they found a way through technology for this to happen.

Imagine your data in the bank is protected by a wall. In order for that data to be accessed by a new player, that new player has to have the consent from you. But that consent is

electronic and as soon as that consent is given by you, which is a three step process, then suddenly the fintech has a plug that exactly fits that wall and electricity, which is your financial data, starts flowing to the fintech. This gives the fintech the ability to analyse your data and to give you services that may compete with your bank.

In a sense, it helps break down the oligopoly of banks in the financial industry. What does this mean for us as a customer? It means that our data will enable us to get many more services, as we said before. And that doesn't just have to be in the area of finance. So it doesn't have to be just lending or mortgages or credit, et cetera. It can be many other things because as soon as that payment data, that transactional data, is analysed, third parties will be able to also tell how much we're paying for insurance, whether we're paying too much for our plane tickets, et cetera. So many services will be possible for us to enjoy and to compare once that payment data is analysed.

One of the beauties of open banking is that it allows this data to be shared in a secure way. Compared to the previous technology of screen scraping, open banking regulation mandates that third parties share data through application programming interfaces, which is really a lot more secure compared to screen scraping.

2.2.2 The Birth of the Open Banking Standard

PSD2 and the Open Banking Standard

The earliest advocates of open banking emerged in Europe, when in 2013, the European Commission proposed an amendment to the Payments Services Providers Directive (PSD). Adopted in 2007, the PSD had the goal of making cross-border payments as easy, safe and secure as payments made within a member state. The first PSD produced a number of benefits, cutting down the cost of payments, increasing transparency, and boosting customer protections and rights. The amendment sought to strengthen the original aims of PSD even further ("Payment Services Directive", 2018).

In January 2016, the second Payments Services Directive, often known as PSD2, came into force, with member states given two years to transpose it into national law.

PSD2, according to the European Commission, had four main goals:

- To contribute to a more integrated and efficient payments market across the EU
- To increase competition and ensure a "level playing field" for payments service providers (PSPs), especially new market entrants
- Increase the security and safety of payments
- Protect consumers

PSD2 extended the scope of the first payments directive beyond payments. Banks were now required to do two things, if authorised by the consumer:

- As stipulated with the first PSD, to allow third party payment initiation providers (PISPs) to initiate payments directly from consumer accounts.
- As ushered in by PSD2, to grant TPPs, or account information service providers (AISPs), access to customer data to permit an overview of all of a customer's payments accounts in one place, even if the accounts were with different banks.

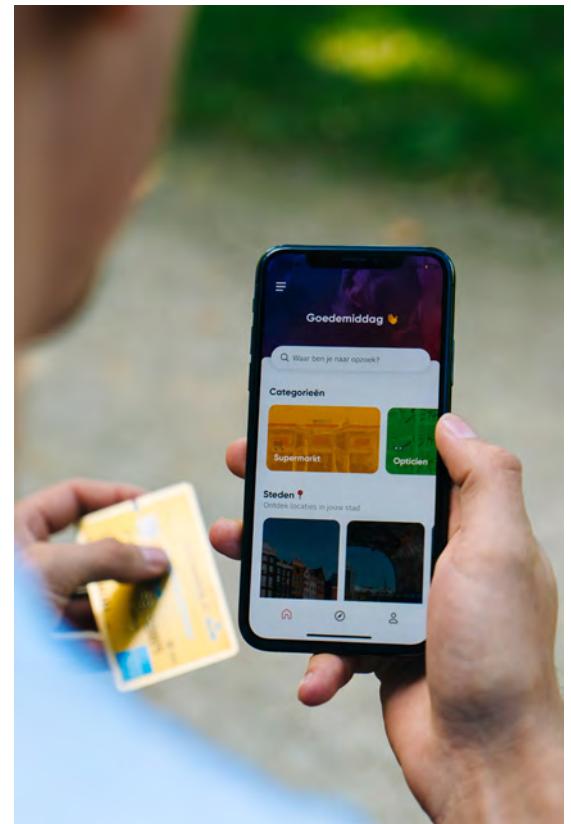
To do this, PSD2 further required banks to open their payments infrastructure and customer transaction data, at the consumers' behest, to third parties in real time, at no cost to the TPP.

PSD2 did not, however, explicitly mandate which of the many systems in place across Europe each bank should use (Rudenko, 2021). At the time, this was seen as a concession to banks, given the expense of potentially needing to upgrade to comply with a mandated standard.

In the UK, the Competition and Market Authority (CMA) had launched its own investigation into retail banking in November 2014. Two years later, in 2016, it produced a report concluding that the dominant British banks weren't working hard enough for their customers ("Making", 2016). There was a lack of innovative products, and consumers and small businesses were paying too much in banking fees ("Background", 2017). The CMA also issued a ruling, the Open Banking Standard, that would take effect in January 2018, and required the UK's nine largest banks (CMA9), including Barclays, Santander, and HSBC, to open up their data to third-party providers that consumers had authorised.

The CMA took PSD2 one step further, requiring the CMA9 banks to share the data using a standard format, an application programming interface (API) now known as the Open Banking Standard. APIs, long used throughout the tech industry, are intermediary software tools that facilitate sharing data between applications. The Open Banking Standard made it even easier for TPPs, including competing incumbents and smaller fintechs, to access data and create new services and products. Thanks to this standard, open banking as a whole now refers to the growing use of secure, standardised APIs that allow TPPs access to banks' data.

As one effect of open banking, fintechs could build apps that allowed consumers to have one view of all of their finances, and to make quicker, easier payments through their bank accounts ("What Is Open Banking", 2018). As we learnt in Module 1, one of the earliest open banking apps was Yolt, a personal budgeting app built by the Dutch incumbent ING Bank, that aggregated all of a consumer's bank accounts into one place. This allowed consumers to get a complete picture of their finances, from their income, to their bills, to their credit card accounts, and savings—even if these accounts were held by competing banks.



Three years after the Open Banking Standard took effect in the UK, the British ecosystem now counts 299 regulated providers serving three million open banking account holders, according to the UK's Open Banking Implementation Entity (OBIE) ("Open Banking", 2021).

Guest Video: Benefits and Challenges with Implementing Open Banking

In this video, we hear from three open banking experts—Gavin Littlejohn, Bill Roberts, and Michael King—on the benefits and challenges with implementing the Open Banking legislation.



Gavin Littlejohn: There have been a number of challenges in the UK delivery of open banking. These are well documented. But the end state is a high availability, high functional tool, which has attracted lots of new market participants and hundreds of millions, if not billions, of pounds of venture capital flowing into it.

There are still issues, the most significant being a regulatory issue with the requirement for 90-day re-authentication. But in terms of the performance in the UK of the API deliveries particularly amongst the large firms, it is now really, really high quality and a job that's taken longer and probably cost a bit more than people understood when they started.



Bill Roberts: The challenge came where we left room in the competitive space for banks to decide themselves what the customer journey should look, what the customer experience should be. And that was particularly in the authentication journey.

So we didn't specify, what that journey should be, other than that it should be — well, technically it's called a redirection journey. And each bank interpreted in its own way. And they had they had no real incentive to make this journey frictionless.

So what we discovered was that the journey would be maybe 15 clicks through, or you had to wait for a one-time password, or somebody from a call centre would ring you and ask you what the maiden name of your first dog was, lots of questions that. It wasn't a very friendly experience.

So we set about building what we called the customer experience guidelines. It's a very detailed manual, which became part of the standard of how to create a frictionless journey for customers to authenticate themselves.

And in particular, we advanced the adoption of biometric authentication. So most people access their bank account information through a mobile device. Most people will tend to authenticate themselves on that device with a thumbprint or facial recognition. We said, let's use that. We want something which is secure but easy to use.



Michael King: There are many issues, both technical as well as regulatory, to do with open banking. And it's quite easy to get bogged down in the details. But I think the key for regulators around the world is to keep in mind what the goal is. And the goal is to have a consumer-focused financial system that protects people's data and privacy.

And what we keep seeing is we keep seeing that individual players, when they're consulted, want to protect their own business models and their market share. And they

tend to lose sight of the goal that financial data belongs to consumers. And we need to be providing consumers with a safe way to understand their financial lives.

Bill Roberts: There's one lesson for regulators that we learned. I said earlier on that normally regulators tell you to do — give you the most precise instructions about what to do and get it right first time. And maybe because we were the pioneers in this, we couldn't do that. So I think there is merit in at least looking at the concept of the minimum viable product from a regulator's perspective.

So you don't necessarily get it right the first time. Maybe just get some regulation out there in the market. But make sure you can change it as the situation develops, because the digital world — I mean it's not — the way you regulate in the digital environment these days, it's completely different to regulating, I don't know, breweries or the steel industry in the 19th century.

2.2.3 The Market Context of Open Banking

Incumbent Reign

For years, incumbent banks had little difficulty in keeping their customers using a centuries-old business model. They paid savers less and charged borrowers more, tacking on fees as additional services emerged. By the first decade of the 21st century, current account holders routinely paid fees to withdraw money from ATMs, use a debit card or credit card abroad, transfer money across borders, and access overdrafts.



New players were dissuaded from entering the retail market due in large part to the data that incumbents held on their customers. A great deal of information could be gleaned from an individual's financial transactions: their salary, their mortgage payments, the details of what they spent on, and the exact price they paid for everything from their most important financial commitments to their most mundane.

Collectively, this information also tells an important story of their spending behaviour. For example: Do they save, regularly overdraw, spend beyond their means, or pay bills on time, and how much of their salary goes to essential versus nonessential items? This data gave incumbents a competitive advantage, especially when it came to risk scoring and pricing ("How to flourish", 2017). Banks used the data to cross-sell other products, including mortgages, credit cards, or loans, at prices that

regulators, including the UK's CMA, found by 2014 were increasingly non-competitive.

During the same period, banks were operating in what Deloitte called a “suboptimal macroeconomic environment” (“How to flourish”, 2017). The immediate years following 2008’s global financial crisis (GFC) brought in low interest rates, as well as a flurry of rules and regulations designed to clean up the freewheeling financial sector. Margins were squeezed to razor-thin levels and the incumbents found it difficult to generate the revenues they once did. In Europe, the estimated return on equity (RoE) of banks, as high as 20% in the early to mid-2000s, had plunged to less than 0% during the GFC and as of 2021 has yet to climb back to pre-crisis levels (“How to flourish”, 2017).

Meanwhile, a political and social backlash against the crash drove customer confidence in banks to an all-time low (White, 2018). It has remained in the doldrums ever since.

Enter Fintechs

In this market of discontent, fintechs began to emerge, seeing an opportunity to tap into rocketing smartphone penetration and a growing expectation for better consumer services. Fintechs also believed they could better use the financial data sitting inside a consumer’s bank account—and turn that data into valuable products and services.

In Europe, by 2016, fuelled by venture capital investment, a healthy pipeline of fintechs existed. Some were aimed directly at consumers, targeting payments, personal or small and mid-sized enterprise (MSE) bookkeeping, cross-border transfers, loans, current accounts, and savings accounts. Others targeted the underlying platforms or services that would enable them. With a common rallying cry that they were democratising finance by giving consumers control of their money, these fintechs chiselled away at incumbent banks, unbundling the banks’ core products.

The raw fuel that powered some of these new startups was the personal financial data that could only be obtained from the current accounts of consumers. This was especially true of personal budgeting apps, such as Money Dashboard, which needed access to a consumer’s bank transactions to give them meaningful data back about it. For example, to give a consumer data about how much they were spending on groceries in relation to their entire salary, the app needed access to the consumer’s transaction data. Other fintechs that relied on transaction data included “buy now pay later” provider Klarna, which uses consumers’ financial data to make risk assessments, and Tink, a data aggregator aiming to be Europe’s Plaid.

Fintechs initially collected this data through screen scraping, a method in which they would obtain sign-in credentials from the customer, log in to the customer’s account, and use software tools to scrape the data. This was not a precise method, and usually robots would scrape more than was necessary. In the earlier days of fintech, financial institutions begrudgingly tolerated screen scraping, as the customer was permitting access to their own data, but these same institutions often decried the practice as a privacy and security disaster waiting to happen. Further, as banks started to become more aware of how fintechs were monetising personal financial data, they became even less keen to allow access to this data.

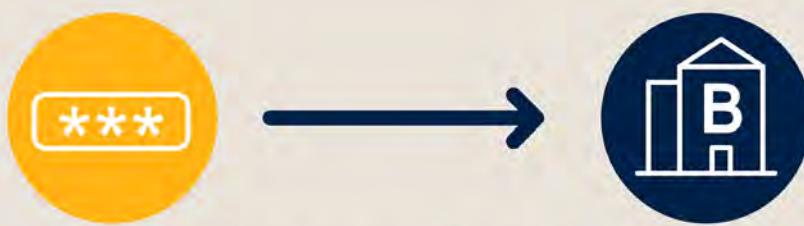
As part of PSD2 regulations, screen scraping was to be phased out, replaced by data feeds that banks provided. Fintechs, however, were wary. For a start, screen scraping allowed them to collect a wealth of data beyond what was often necessary to perform the task they initially needed the data for. Secondly, fintechs were worried that the banks would control both the technical supply of the feeds

and the data itself, a position they could abuse (“European banks”, 2017). In the UK, where the CMA stipulated a standard format for the feeds, the quality of these feeds, especially in the early days of open banking, was patchy (Boskovich, 2021). For now, although screen scraping is still expected to be banned under PSD2, regulators, including those in the UK, have given its use a reprieve whilst Strong Customer Authentication (SCA) standards are established. Because of the Covid-19 pandemic, the deadline was pushed to March 2022 (“Strong”, 2021).

Screen Scraping Explained



Customer needs data to be shared from company A
in order to use the services of company B.



Customer provides company B with the user name and
password for their account at company A.



Company B accesses the account on behalf of the
customer and takes the information they need.

2.2.5 Opening Data - The Rise of Data

Opening Data

While the banks viewed data sharing as a growing threat, regulators in Europe, and especially the UK, viewed personal transaction data as belonging to the consumer, not the bank. Trapped inside the banks, the data languished. What if banks were forced to open this data, acknowledging that the data belonged not to them, but to the consumer? What if they were required to allow that data to flow freely, to any third-party provider that the consumer had authorised? What new services could be built from this data?



The decision to open the data grew into the open banking movement, which marked a seismic change in the way data is viewed. According to the tenets of open banking, the data belongs not to the banks, but to the individuals, who can authorise the data's use to any provider they want. What makes the principle of open banking so radical is its potential to upend a number of industries, with financial services being just the start. As Deloitte notes, it requires an entirely new data sharing infrastructure, one that will allow consumers to potentially port and share their data across different industries, as new products and services are built in an

ever-expanding digital economy ("Open Banking", 2018).

Increasingly, open banking has set the stage for the growing race to provide and profit from the next wave of consumer financial services. This wave could ultimately see the primary role of banks today fade to a secondary, more commoditised one, in which banks supply the plumbing of financial services, but no longer own the direct relationship with their customers. In this increasingly fraught battle, incumbent banks are pitted against a growing range of third parties that go far beyond consumer banking apps. They include data aggregators like Plaid and Tink, alternative credit scoring players, payment giants such as Mastercard and Visa, Big Tech, and a growing number of consumer apps that have amassed large user bases, such as Uber, Grab, and Gojek.

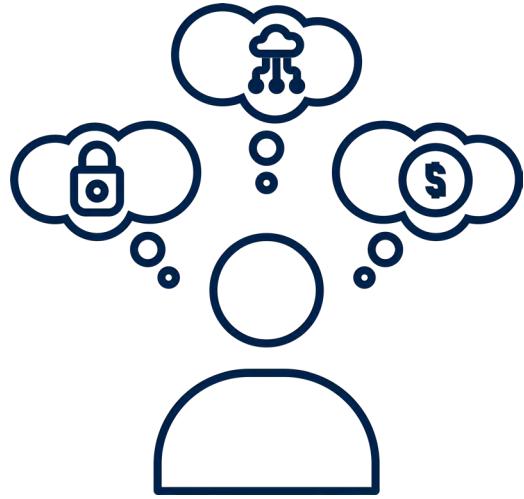
Regulating the Use of Consumer Data

The grandest dream of the consumer-facing apps is to build a financial behemoth to rival China's super apps, Tencent's WeChat and Ant Group's Alipay. Together, these apps control nearly 95% of China's digital payments market ("China", 2021). More importantly, the apps form their own extensive, deep ecosystems in which Chinese consumers use and pay for a number of other services. Inside the apps, consumers can shop for goods, book a taxi, order food, play games, send money, and access credit.

These apps are enabled by network effects, much lower overhead costs, and the growing trend for "embedded finance", or the ability to offer a finance solution right inside a consumer experience.

Embedded finance works by using APIs to integrate financial services, such as payments, within a third party's platform or apps, such as an ecommerce provider. But more important is the apps' AI-driven ability to parse and analyse the large swathes of data they collect on their consumers. Ant Financial, for example, uses AI to drive and refine a disparate and broad set of functions, such as personalisation, recommendations, revenue optimisation, automatic credit score calculation, and flagging suspicious activity (Iansiti & Lakhani, 2020).

In the rest of the world, governments are still determining how to regulate the use of consumer data. Data supremacy has become a competitive weapon, and regulators are struggling to keep up with the ever-increasing types of data—including highly personal behavioural data—that companies are collecting, and potentially using, to fuel financial decisions. In late 2020, the EU approved Google's US \$2.1 billion takeover of Fitbit, the American wearable tech company that collects an assortment of health data from its users, including sleep patterns, heart rate, stress management, and even skin temperature (Ricker & Statt, 2021; "Smart", no date). In return for this approval, Google agreed not to use the health data Fitbit collected to target EU consumers with ads for 10 years. The data, however, could be used in other ways. As a set of economists and professors argued during the European Commission's investigation into the merger, there is "enormous money to be made by selling sophisticated analytics to health providers and insurers that enable them to identify risk and price it accordingly" (Bourreau et al., 2020).



As more companies, including those in the financial sector, look to create new products (some based on sensitive behavioural data), governments will have to regulate the collision of privacy, big data, and the tightening monopolistic control that some companies exert over sensitive consumer data. Banks, and especially those required by governments to open their data, will need to navigate between the rising tide of fintechs tearing off pieces of their business, trying to innovate with their own consumer products, and the encroachment into their space of Big Tech.

2.2.6 CDR: Australia's Unique Approach to Consumer Data Protection

Consumer Data Right (CDR): Australia's Unique Approach to Consumer Data Protection

As open banking grows around the world, it is colliding with another rising trend: data privacy. In particular, as consumers are given more control over their data and are able to consent to that data being used by other parties, how that data is collected, used, handled, stored and passed on is of growing concern.

Regulators around the world have approached this collision in a variety of ways. Most have created two separate sets of regulations: one for open banking, and one for data. For example, in the EU,

the second Payment Services Directive (PSD2) allows consumers to consent to share their banking data to third parties, while the General Data Protection Regulation (GDPR) protects consumer data. However, concerns have merged that these regulations could contradict one another. Under PSD2, third-party providers (TPPs) of open banking services can potentially gain access to sensitive personal data, through their open banking licenses, that conflicts with GDPR. For example, based on a current account feed, a TPP could potentially learn when and where the consumer shops, if they make political or religious donations (and to whom), and what prescription drugs or medical aids they purchase—all data for which GDPR forbids processing (McNamee, 2020).



Meanwhile, Australia is trying to solve the collision of open banking with consumer data protection in a more cohesive way. The country's regulators have taken a data-first stance, in part to protect consumers, but also to clarify the responsibilities of all companies handling the data, and to ensure that the regulators are looking ahead to an eventual flow of consumer data across industries in addition to finance. In 2018, Australian regulators agreed to implement the Consumer Data Right (CDR), a framework that the Australian Competition and Consumer Commission (ACCC), the lead regulator for CDR, envisages as an “economy-wide system, which will enable the safe and secure transfer of consumer data” (Australian Competition and Consumer Commission, 2020). Financial services, including open banking, is the first sector to which the CDR applies. Eventually, it will be applied across other industries, including telecoms and energy.

The CDR has four key principles and became law in 2019 (Australian Government: The Treasury, 2019):

- The CDR is solely focused on putting the consumer first and offering consumer protections at lower costs.
- The CDR should drive competition by increasing consumers' capacity not just to compare products, but also to seamlessly switch between them.
- Although the individual consumer comes first, the CDR should create opportunities for data providers as well.
- CDR enforcement should be efficient and fair. To that end, two different agencies share the responsibility of enforcing the law.

Australia's CDR applies to all industries. Underscoring this multi-industry application, different agencies are responsible for enabling adoption and enforcing the law: the Data Standards Body (DSB) creates the actual technical standard for the CDR, while the Australian Federal Treasury serves as the enforcement agency.

The landscape around the CDR and Australian fintech in general continues to evolve, and the future remains to be seen. However, the country retains a first-mover advantage, and also has a burgeoning

fintech industry, scandal-free banking, an instant payments system, and an eye toward Banking as a Service (BaaS) to drive innovation and improve the consumer experience. Of course, improvements across all these areas take time, but as of December 2021, the number of banks or financial institutions required to share and protect information under the CDR had already jumped from five to 100 (Commonwealth of Australia, 2021).

2.2.7 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Following the global financial crisis in 2008, consumer confidence in banks was at an all-time low. This opened up the opportunity for fintechs to enter the market, tapping into rocketing smartphone penetration and a growing expectation for better consumer services.
2. Fintechs need data to power their services, and initially collected this data through screen scraping, a method in which they would obtain sign-in credentials from the customer, log in to the customer's account, and use software tools to "scrape" the data.
3. While the banks viewed data sharing as a growing threat, regulators in Europe, and especially the UK, viewed personal transaction data as belonging to the consumer, not the bank. They believed that data was languishing, trapped inside and only benefiting the bank, and so wanted to "open" financial data.
4. With the movement to "open" financial data, governments will need to figure out how to regulate the collision of privacy, big data, and the tightening monopolistic control that some companies exert over sensitive consumer data.
5. Banks, and especially those required by governments to open their data, will need to navigate between a rising tide of fintechs tearing off pieces of their business, innovating with their own consumer products, and the encroachment into their space of Big Tech.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[BIS: Report on open banking and application programming interfaces](#)

[Mr Open Banking: The Big Picture \[Podcast\]: on the ethos of radical transparency behind open banking](#)

[Open Banking in the UK: what's happened so far](#)

[Open Banking: Preparing for Liftoff, from the Open Data Institute](#)

2.3 Open Banking Around the World

2.3.1 Open Banking Around The World



Section Objectives

In this section, we compare how policymakers around the world have enacted or not enacted open banking regulations.

Open Banking Around The World

Since the establishment of pioneering regulations in the EU and the UK, initiatives around open banking—the practice of sharing financial data with third parties via open APIs—have proliferated around the globe. The key factor in how open banking develops in a country depends in large part on the regulations that policymakers have enacted, or not enacted, to compel market players to act.

In some regions, including the EU and the UK, regulators have taken a more aggressive stance toward opening the market to competition—in some instances to the point of being seen as a threat to incumbents' existing revenue models. Other regulators globally have taken a more cautious approach to disrupting the banking sector, instead working to coordinate with the market (Japan and Hong Kong), to guide it (Singapore), or to let industry initiatives direct it (New Zealand and Colombia). Some countries, including the US and China, have taken a market-led approach, allowing market forces to usher in the opening up of data between banks and third parties. In the instance of China, open banking has been led by new market entrants, including Alipay and WeChat Pay, and it is the banks that have asked regulators to open up access to the valuable data these new players have amassed.

Open banking regulation, or the lack of it, has shaped markets very differently in different countries. In the next section, we look at how policymakers' actions have led to distinct open banking outcomes across the world.

Guest Video: Open Banking Around The World

In this video, open banking experts Michael Salmony (mainland Europe), Ian Pollari (Australia), and Michael King (Canada) speak about open banking in their respective jurisdictions.



Michael Salmony: Hello, my name is Michael Salmony. And I'd like to share with you some impressions from Europe in open banking. Well, why was it created in Europe? We believe that Europe was the first region in the world to actually mandate open banking and APIs, and opening up of banks across the whole world. And this legislation called PSD2 has since been copied in various forms around the world.

Why did it come out of Europe? Well, there were two reasons. One is strategic. And one is empirical. The strategic one is that it was felt there wasn't enough innovation and competition. And movement in the banking and financial services markets, opening up with APIs, was felt to be a good way of improving that. And that certainly has come true.

The other reason why it emerged in Europe is because people were actually beginning to do screen scraping and credential sharing, which was felt not to be very safe, which is probably true enough. So there was some providers who were asking people to give them their log on details for the bank. And they would then log on in the name of the customer on their bank pretending to be the customer effectively. And that, of course, is not a very good way of doing things. So again, it was felt we need more security and APIs rather than screen scraping as a way of doing that.

So those were two of the primary motivations why PSD2 was created in Europe. Europe is very complex. It's pretty unique in that sense. There are over 4,000 banks. There are 27 national regulators and fiercely independent countries. So you have a lot of regulators, both national and European. You have a high diversity of banks in the way they are structured and organised. And that, of course, makes things a lot more complex. And that's why you need a really good governance structure to make that work.

So I think this is going to happen like in a lot of other areas. It's initially a bit difficult to do things in Europe. But once it gets going, they tend to do it better than a lot of others. So it's an uphill fight at the beginning. Because, for example, by comparison with the UK, where you just take the top few banks and they already cover 80% of the market. That makes life a lot easier.

The future of open banking, and there, again, I think Europe may be leading the way. Europe is created in a number of legislations which have conquered the world, like privacy, GDPR. Even the Americans who don't normally like to have governments telling them what to do have seen the value of having some regulations around privacy.

So GDPR, and GSMA, and management of data, and now PSD2 have conquered the world. And maybe the next thing that is coming out of Europe is identity, which I think is an absolutely core thing. If we don't get the basis right of who is talking to who, then the whole of the digital economy is built on sand. So this may be another area where Europe may be leading the way.

And finally, on the future of open banking, now all industries are being opened up using APIs with the same successful model of getting more competition, more innovation, more APIs. And there's now the goal to create a

data market for the free movement of data, not only the free movement of people and capital, but also the free movement of data. And I think that's going to be the next thing where all industries are mashing up together all their assets via APIs. And that is I think the next thing we can look forward to.



Ian Pollari: It was around the middle of 2017 that Scott Morrison, our treasurer of the time, commissioned a review into open banking. And that was effectively six to nine month process of consultation across the industry clearly, including engaging with other parts of the world, both with regulators and policy makers, including the UK. And then really forming a view on what approach we would take in Australia.

And so implementation really only took effect last year. So July 2020 was when the regime officially started in Australia. And there are some differences in the context of our regime here to that of the UK and other markets. One of those differences is that notwithstanding the big four banks, which control about 70%, 80% of the Australian banking market were the first data holders. So the first banks or authorised deposit taking institutions that would be brought into open banking.

From day one, the intent was that all ADIs, i.e. all banks, would be subject to open banking rules. The other point of demarcation was unlike the UK and Europe with PSD2, we have started with information exchange. And so that's read-only access, not right access. And right access being payment initiation. That's actually now currently under discussion. And another review has been completed by-- oh, commission rather by the government, which was handed down late last year to consider payment initiation.

And probably the most fundamental element of difference is that the legislation, which has seen open banking come into effect in Australia, is called the consumer data right. And the intent from an Australian government perspective is that this will be economy-wide. And it will be designated bisector of which banking is the first sector.

Energy has started consultation. And we expect telecommunications, retail, other parts of financial services to have the CDR apply to their sector. So that is quite a big difference that the government is very intent on ensuring this is an economy-wide data sharing regime.



Michael King: So open banking in Canada was launched in with consultations in 2019. So quite late relative to, say, the UK or Europe. The consultations were announced at the federal level. The Canadian system puts responsibility into both two sets of hands, both national or federal, as well as the provinces of which Ontario and Quebec are the largest.

The open banking regulation was actually mentioned in the 2018 federal budget in an appendix, which suggested it would be enabled in the coming year. But after holding consultations in early 2019, basically nothing happened. And although there were many participants from all sides of the ecosystem that were involved, the question was whether there was the political will at the federal level to actually push this through over the opposition of the incumbents, the big banks.

Canada's financial system is dominated by five banks who have majority market share. And for many of the innovations, they are either the leaders or they are the laggards. And with open banking, it seems Canada has been slow walking this for the past two years, and we have yet to see the regulation actually being put into place.

Faculty Video: Implementing Open Banking

In this video, Professor Pinar Ozcan discusses implementation of open banking.



At the Oxford Future of Finance and Technology Initiative, we've been doing research on open banking for a few years now. Here are some of the interesting things that we find out about the implementation of open banking and how it differed across the UK, EU, and other parts of the world, and why some of these differences led to successes or failures.

The first issue to consider is the scope of the regulation. When open banking was implemented, the UK made the decision to actually specify the technical standard for data sharing in terms of APIs. It basically said everybody that wants to access data needs to use APIs that will be published by all the players that have data. So in a sense, the highway on which data sharing will happen has to be based on API.

On the other hand, the EU took a different approach. The EU regulator said if we specify the technical standard, we're actually limiting ourselves. And in the future what might happen is that a better technology might come along. But if we force people to use APIs, then they will be having a hard time changing.

So instead, they left to the market to decide what technology would be used. The problem with that was that although this was a much more flexible approach in terms of opening itself up to new technologies in the future, it actually became very difficult to implement because different stakeholders had different approaches to technology and they made different choices.

This is why we see that in the UK, open banking and API-based data sharing is much more advanced now compared to the EU where standards still need to be implemented in different countries and decisions need to be made in terms of what the technical standard will be for data sharing.

Another way that we can compare some of the regulator's decisions regarding open banking is between UK, EU, and Australia. What we see is that in the UK and EU, the decision was made to have a step-wise approach trying to make sure that data that is being shared at the beginning is just payments data which resides in current accounts and checking accounts.

The Australian regulators took a different approach and said that only payment data sharing can actually be quite limiting for the new players. They need other kinds of data in order to run their AI models. So therefore, the Australians have decided to open it up to what we call the Open Finance Regulation, which is a regulation that allows sharing of different kinds of financial data which goes beyond payments.

The UK and EU's approach was actually quite a bit more conservative, and they wanted to have a controlled rollout of data sharing. However, this created a problem for fintechs, particularly if they needed data going beyond payments.

For example, if you wanted to give a loan and if you wanted to understand the different dimensions of someone's financial life before making a decision for a loan, it's not enough to just look at their payments and their income. You need much more data in terms of what else is going on in their life? Whether they have mortgage payments going on. Whether they're making investments, what kind of pensions they have? And some of that data might be missing from the payment data.

So for newcomers that are trying to get access to financial data in order to run data businesses, the UK and EU's approach to only limit data sharing to payment data was problematic. They ended up finding ways to get access to other data. However, that data was not available over APIs. So they had to go back between APIs and screen scraping which created a lot of confusion in the eyes of consumers.

One of the consequences of open banking being implemented was that as different players were forced to publish their APIs to allow data sharing, the discrepancy between these APIs, despite all the technical standardization created a situation where the IP APIs looked different across the different players.

For new fintechs that wanted to connect to different banks, this created a problem. APIs didn't look the same. Some of them were missing important dummy variables, and some of them were actually in different languages, particularly in the EU.

So what happened? We saw that there was a new type of industry role that emerged in order to solve this problem. These were technical middleware platforms that standardized the APIs and allowed fintechs to connect to that platform in order to have a one stop shop in terms of connecting the different banks.

This type of industry role which is now played by the likes of BUTT and Token and True Layer is a very important role when it comes to making open banking work, because without these middle layers, the different APIs, the variance in the performance of APIs would really end up becoming a problem for the new fintechs.

2.3.3 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Open banking is growing in all parts of the world. How open banking develops in a particular country depends largely on the regulations that each country's policymakers have enacted (or not enacted) to compel market players to act a certain way.
2. In the US, regulators have favoured a market-driven approach, taking a more laissez-faire attitude towards regulating consumer data protection. However, due to the ongoing conflict between banks

and fintechs over the security and privacy risk of screen scraping practices, US regulators are finally taking steps to standardise open banking.

3. With pioneering regulations such as PSD2 and the UK's Open Banking order, the EU has quickly introduced open banking into the market. While PSD2 allows incumbents to decide on the technical standards of the APIs they use to share the data, the UK'S CMA requires a standard format.
4. China's unique market conditions, including the rapid rise in consumers using direct online and mobile banking, have allowed open banking to grow at a rapid pace. For example, Ant Group is "on track" to earn 65% of its revenue by 2021 from open banking products, an increase from 35% in 2017.
5. Australia stands out in open banking as expanding the concept into other industries. The Consumer Data Right (CDR) emphasises the control that consumers have over what data they want to share with whom.
6. With the Saudi Arabian Monetary Authority (SAMA) launching a framework for open banking in the country, Saudi Arabia is making a move away from prizes stability to pursuing innovation. Fintechs and new services could fare especially well in Saudi Arabia, as 70% of the country's population is under 30 and highly digitally literate.

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Optional Resources

[Asia is the next frontier in open banking](#)

[Fintechs worry H.K. banks impeding open APIs](#)

[From Singapore to New Zealand, five open banking models in Asia and Oceania](#)

[Open Banking around the World](#)

[Rajeshwar Rao: Open banking in India](#)

2.4 Open Banking: Opportunities and Challenges

2.4.1 Open Banking: Impact on Financial Sector

Section Objectives

In this section, we will discuss what open banking means for the financial sector, and explore both the risks and opportunities in open banking.

The Risk and Opportunity of Open Banking

Across the globe, following the lead of the EU and the UK, the adoption of open banking has increased—driven both by regulators, eager to stimulate competition in their own banking markets, and by industry players, themselves under pressure to move quickly to establish early dominance. In the UK, which is seen as the world's leading open banking market, three million consumers are now using open banking products, with a healthy ecosystem of 311 regulated providers (“Open Banking”, 2021). The open banking services in the UK range from personal budgeting apps, such as Gen Z-friendly Cleo, to apps that can help protect vulnerable persons, such as older people, falling prey to scams or financial mismanagement (Davidson, 2020).

However, while open banking is often viewed as “an inevitable and accelerating structural trend”, and projects around the world have proliferated, the finance industry remains deeply divided on the level of impact that open banking will have on incumbents, and what actions these banks should take to maintain their competitiveness (“The Brave New World”, 2018).

Some incumbents, seeing an opportunity in the market, have moved quickly to offer open APIs. Through its Bank Account Starter API, Capital One allows consumers to apply for a savings or certificate of deposit (CD) account within a third-party site (“Bank Account Starter”, 2020). Use cases vary for this API, but the API allows consumers to set up a wedding registry, and lets new employees quickly set up direct deposit for paycheques. Other incumbents have balked, doing only the minimum needed to meet compliance standards, while still others have drawn out the process of offering APIs, wary of giving away the source of their historical competitive advantage.

Guest Video: Open Banking and Incumbents

In this video, Barry West, a fintech and regtech expert who leads the exploration, design and implementation of fintech strategy and initiatives at Abu Dhabi Global Market, discusses the early challenges of leading incumbents to move toward open banking in Abu Dhabi and the incumbent banks' concerns about what they would receive in return.



One of the things that was very apparent to us through our work and our analysis and indeed my work previously, it was mandated on the banks to open up their pipes and give all this data, which has been great on the other side of the fence if you're a fintech, but not so good if you're a bank. And actually, many banks are still dragging their heels on it, if we're really honest. And they're still only offering screen scraping.

So it gives you a real insight into what's going on there. And so we were kind of very cognizant of that. And so what we're trying to do is make a two way street. On the one hand, obviously, banks need to get something back in exchange for this collaboration or exposing some of this data. But at the same time, we can't expect fintechs to give up their secret sauce, and their IP and expose everything to the banks, because that's just not fair either.

So what we've come up with is our digital app is a way for us to enable fintechs to expose their APIs in a safe way and reduce that burn rate, keep the cost down on POCs and actually hit the banks very quickly, multiple banks very quickly with POCs, and prove their worth, prove their mettle. And then on the other side, the banks get to see the fintechs, they get to work with them, they get to really do a very quick POC, test out their API, test out their endpoints, test out the data, and then look if they want to partner up with them a bit further down the line.

Hopefully, by that process, they're building up a business case on both sides of the fence. And also, we hope to hack procurement, to speed up that whole interaction between the two entities involved in that.

Yes, yes indeed. So Digital Labs has come about through our work with our own regulatory sandbox. So we've had about four or five different cohorts of fintechs and financial institutions come through our regulatory sandbox. And the same issues come up time and time again.

So we noticed lengthy procurement processes, very complex integration issues, lack of business buying. And once let's just say, the fintech gets within the door and they got through the compliance hoops and they've got through the procurement process, then quite often, the business turns around and says, look, this isn't quite what we wanted.

There's a whole bunch of things also around legacy infrastructure and strategy that's already been put in place that make it very difficult for fintechs to get in the door, but the final piece being regulatory uncertainty. And this has been something that we've seen time and time again and in my other role as well, what does the regulator think in adopting this technology? And that's always been perceived to be a bit of a blocker. And rightly so, I guess.

And so throughout this work, we kind of challenged ourselves to think about, how can we as a regulator help some of this? How can we actually make some of this really excellent innovation real? Without influencing too much because that's not our role as a regulator. But perhaps we can convene and we can help in some way. And so the Digital Lab for us, is our way of hopefully facilitating that.

2.4.2 Risks and Opportunities for Incumbents

Risks

There is no doubt that open banking poses risks for incumbents, and will create new winners and losers in the market. As Deloitte notes, the “inherent threat to banks is the risk of commoditisation” (“How to flourish”, 2017). As the market grows increasingly crowded, and consumers are able to switch accounts more quickly, banks could see their market shares erode, affecting profit margins. Much like the challenger banks that gained younger customers seeking always-on banking experiences on their mobile phones, open banking fintechs, adept at creating consumer-friendly apps, could further usurp the direct relationship banks have with customers, relegating banks to a more supporting role.

For example, Cleo, a British open banking personal budgeting app, uses an AI-powered chatbot to communicate with consumers. The app, which sits between the consumer and their bank, is aimed at helping generation Z customers understand the state of their finances in a fun, non-intimidating way. Through the use of emojis, gifs, slang, and banter, Cleo takes on a role more akin to a coach or personal trainer for finances, as the customer’s bank quickly fades to the background as a distant place to simply park one’s money.

Opportunities

While today’s most popular open banking apps tend to offer budgeting help or account aggregation, the proliferation of APIs has steadily opened up the market to new services, including “buy now pay later” (BNPL), the practice of slicing up a consumer’s e-commerce bill into smaller interest-free installments to be paid off over a longer period of time. BNPL has been popular with retailers, and can boost the average order value of a consumer by as much as 68%, according to Klarna, a Swedish BNPL fintech (“Shopify”, 2020).



Open banking APIs have allowed BNPL players like Klarna, now one of Europe’s most highly valued unicorns, and Zilch to perform quick, timely credit checks on customers, who opt for BNPL at the checkout on an e-tailer’s site. While the practice is controversial and critics have pointed to the dangers of racking up debt, BNPL has grown steadily across the world. In the UK, usage jumped 39% from 2019 to 2020 and was estimated to be worth £2.7 billion and growing by February 2021 (Browne, 2021).

As Accenture notes, while the shift towards APIs certainly has its risks, there are significant opportunities for banks as well (“The Brave New World”, 2018). As one example, although banks will be forced to innovate to serve third-party developers who access their APIs, they can also sell the more specialised of these APIs to third parties. For example, the Spanish bank BBVA sells its open APIs, including one API that allows a shopper to apply for a BBVA loan from within a retailer’s checkout site.

Indeed, it is this emerging trend for “embedded finance” that could see banking APIs extend their distribution through third-party services in other industries. Embedded finance combines a non-financial service, such as food delivery, with financial services, such as payments. By combining the two, a customer can effortlessly order food and pay in a single experience. As interfaces become more standardized, banks have an opportunity to use these third-party partnerships to grow their revenues. The trick, notes Accenture, is for banks to remain the “preferred partner” rather than being relegated to a “commodity product provider” (“The Brave New World”, 2018).

Guest Video: Opportunities for Banks and Fintechs in Open Banking

In this video, Ian Pollari, Global Co-leader of KPMG’s fintech practice, talks about the opportunities for banks and fintechs in open banking.



So the convergence of open banking, embedded finance and how organisations would look to capitalise on this convergence, you know, I certainly feel that while open banking has been slow to get started, I think importantly, as there's some fine tuning of our data recipient regime and also as banks themselves look to become data recipients, I certainly feel that will be a stimulus for banks looking to extend their business models, their services beyond perhaps call banking.

Some areas that I think could be quite appealing-- and look, in most market markets, you know, consumer surveys would repeatedly tell you that banks are not loved or liked terribly well compared to many other experience providers. But it is true that in most of those surveys, and certainly surveys that KPMG have published, banks are the most trusted parties to keep your data safe. And so just as we spoke of earlier, that your financial data is something that you hold obviously at a high degree of expectation around security and, you know, using that to be able to protect consumer interest and business interests, I think that there is really an opportunity there for banks to consider how they can extend beyond the provision of traditional banking services to the provision of data services.

And look, I don't think in the first instance that's going to be anything around helping people commercialise data, notwithstanding there are fintech and some parties that think there'll be that opportunity and maybe that will come in 5 to 10 years time. But I think in the short term, helping consumers that are going to be far more discerning around who they are sharing their data with, how they're managing the content around the data, I think is an enormous opportunity.

So the opportunity for banks and other fintech providers, provided they have trust, will be to help manage concerns, to help protect and treat customer data securely and to help customers opt out. I think that this notion that the free world of data and everyone will be freely sharing data, I would challenge that hypothesis. They'll certainly be cohorts of the population that will. But they'll also be, I think, quite a significant number of consumers, businesses, that will want to opt out of experiences and will not want their data shared. And so for financial institutions who have got the technical capability and strategic intent to manage and introduce a set of services that relate to data, I think will benefit commercially and also from a brand and reputational standpoint. And the most exciting dimension of that is then extending into areas such as energy data, telco and IT data, other data, as I mentioned earlier. So that's a real opportunity, I think. And I'd expect the notion of that combination of factors that will really facilitate the exploration of some of those new opportunities.

So I think there are a lot of opportunities for fintech companies. The first opportunity would be that of, you know, enabling banks and other corporates to fulfil the requirements that pertain to open banking. That consent management is a good example, the ability to aggregate and interrogate data and apply machine learning to automate a lot of manual intervention that exists within the middle and back office of most bank and finance institutions today. And I also think one of the biggest opportunities is really around credit underwriting. And so, you know, most bank models, you know, have been around a long time. And I do think there is a genuine opportunity with the introduction of open banking and with fintech capability in areas of machine learning and AI to automate what is by and large still, particularly as it relates to some segments of the market, like secured lending, mortgages, et cetera, where there's still very people-heavy, manual, paper-based set up processes, but to inform credit decisioning in a more rapid, real-time nature and to importantly bring in third-party data or data that would be difficult to obtain absent open banking and the Consumer Data Right, which will extend into other parts of the economy, presents a real rich opportunity, I think, for fintech companies to help enable both banks and financial institutions, but also for themselves to be positioned.

You know, they've got an ability to position as an app that could be preferred in aggregating and being able to more efficiently meet the needs of consumers. We think that's a really interesting place, but there's clearly some elements that would need to be in place to fulfil that. But most fundamentally, that around trust and in building the scale in the customer base to get enough data to really drive the inputs into any machine learning or AI applications.

So that would be the opportunities that I would frame is both in terms of enablement of banks, but also, then, for some fintech companies, an opportunity to become potentially the platform of choice. But, you know, there's some conditions, precedent they would need to fulfil in order to take that position.

2.4.3 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Regulators in the UK stipulated the creation and use of an open API, now known as the Open Banking Standard. APIs are the preferred method of facilitating data access in the tech industry and are often compared to a “plug and play” system.
2. While open banking is flourishing, the finance industry remains deeply divided on the level of impact that open banking will have on incumbents.
3. There are risks associated with open banking for incumbents, such as fintechs disrupting the relationship between banks and customers with user-friendly fintech apps.
4. There are also opportunities for incumbent banks to innovate their business models, such as selling specialised APIs to the TPPs.

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Optional Resources

[Is Open Finance worth getting excited about, or is it just spin?](#)

[Open banking – the quest for a level playing field](#)

[UK Open Banking Standards](#)

[Why open banking in Europe may just be the start of bigger data revolution](#)

2.5 Beyond Open Banking

2.5.1 What's Next After Open Banking?

Section Objectives

In this section, we explore the future of open banking, and analyse the challenges that regulators face in reining in open banking innovations.

What's Next After Open Banking

While open banking in the EU and the UK first took aim at payments and direct banking, British regulators are exploring the extension of the open banking ethos to a wider range of financial services and sectors to give consumers an even more complete picture of their total financial lives. This initiative has been called “open finance”, and much like open banking, it would enable third-party providers access to authorised consumer data through secure APIs—but in wider areas such as savings, insurance, mortgages, investments, pensions and consumer credit (“Call for Input”, 2019).

According to the UK’s Financial Conduct Authority (FCA), open finance could have a number of positive impacts on British consumers and the financial industry itself (“Open Finance”, 2021). Open finance could enable access to more individually tailored products, allow consumers and businesses to make better financial decisions, and make it easier for both to shop for better prices and switch products or providers. Open finance could widen access to products that some consumers have been traditionally reluctant to buy into, such as wealth management. For the industry itself, open finance could usher in improved competition, innovation, new services and increased demand. In short, open finance could boost the health of the whole UK economy.

However, bringing this vision of total consumer financial empowerment to reality won’t be easy. Its success rests on another ongoing, seismic shift that open banking has brought to the market: the necessity for a new data sharing infrastructure. This new infrastructure, as the FCA notes, must be grounded in the principle “that financial services customers own and control both the data they supply and which is created on their behalf” (“Open Finance”, 2021).

As Deloitte notes, for open finance to fully develop, a legislative and regulatory framework will be necessary for mandating and overseeing how data is shared—and the potential risks this data sharing generates. Data ethics is at the top of the risk list, and indeed industry feedback to the FCA’s Call for Input highlighted unfair discrimination, financial exclusion, and low AI transparency and explainability (Gallo, 2021).

Finally, an even grander vision beyond open finance has emerged, a movement sometimes referred to as “open life” or “open data”, in which the flows of authorised consumer data don’t just move across the finance sector, but across and through other industries. For example, what if a consumer could authorise the sharing of select health data for better insurance rates? Australian regulators and

Open Banking

Payments information is owned by the customer, and they decide where that data can be shared.

Open Finance

All financial data (mortgages, investment accounts, pensions, and insurance) is owned by the customer, and they decide where that data can be shared.

Open Data

All data is owned by the customer, and they decide where that data can be shared.

lawmakers have been at the forefront of this movement with the Consumer Data Right (CDR), which places consumers in control of their data. But as more industries are integrated, how will consumers manage their consent and control across them? How will they understand how their data is being used and where? As you'll see in the following video, Ian Pollari believes that this could give banks an opening in what is being called "customer consent management".

Guest Video: Opportunity in Customer Consent Management

In this video, Ian Pollari talks about the opportunity for banks in the area of "customer consent management" that will arise as the ownership of data moves to customers.



That's an example of one of the opportunities, I think-- not just open banking, but the application of the consumer data as it applies across other sectors of the economy. If you're a consumer of small business and you're considering, I've got multiple financial providers or multiple providers in most sectors or categories, clearly, the fundamental dimension of open banking regimes is customer consent. And so as a consumer, having multiple providers of consent from a financial perspective isn't the most elegant or intuitive process for me as a consumer. And clearly, as the consumer data in Australia will then apply to different sectors, the notion of having multiple consent providers, again, I think is an enormous opportunity for players to lean into.

And so the notion of an aggregated consent platform, which helps me, as a consumer, to manage not just my financial data, but my energy data, my telco and IT data, my retail data, et cetera, et cetera-- to do this in an orchestrated way, in a way that can bring all of that together for me, I think is a really big opportunity. And again, as banks are the first cabs off the rank, so to speak, in adopting open banking, I think there's an opportunity for them to have a first-mover advantage in creating services around aggregated consent.

2.5.2 Changing Role of Regulators Beyond Open Banking

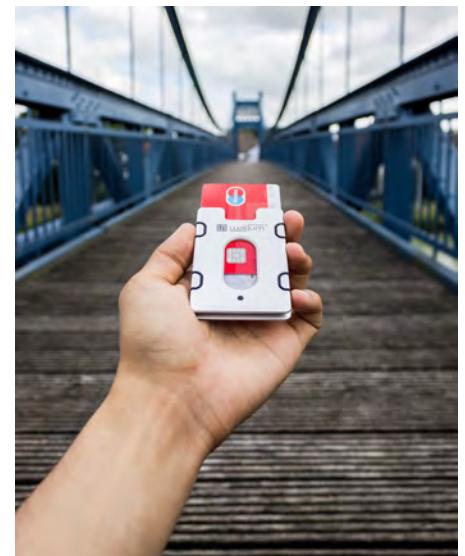
The Evolving and Expanding Role of Regulators

While open banking is now spreading across the world, buoyed by the promise that it will usher in innovative new banking services, increased efficiency, and even financial inclusion, policymakers are fully aware that they face a growing number of complex challenges as they enter the “uncharted territory” of a world in which the combining of open APIs will create services yet to be imagined (“Open Banking”, 2017).

For a start, regulators face trying to control an increasingly diverse and crowded ecosystem, with new entrants that bring with them novel business models often fuelled by new technologies, network effects, or both. Three regulators, the Financial Stability Board, the European Banking Authority, and the UK Financial Conduct Authority (FCA), have already flagged the pressure that fintechs could exert on the financial system’s stability, as fintechs continue to disassemble banks by building more consumer-friendly products that take aim at specific bank services. These new services squeeze the profit margins of retail banks—already down to razor-thin levels—leading the banks to suffer “higher deposit volatility, increased liquidity risk, and consequently, lower stability in banks’ sources of funding and lending capabilities” (“Open Banking”, 2017).

Additionally, in this rapidly shifting tech-fuelled market, where small upstarts can quickly amass dominant market share through network effects, these fintechs could emerge as key players in the ecosystem, becoming so important to the system that they could be considered “too big to fail” (an echo of the attitude toward specific banks during the global financial crisis of 2008). In China, for example, Alipay and Tenpay already control 93% of the retail non-cash payments market. Alipay was launched in 2003, while WeChat Pay, Tenpay’s popular payment app, was started in 2011 (“Do Alipay and Tenpay”, 2020).

Further, not only does open banking recast the competitive dynamics of retail banking sectors globally, but it puts data at the centre of this new economy, meaning that policymakers will find themselves potentially regulating players not just from inside the financial services sector, but also those from outside it. Open APIs will permit new services to be created in which industries will overlap—especially as the practice of embedding financial services, such as payments, into non-financial services continues. How, for example, should financial regulators think of Chinese-style super apps, such as WeChat Pay, that blend retail, ecommerce, social media, loans, and payments? How should they think of Big Tech companies, such as Google, Apple, or Meta, as they ramp up their financial service offerings? If any set of companies has troubled the regulators, it has been Big Tech, who have a massive user base that runs into the billions. This handful of companies could quickly and very well dominate financial services, not just posing a systemic risk, but serving as gatekeepers to and controlling the functionality of a market they dominate (Crisanto et al., 2021).



Regulation Beyond Open Banking

In a 2017 speech at a Bank of England conference, Christine Lagarde, then IMF Managing Director, noted that traditionally, regulators have focused on clearly defined entities within the financial services sector. She noted, however, “As new service providers come on stream in new shapes and forms, fitting these into buckets may not be so easy. Think of a social media company that is offering payments services without managing an active balance sheet. What label should we stick on that” (Lagarde, 2017)?

Moreover, regulators will need to rethink how the data itself is regulated. Technically, the EU’s General Data Protection Regulation (GDPR) requirements, which give consumers rights around their personal data, are in conflict with screen scraping, which PSD2 still permits. Eventually, clashing regulations around data will need to be reconciled as the ethos of open banking infiltrates other industries. In Australia, for example, regulators are already looking toward energy and telecoms.

Finally, one of the biggest challenges for policy makers around the world will be how to regulate and coordinate with one another in a world in which banking is borderless. In her Bank of England speech, Lagarde noted, “Reaching across borders will be critical as the focus of regulation widens—from national entities to borderless activities, from your local bank branch to quantum-encrypted global transactions” (Lagarde, 2017).

Faculty Video: The Role of Big Tech in Finance

In this video, Professor Pinar Ozcan discusses the advantages of big tech firms and what that means for the competitive dynamics of the industry.



As you know by now, open banking is a regulation that allows data access. That is important because data excess gives you the opportunity to run data-driven business models in finance. And you also know by now that open banking regulation has invited a flurry of different fintechs into the market trying to do different kinds of things that are going to be an improvement in the financial wellness of customers.

When we think about analysing financial data by different players, we need to think about the advantages and disadvantages that these players have in that particular activity. Let's consider the advantages and disadvantages of different players when it comes to data analysis in finance. Let's consider the entrepreneurial firms, the new fintechs first. On the one hand, these are digital-born firms. They are full of data scientists and behavioural scientists, and they can really build models in order to understand people's financial behaviour better and to nudge people in the right way in order to improve their financial wellness.

However, these are new firms, and whenever you're a new firm in a market, you have what we call the liability of newness. That means that customers are not aware of you and of your brand, and they may have trouble trusting you. This creates problems, especially in an industry where data, financial data, is sensitive. So what we see is that one of the biggest liabilities of being a new firm in finance is that you may have trouble accessing data.

On the other hand, the incumbents don't have this problem. They actually have lots of customers, and they have a trusted brand that customers have difficulty switching away from. However, as you will see in later modules, the incumbents have different issues. Their data might be siloed and therefore difficult to merge. It might be difficult for them to change their organisational structure and their culture in order to focus on data analysis. So the incumbents' disadvantages are actually exactly the opposite of the disadvantages of entrepreneurial firms.

However, let's consider a third type of player that has the advantages of both sides and actually doesn't have the disadvantages of any of them. These are the big tech players that now can come into finance using the open banking regulation. These players already are household names for us. We trust them. We trust them with our email communications, we trust them with our shopping, we trust them with our social life.

These players also know how to analyse data. They are digital-born. So merging lots of data and combining data from different industries is second nature to them. What this means is that once big tech wants to come into finance using open banking regulation, once they get access to data and integrate different fintech activities into their platforms, it will be particularly easy for them to run AI models in order to offer us better services. So in a sense, what incumbents need to be scared of is not necessarily the entrepreneurial firms that are trying to make it big today, but the entry of big tech firms into finance.

Guest Video: Open Banking and Big Tech

In this video, open banking expert Bill Roberts discusses what regulators are wary about when it comes to big tech entering the financial market.



Well, big tech is already there, of course. I mean, Google already has a license to be a payment initiation, to offer payment initiation services in the EU. It's had that license for a while.

And yeah, in the payment space, they're all active. So through WhatsApp or through Google Pay or through Apple Pay, and in some other areas, too. I mean, Amazon is a big lender to small businesses, particularly in the US.

And we've all heard of Amazon Pay. It's not quite the same as Google or Apple Pay. But there are payment services they offer. I think there's a wariness amongst regulators in terms of the further expansion of the big platforms into these areas.

I saw it most curiously, I saw this in China, PRC. But there is a lobby to allow open banking in China. And it's coming from the banks. And the banks said they want a level playing field to compete effectively with Alibaba because Alibaba has too much power.

So it's that kind of direction of travel that people are looking at. As I say, if you melded browsing data with transaction data, that would be a very, very, very powerful set of tools to be used for good or ill, really. And equally, I guess it would depend on which platform you were talking about, how much public confidence people would have in each platform.

Amazon is very well placed to offer some services based on purchasing behavior comparison tools, for example, which wouldn't necessarily involve using your own personal data, but maybe just aggregated data. I don't know. But certainly, the idea of mixing and matching data from the big platforms with bank transaction data, it would be hugely powerful. But because it's hugely powerful, you would be wary about allowing it to get into the wrong hands without regulation.

2.5.3 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Although open banking promises innovative new banking services, increased efficiency, and financial inclusion, policymakers are becoming aware of the complex challenges they face in regulating open APIs and future services that these APIs will create.
2. Policymakers face regulating an increasingly diverse and crowded ecosystem that is full of new entrants with novel business models.
3. In this rapidly shifting tech-fuelled market, where small upstarts can quickly amass dominant market share through network effects, new entrants could emerge as key players in the ecosystem.
4. Because open banking both recasts the competitive dynamics of retail banking sectors globally and puts data at the centre of this new economy, policymakers will find themselves potentially regulating players from inside and outside the financial services sector.
5. One of the biggest challenges for policy makers around the world will be how to regulate and coordinate with one another in a world in which banking is borderless.
6. Open finance is the extension of the open banking ethos to a wider range of financial services and sectors to give consumers an even more complete picture of their total financial lives.
7. Open finance could enable access to more individually tailored financial products, widen access to financial products that have traditionally been inaccessible to many, and improve competition and innovation in the finance industry itself.
8. A grander vision of open finance is the concept of open data, in which the flows of authorised consumer data don't just move across the finance sector, but across and through other industries.

References

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Optional Resources

[Banks, Fintech Firms Eyeing CFPB Proposal on Consumer Access to Financial Records](#)

[BIS: Report on open banking and application programming interfaces](#)

[US looks abroad for open banking best practices](#)

2.6 Case Study: Open Banking and Financial Inclusion in Brazil

2.6.1 Case Study: Open Banking and Financial Inclusion in Brazil

Quick Fact

According to the World Bank, 31% of the global population of adults, representing 1.7 billion people, remains unbanked—that is, this population does not have a financial account either through a bank or a mobile money provider (Demirguc-Kunt et al., 2018).

Tackling Poverty and Financial Exclusion through Open Banking

One of the great promises of open banking is its potential to tackle the challenge of financial exclusion, and with it, poverty. The World Bank estimates that 45 million of Brazil's 210 million citizens have no access to a bank account, and therefore no access to additional financial services, such as credit or savings (Demirguc-Kunt et al., 2018). This population is locked out of the opportunities for stability that the banked enjoy, including home ownership, retirement savings, loans to access education, and credit to start businesses.

In Brazil, challenger bank Nubank, founded in 2013, has amassed a customer base of 34 million, with an initial focus on providing the underbanked and unbanked with services. The Brazilian Central Bank (BCB) has embarked on an ambitious project to deliver open banking, and, by extension, widen financial inclusion (Mari, 2019). Open banking regulations will compel banks to share



the data they hold on consumers through open APIs with third-party providers (when authorised by the consumer). By placing Brazilians in control of their financial data to choose the services that will benefit them, the main hope is that open banking will inject competition into the financial service sector by bringing even more new entrants to the market, drive down the cost of financial services, and make these services more widely available across the population.

Brazil is introducing open banking in four phases in 2021:

- Phase 1 saw incumbents publicly publish information on their websites about their products and services.
- Phase 2 launched the authorised sharing of customers' financial data. Companies can only use the minimum set of information needed to fulfill their stated purposes, and consumers can withdraw their consent at any time (Rippy, 2020).
- Phase 3 began the sharing of payment transaction initiation among participating banks and third parties, including with Pix, the central bank's recently launched instant payments platform.
- Phase 4 saw a wider range of financial services integrated into open banking, including cross-border transfers, investments and pension plans.

The Central Bank's Early Boost to Open Banking: Mobile Wallet and Instant Payments

Perhaps the most compelling initiatives that could help propel Brazil's open banking efforts were created by the central bank during the pandemic. These two initiatives, a digital wallet and an instant payments platform, built key financial infrastructure, and their overnight popularity has shown what serving the unbanked might mean for the economy and the opportunities that await new market entrants when open banking is unleashed.

During the pandemic, the Brazilian government needed a safe, secure, and efficient way to disburse the emergency aid the state was paying its citizens. With smartphone penetration in Brazil registering around 69% (Navarro, 2021), the government opted to work through Brazil's state-owned bank, Caixa Economica Federal, to create a digital product called "Caixa Tem", available to both iOS and Android users. By May 2020, the central bank had paid two installments through the wallet, reaching 107 million users, and estimated that 30%–40% of the emergency aid payments were to those who were previously unbanked ("Brazil's Caixa", 2021).



Kazuo Missao noted that for countries like Brazil, “these initiatives are much more than a regulation . . . [they are] a game changer for us as a country. People will have new ways of using their money, consuming financial products, in a cheaper [and] safer way, and for a country like Brazil it means including [formerly unbanked] people in this environment, [and] protecting people in terms of privacy and data rights and in terms of physical security as well once we are working with digital money rather than cash”.

Case Analysis

Having read the case, consider the following questions:

1. What do you think of the role that Brazil’s central bank played in creating a mobile wallet and a payments platform for the country?
 - Did the bank overstep its role and hurt private sector fintechs who already exist in Brazil? Or, did the government’s responsibility lie with the unbanked of Brazil: to get aid payments to those who needed them most in the safest, quickest way possible?
 - Should the government have left the creation of these initiatives to the private sector? Or, has the government given the market a major boost that the private sector can build on?
2. Do you think other underbanked countries can or should mimic the Brazilian government’s actions?
3. What other products could the private sector focus on to better serve the underbanked in Brazil?

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Module 3: AI in Incumbent Banks and the Opportunities for New Entrants

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford Artificial Intelligence in Fintech and Open Banking

Module 3: AI in Incumbent Banks and the Opportunities for New Entrants



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3.1 About Module 3

3.1.1 Module 3 Overview

Overview

Welcome to Module 3 of the AI in Fintech and Open Banking Programme!

This week, we explore the opportunities for new entrant fintechs to deliver AI based services in finance, examine their main challenges, and consider the benefits and drawbacks of partnerships. We dive into how banks and other financial institutions are digitising their platforms and using AI in an effort to leverage data and personalise the banking experience for their customers. We'll look at the challenges associated with the process of building successful prediction machines—either by developing and implementing AI systems in-house, or choosing to partner with fintech third-party providers (TPPs).

Faculty Video: AI in Incumbent Banks & the Opportunities for New Entrants

In the following video, Professor Pinar Ozcan shares what to expect this week.



Welcome to Module 3. After exploring the wonderful world of open banking and related frameworks, it's now time for us to look at the opportunities and challenges that await incumbent banks as well as newcomers when they adopt AI services.

First, we will take a realistic view on how incumbent institutions are adopting AI-based services. Incumbents are at an advantage here, as you will see, because they have data. However, that does not mean that adopting AI-based services is easy for them. We will look at how different incumbent institutions are adopting services, what challenges they face, what solutions they have found for these challenges, and what lies ahead for them. After that, we will take a look at the world of AI-driven new entrants. New entrants will have an easier time accessing data and building AI-based services on top of it now that open banking and related frameworks are in place.

However, that does not mean that their world is perfect. They have many challenges lying ahead, and depending on whether they are in a business-to-consumer or a business-to-business setting, these challenges are different. We will take again a realistic look and try to understand how opportunities, challenges, and solutions might look for new entrants.

Objectives

At the end of this module, you will be able to:

- Describe how new technology driven by data centralisation has fueled a power shift in the finance industry.
- Identify the opportunities and challenges for AI startups in finance.
- Formulate ideas to address the cultural challenges of emerging technology and banking cultures.
- Develop a plan for launching an AI solution inside an organisation.

Graded Assignments

You will complete individual and group assignments, which count towards your completion of the programme. This week, you will:

- Meet with your group to examine the scope and feasibility of your proposed AI projects.
- Complete a quiz on the module's content and key takeaways.
- Reflect on what you have learned this week by applying it to your personal or professional experiences.

You must submit all graded assignments in Module 3 by **5 July, 2022, 23:59 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

Additional Activities

As in each module, we present additional content related to the core learning. This week, we:

- Analyse the challenges and opportunities for incumbents and fintechs with AI, and discuss the benefits and drawbacks of fintech and incumbent partnerships.
- Discuss how both incumbents and challenger banks have used AI to help customers manage their finances, especially during the Covid-19 pandemic.

Vocabulary Check

The terms below are industry specific terms that appear in this module. Before beginning the module, check your knowledge of these words, and, if you need to, review the definitions in the programme glossary.

[business-to-business \(B2B\)](#)

[business-to-consumer \(B2C\)](#)

[challenger banks](#)

[incumbents](#)

[new entrants](#)

Time Commitment

Plan to spend seven to ten hours on Module 3 this week. As there is a lot of reading material, and many videos, you might want to divide up your work into several sessions. The module is broken up into sections by theme, giving you potential break points.

Make sure you plan time to meet with your group, and to complete the assignments.

3.2 Opportunities for New Entrants

3.2.1 Opportunities for Fintechs to Deliver Needed AI Solutions

Quick Fact

Driven by open banking and the use of AI and machine learning, fintechs are in a period of rapid growth. Statista predicts that digital payments will reach a transactional value of US \$7,860,739m in 2022 (Statista, 2022).

Section Objectives

In Module 2, we looked at how Open Banking regulations have enabled opportunities for fintechs to compete in the financial market and use their advantages to deliver AI solutions. In this section, we will take a closer look at some of those opportunities for fintechs.

Opportunities for Fintechs to Deliver Needed AI Solutions

Whether helping with analysis and prediction, actual decision-making, or organisational efficiency, machine learning and AI systems have the potential to solve problems across financial market sectors—each with its own distinct challenges. Let's take a look at each of these sectors and explore what opportunities they present, and examine a few examples of fintechs that are using AI to capitalise on these opportunities.

Digital Banking/ Payments 	Financial Wellness/ Personal Financial Management 
Cybersecurity, Identity, and Fraud Detection 	Loans, Funding, and Underwriting 
Open Banking, Regtech, and Infrastructure 	Insurance (Insurtech) 

Digital Banking and Payments

Digital banking has shifted financial expertise and power from incumbent banks straight into the hands of the consumer, with online and mobile banking enabling access to financial information at any time and in any place. Important factors in this sector include data security, connectivity, accessibility, and technological reliability. AI is helping to advance options and quality of services in areas of digital support, speed and efficiency, and personalisation, for the following players:

- **Monzo** (UK): touted as “a bank that lives on your smartphone”, Monzo uses machine learning to get to know customers better, then provides updated services that expand along with user needs (Monzo, 2018). One way Monzo uses AI is to feed a recommendation system that gives customer service agents suggestions for responding quickly and effectively to customer queries (White, 2019).
- **N26** (Germany): a fully mobile bank hosted in the cloud, N26 allows for more flexibility and seamless customer interactions, without the burden of updating legacy infrastructure. As of 2021, 20% of N26’s customer service requests are handled by a multi-lingual AI assistant that operates in the company’s mobile and web apps (Rasa, 2021).
- **Revolut** (UK): this digital banking company offers a wide range of services, including currency exchange, cross-border money transfers, stock trading, and cryptocurrency access. Revolut uses Sherlock, an AI-powered fraud prevention system that correctly predicts and blocks 96% of fraudulent transactions and eliminates the need for hundreds of support staff (Jones, 2019).
- **Starling Bank** (UK): a digital challenger, Starling is the first bank to feature in-app provisioning for Apple Pay. Starling uses a proprietary open banking API that offers users “smart integration” with other financial companies. It also uses AI to give customers predictive insights into their money management and future earnings (Woollaston, 2016).

Financial Wellness and Personal Financial Management (PFM)

This sector is focussed on analysing markets and offering consumers a convenient dashboard of services to help view, access, and manage finances in a holistic way. Intuit’s Quicken software could be considered the first player in this space, though technology has advanced substantially in the decades since its advent. Today’s fintechs have an increased focus on financial education and wellbeing, with AI systems being used to help organisations leverage transactional and behavioural data to customise experiences and positively affect the consumer’s relationship with money.

- **Acorns** (US): merging robo-advising with automatic savings, Acorns expands investing and micro-investing access to a broader range of people, including millennials, and promotes long-term saving. Powered by AI, this savings app provides customised advice to clients about how much more money they could be saving, and facilitates automatic investments from clients’ bank accounts (Shevlin, 2021).
- **Arabesque AI** (UK): this fintech leverages smart technology by enabling human decisions in finance and portfolio management through AI. Also focussed on sustainable investment,

Arabesque uses AI to analyse and predict financial market behavior and subsequently generate recommended customisable investment strategies (Google Cloud, 2021).

- **Cleo** (US): aimed at the millennials market, Cleo uses slang and a conversational approach to make personal money management attractive (the company encourages users to “Save money fast with goals, hacks, autosave features and some AI sass”) (Cleo, n.d.). Users have easy access to budgeting and savings tools as an introduction to financial management. Described as having a “strong personality,” Cleo’s AI-powered “personal assistant” offers users a personalised budget and spending breakdowns, as well as proactive budgeting tips and help with their expenses, with the ultimate goal of improving customers’ financial behaviour (O’Hear, 2020).
- **Meniga** (Iceland): an Iceland-based company offering software that powers open banking for partner banks across the globe, Meniga was an early proponent of PFM technology. Meniga’s Correlator software uses AI and machine learning to enable banks to identify valuable customer segments and predict the behaviour of customer groups (Meniga, 2020).
- **Moneyhub** (New Zealand): enabling financial wellness through an open finance platform, Moneyhub features powerful analytics, actionable insights, and hyper-personalised experiences, and is a pioneer in offering customers a holistic view of their financial picture. Moneyhub uses “holistic” AI to offer insights and support to help people save money and plan their finances (EU Business News, 2018).
- **Plum** (UK): Powered by automation and a smart algorithm, Plum’s AI assistant analyses customer transactions and “every few days. . . transfers the perfect amount from your bank account” to help customers save money (Plum, n.d.). Like Acorns, Plum offers customised advice to its customers.
- **Tully** (UK): a PFM app that helps give consumers debt advice (Tully, n.d.), this open banking and conversational AI-based platform offers customers personalised, auto-generated debt management options.

Cybersecurity, Identity, and Fraud Detection

Securing information and minimising risk for both financial services companies and consumers is at the core of these sectors. An unimaginable amount of data is moving through organisations and throughout the global internet each day. Financial firms must be able to scale transaction capabilities whilst also identifying increasingly dangerous threats. AI and ML tools are helping to analyse this information and protect both people and industries, and are getting smarter in the process.

- **Darktrace** (UK): this fintech uses cyber AI that’s modelled on the human immune system to ward off threats to the cloud, email, IoT, and network systems (Darktrace, n.d.). Like fighting a virus, Darktrace can handle changing and increasingly complex attacks by going on the offence with AI.
- **Intezer** (Israel): with genetic malware analysis technology focussed on cyber threat detection and analysis (Intezer, n.d.), Intezer’s innovative technology detects threat mutations by recognising code reuse, resulting in faster response times (Intezer, 2018).

- **McAfee** (US): founded in 1987 and now one of the oldest cyber security firms, McAfee has grown successfully through acquisition, and has deep roots in protecting both corporate networks and private consumers online. McAfee uses machine learning, deep learning, and artificial intelligence to detect and prevent cyber attacks (McAfee, 2019).
- **MindBridge** (Canada): this B2B fintech offers tools that enable financial institutions to assess and identify risk and fraud. The company's AI Auditor platform crunches massive amounts of data to analyse activity and transaction patterns and to detect outlying anomalies, errors, or possible misrepresentations (Colthart, 2017). With the quick flagging and remediation that MindBridge offers, organisations are, in turn, able to limit financial loss.
- **RedSift** (UK): offering self-service when possible, with the goal of bringing a consumer-first approach to cyber security, Red Sift helps organisations fight costly cyber attacks via its Open Cloud data analytics platform. Red Sift's automated tools use AI technology to prevent email impersonation, identify email threat detection, and safeguard client data (Red Sift, 2021).
- **The ID Co.** (UK): the B2B side of this fintech uses banking data in concert with its AI platform to help businesses prove identity, income, and more when performing necessary KYC and AML checks (The ID Co., n.d.), whilst Nomo, a PFM, provides friendly and personalised cash-flow averaging, recommended spending, and financial performance information (The ID Co., 2018).

Loans, Funding, and Underwriting

Efficiency is the core value that fintech brings to commercial lending and underwriting. Using robotic process automation (RPA) and optical character recognition (OCR), fintech tools help to process loans faster, analyse credit history, track and manage data, and keep up with compliance requirements. As an added benefit, algorithms typically improve accuracy over humans for all of these processes.

- **Credit Kudos** (UK): a self-described “challenger credit reference agency,” Credit Kudos hopes to make credit scoring more inclusive and fair (Credit Kudos, n.d.). The company empowers borrowers to demonstrate creditworthiness, and helps lenders harness open banking data to streamline underwriting and reduce risk. Credit Kudos uses an AI tool called Cybertonica, which uses transaction data combined with biometric and behavioural modelling to manage credit risk and fraud (The Paypers, 2019).
- **Kabbage** (US): an innovative, AI-based small business loans platform, Kabbage enables both funding and loans, offers payment processing tools, and provides one-stop financial management dashboards. The Kabbage algorithm uses indicators from the company's own public activities as well as “2 million live data connections” from comparable companies to decide when to offer loans and at what rates (Lunden, 2019).
- **Klarna** (Sweden): this fintech finances and facilitates online shopping by offering customers personalised purchase and payment options at the point of sale. Klarna's AI-powered algorithm uses customers' purchase, demographic, and historical data to generate a preferred payment method for each specific customer in each purchase context (Kotorchevikj, 2021).

- **Moneytap** (India): Billing itself as “India’s 1st Personal Line of Credit,” MoneyTap partners with incumbent banks to offer accessible and flexible credit to a more inclusive customer base (MoneyTap, n.d.). MoneyTap uses AI for everything from assessing creditworthiness and repayment behaviour patterns to personalising products and verifying documents during onboarding (Choudury, 2020, 7 January).
- **OakNorth** (UK): an enterprise-level credit intelligence for commercial lenders, OakNorth collects vast amounts of data on small and medium-sized enterprises and then feeds the data into machine learning algorithms to identify data that lenders require to make more informed credit decisions (Choudhury, 2020, 10 January).
- **SoFi** (US): short for Social Finance, SoFi empowers millennials to “get [their] money right” with financing, refinancing, loan, and money management tools (SoFi, 2019). SoFi’s algorithms enable automated investing to provide financial guidance and portfolio management, eliminating the need for clients to research their own investment options or rely on human financial advisors.

Open Banking, Regtech, and Infrastructure

Additionally, many B2B firms are working on infrastructure and technology to provide help with open banking-related concerns.

- **Bud** (UK): this fintech offers a complete set of APIs, aggregated third-party data, and intelligent tools to incumbents and fintechs alike, enabling all to offer more engaging services (Bud, n.d.). Bud’s intelligence product sorts transaction data into more than 200 distinct categories, ultimately providing clients with insightful context and personal prompts from financial data.
- **ComplyAdvantage** (US): empowering compliance professionals looking for financial crime, ComplyAdvantage uses an AI platform and a global, connected database to detect financial crime, which is not only detrimental to enterprises, but also closely linked to terrorism, human trafficking, and sexual exploitation, and other atrocities worldwide (Martin, 2020).
- **Hummingbird AI** (US): a provider of AML compliance technology similar to ComplyAdvantage and a self-described “Privacy-First AI company,” Hummingbirds uses computer vision, big data, and behavior analytics to enable clients to create, validate, and file suspicious activity reports (Hummingbirds AI, n.d.).
- **Salt Edge** (Canada): this fintech enables TPPs to access account information and payment initiation channels via APIs, and develops technology to aid in PSD2 and Open Banking compliance. Salt Edge provides lenders access to real-time financial data, enabling them to automatically verify an applicant’s identity, account number, income sources, balance, transaction history, and financial behaviour to make real-time lending decisions (Salt Edge, 2018).

Insurance (Insurtech)

McKinsey & Company predicts a “seismic, tech-driven shift” in the insurance industry, based on four

AI trends: the influx of data collected from connected devices; increased sharing of data due to open-source protocols; the use of more physical robotics, such as 3-D printing, drones, and self-driving cars; and cognitive technologies that can process these large and complex data streams (Balasubramanian et al., 2021).

- **Insurify** (US): powered by AI and predictive analytics, Insurify acts as a virtual insurance agent, offering customers an online platform for comparison-based insurance shopping. Insurify produces multiple insurance quotes to customers in as little as two minutes, enabling them to purchase a policy online or over the phone within five minutes (Insurify, 2020).
- **Lemonade** (US): offering AI-built, personalised insurance policies, and known as arguably the world's most transparent insurance firm, Lemonade created the "world's first open source insurance policy" (Lemonade, 2019), available on GitHub and open to competitors under GNU licensing (GitHub, 2019). Lemonade features a "charming artificial intelligence bot," Maya, whose purpose is to enable customers to purchase the "perfect" insurance policy in as little as 90 seconds (Lemonade, n.d.).
- **Quemplate** (UK): A TPP using machine learning to offer zero-code data analysis and insights to firms in the insurance industry, Quemplate offers automation and machine learning that enables insurers to automate and process larger volumes of incoming data than ever before, in faster time, and to overcome the barriers posed by legacy data systems (Intelligent Insurer, 2019).
- **Shift Technology** (France): this fintech offers software-as-a-service (SaaS) that leverages AI to analyse claims data and detect potential insurance fraud—with (according to the company itself) a 75% accuracy rate (Shift Technology, n.d.).
- **Slice** (US): Using AI, machine learning, and Ph.D. behavioural science expertise data, Slice builds on-demand pay-per-use insurance products that enable insurers to assess risk in real time and offer affordable policies for customers with mobile lifestyles (Slice, n.d.).
- **ZhongAn** (China): the first online-only insurance firm in China, ZhongAn was co-founded by three of the biggest names in Chinese business: Jack Ma from Alibaba, Pony Ma from Tencent, and Ma Mingzhe from Ping An Insurance. ZhongAn uses AI to price products, underwrite, detect fraud, and improve customer service (Yeung, 2017).

Guest Video: How Fintechs Use Data, Machine Learning, and AI

Now that we've seen some opportunities for fintechs to deliver needed AI solutions, and examples of fintechs delivering these solutions, let's hear from a few guest speakers who have worked within these fintechs about how exactly they've used data, machine learning, and AI.



Yasin Rosowski: So Arabesque AI, we are primarily a tech company first. And we use AI to essentially evaluate around 30,000 public equities every single day. And we're looking at many different data aspects. So essentially we're covering all the developed and emerging markets as well as a few frontier markets. So that's basically everything from North and South America, all the way to Europe, a few African countries, and all the way over to Asia-Pacific.

And we're using lots of different data sources, lots of different financial data analysts' fundamental data. And we're able to bring in all this data not just on an individual company level, but be able to put it together with macro data, with what the commodity markets are saying, or the fixed income markets are saying, and bringing in lots of different data sources and then using that to build a picture of where we think a certain sector within a certain country or a specific equity where we think that's going. And we're able to do that because we're able to process all these different very complex relationships, because of using the power of basically machine learning and its ability to take more of a data-driven approach rather than an assumption or an economic rationale approach to understanding where we think the equity markets are going into the future.

And that's one of the key advantages of using machine learning, is that we can take in lots of different data sources. And we can build data-driven assumptions, essentially, where we let the machines come up with the assumptions of where they think these very complex, non-linear relationships are in assessing the kind of predictive and behaviour of the equity markets.



Steve Bradford: And we start with categorisation at the base level. So we imagine we're sucking transactions out of somebody's bank account and credit card, then what we're doing is labeling it, standardising the data so that the string of a data such as Safeway or Asda or whatever, it looks exactly the same when we present it to a consumer whether that comes from HSBC or RBS and Lloyds. And you'd be surprised how different the labeling of simple transactions looks from different banks. So we standardise the data, we categorise it so we can put people into this as a coffee shop, this is a sport center, this is a gym, et cetera. So we put as many things as we can into groups, and then on top of that, we group transactions into recent sea levels. Before then all of that data gets applied to something that we call an affordability confidence index.

So at that point, what we've done is we've categorised the data, we've standardise it. We've looked at everything we know about the consumer from the data, and then off the back of that, the next step for us is very much to work out if there are gaps, missing pieces of information that we want to ask the consumer questions. I'm looking to build up more confidence in the data, and I then surface those questions through the budget journey leveraging conversational AI. So that's where the sort of data science plays a big part in driving the engine behind the user experience, and that then results in creating a budget, and then we dynamically calculate what somebody can afford off of that budget.

So we take all of their outstanding debts, we work out what they should be repaying everybody every month, and then we work out what they can afford, and we divide one into the two to work out what the recommended payment amount is. And that amount is then what the consumer commits to with us. And then from that we execute a pull data direct debit so that we can take payment from them. So really the analytics is driving a lot of the strategy right through the pulling of payments.



Simone Ishigawa: There are definite elements of AI that they were using as part of the platform. I mean RPA probably isn't even a qualified AI, a tool in many ways, but RPA standing for Robotic Process Automation. So if you've been an analyst at a credit desk, you know that there are many repeatable tasks that you have to perform. So think of a spreadsheet with 30 sheets and same tables and you want to do this one format change across all 30 tabs, and instead of yourself going through all those 30 sheets and doing them, if you build a macro button, that allows you to format that one table and let it loop through 30 times. That's a lot of time saved by that analyst of course. Then there's the machine learning element which is a training process.

So you have a set of algorithms to hopefully get fed a lot of data, and therefore make it reliable and be able to help you in the future. Within the machine learning element, one of the areas that we focus a lot on was OCR, and that stands for Optical Character Recognition. As a lender and a commercial bank, you get lots of documents from your borrowers. This is, of course, part of the due diligence process as part of know your client for your borrower and to assess their risk. In a traditional model, this part of your job is very time consuming. You're most of the time scanning these hundreds of pages of legal documents for one or two pieces of information so that you can then feed the Excel models those information, and use it as an input for credit decisioning for example.

OCR allows you to pick up that table nicely and transport it to the part of Excel that you want it to go. Another element of machine learning that OakNorth platform had in place was finding comparables. So as a credit analytics company, of course, one of the major elements for a credit analyst is to be able to compare the company to some other companies doing similar things. This is a tough problem, even in public companies with lots of data, because there are many elements that come into play when you want to compare companies.

So a company that does this really well is Netflix, of course. You watch a movie and based on what they think your preferences are, and across different variables, they recommend you with certain percentage. This is the movie that we think that you would like. And we try to do something similar for a lot of these SME companies, but the percentages were a lot lower.

3.2.2 Challenges Fintechs Face Implementing AI

Faculty Video: Challenges of Fintech Ventures Using AI

Of course, all fintech opportunities present their own set of unique challenges, so we must also take a look at the challenges newcomers face when entering the market with AI solutions. Here, Professor Pinar Ozcan discusses the challenges that fintech ventures face when using AI technologies.



At the Oxford Future of Finance and Technology Initiative, we've been doing research on the challenges that different stakeholders face when it comes to Fintech and the new world of finance. Let's consider the challenges of Fintech ventures that are using AI in order to produce new products and services in the financial sector.

Our research shows that Fintech ventures, first of all, struggle in order to get access to data. Being new players in the sector, consumers aren't aware of them. In addition, they are also wary to give their data to someone that they don't know really well. And so what these players struggle with, first of all, is access to data. Although open banking regulation is in place, and APIs might be published, so technically everything is in order, the trust factor is still an issue for these Fintechs.

Another important consequence of the open banking regulation is that this regulation allows consumers to open a second and third account and connect these accounts via data sharing. That also takes away the motivation to switch from one big player, for example, a main bank, to another one, to a new digital bank.

What these Fintechs struggle with, then, is being the primary financial service provider of consumers. Consumers do open accounts. Some of the digital banks or large Fintechs actually have millions of subscribers. However, the average activity level is still low, and the revenue per user remains low.

What this means is that these Fintechs have difficulty breaking even. This matters particularly for those players that need a large asset base as collateral in order to start being able to give loans, which is the most profitable sector within finance. So what we see overall is that data access and trust issues are still a hurdle for these Fintech players.

Another important issue that these players face is how to spend their resources on IT. On the one hand, in order to steal customers from big players, they need a really fancy and really easy-to-use user interface. So at these ventures, a lot of money typically goes into the front customer-facing end of the IT infrastructure. On the other hand, they also need a backend infrastructure in order to, for example, process payments or handle large amounts of transactions otherwise.

Typically, these players rent the backend IT from larger players at the beginning. However, they get charged per transaction. So as their volumes increase, they end up having to pay more and more. And at some point, they need to switch over to their own IT infrastructure.

One of the digital banks in the UK that had to go through this process actually had quite a bit of difficulty when it comes to migrating data from a rented IT infrastructure to their own IT. And during this migration process,

their systems went down for four days, and customers weren't able to access their accounts, which created a serious trust issue for this new player.

Overall, what we see is that Fintech ventures need to be aware of a negative feedback cycle when it comes to having a low amount of resources to start with and having difficulty getting access to data. That's why we see a lot of Fintechs pivoting from B2C business models, customer-facing business models, to B2B business models, where they can get access to large bulks of data by cooperating with larger players, for example banks, or other types of players, like large employers.

One of the critical things that these ventures have to think about is that, as they get access to data through a partnership, what are the constraints that that partner will put on them? For example, a large bank might have all the amazing data that the Fintech could only dream of. However, when they start a partnership, the bank can then say, based on the data that I'm giving you, here are the things that you can do. And these are the products and services that I will not allow you to develop in the future because they will be in direct conflict with my own products and services. So the future growth of the Fintech might be impeded by the demands of the large bank.

On the other hand, a large employer might also have interesting data for a Fintech, but this data will be largely income data and perhaps a bit of pension data. So it will not give the Fintech access to things like payments data, which is going to be a liability in terms of developing AI models. As you see, there is a trade-off in what kind of partner you go to in order to get access to data.

Challenges Fintechs Face Implementing AI: Access to Data

Starting an AI-based fintech often presents a “chicken and egg” problem, as access to data is the fuel that helps predictive algorithms to thrive and improve, but without customers—acquisition of which can be expensive in its own right—where does that data come from?

New fintechs are forced to make decisions about what data they need, where they will obtain it, and what technology they will use to gain access to it. Open Banking APIs are one option, as are data aggregators and screen scraping. However, gaining access to unique financial data can be extremely expensive, particularly for new AI-based fintechs, and scaling the amount of data needed as the business grows can be challenging.

Fintechs must maintain a delicate balance between spending money on data they don't ultimately need, and being able to add new data as needs evolve (Caltuna, 2020). Additionally, there are security and regulation risks associated with obtaining data. Cloud data and security processes which are hastily designed to meet growing fintech needs can leave financial data exposed and vulnerable to hackers (Peters, 2021). At the same time, fintechs must be aware of and follow new and evolving data compliance requirements that are put in place to protect the public and help fintechs avoid regulatory censure (Snyder, 2021).

Further, as new entrants without brand name recognition, it is difficult for fintechs to build not only a customer base, but a sense of trust within that customer base—because businesses based on data must be built on a foundation of trust. Fintechs that rely heavily on AI-based business models demand from customers a degree of confidence even higher than that of being entrusted with their money:

to provide the personalised experience that so many customers seek, fintechs must persuade those customers to grant access to their private data.

Because of open banking, customers don't have to leave banks with whom they have existing accounts, so fintechs often act as a secondary bank for customers eager to try out new features and services. But the fintechs struggle to gain traction and raise usage and activity levels to that of primary banks.

Challenges Fintechs Face Implementing AI: Operational Expenses

Another chicken-and-egg problem for fintechs can be that of needing money to make money. Beyond operational funding, it can be quite difficult to build up an asset base to levels large enough that the fintech can actively sustain loan programs, which in turn generate future revenues.

In terms of operational expenses, highly regulated markets are resource-intensive, as they demand governance and compliance infrastructure, leading to potential high burn rates among fintechs. Fintechs are also confronted straight away with IT challenges, often renting backend providers to handle transactions instead of building out their own infrastructure. But renting can become exceedingly expensive, and eventually brings about the need to switch over to the company's own IT—a process which is costly and time-consuming, and can be error-prone (a tenuous situation for already skittish customers).

Guest Video: Data Challenges

In this video, Steve Bradford, Co-Founder and COO of Tully, a personal finance management (PFM) app that helps give consumers sound debt advice, and Husayn Kassai, Co-Founder of Onfido, an app that facilitates identity verification for business customers, discuss the data challenges they faced when building their products.



Steve Bradford: You know, some of the early bottlenecks was just lack of data early on. So, can we get enough transactional data to learn from, particularly build the categorisation of them? So, certainly the first six to nine months, trying to get a hold of as many data sets as we could to build up patterns. And then I think the second one was getting consumer feedback. So, the way the models are going to learn quickest is if there's something like 100 odd consumers that could give us feedback from that initial batch we were doing.

What we're really trying to do is isolate the little pockets of value. So, for example, a new coffee shop's set up in London. We've not heard about it, but a consumer tells us about it. That's really valuable, updates the model real time. And so we look for some validation points in that. We don't just take one input, but really triangulate and get two or three, then we can then put that into the model, so next time that's refreshed and more available. So, I would say consumer recursive learning's been a real part of the journey we've been on, and still is today.



Husayn Kassai: Access to data is core to any machine learning project. And arguably, it's maybe even more important than the machine learning models themselves. You can develop models, right, but getting access to data can be more difficult. In our use case, government IDs is arguably one of the most difficult data points to get of any in the world. People are very rightfully guarded of it, and it's sort of private and sensitive, and so on.

So, when we started back in 2012, we were somewhat fortunate in that there weren't many other alternatives helping people digitally or remotely gain access to online services. So, at the time, clients would be happy to wait for a few hours for us to process these checks. And a lot of these checks were actually processed quite manually in the early days. So, we had technology and some models to automate parts of it, but a lot of it had a human touch and a human component.

So, as a human started processing, our experts are processing these checks and training the models, more and more of these IDs were automatically done through the technology. So, the way to get in our situation in the early days was to have more human involvement. Then, actually, over time that, human involvement became less frequent and more specialised, to detect the more sophisticated frauds.

The length of time it took for the machine learning models to actually become very effective and be able to do the vast majority of these IDs, not only fast and in an automated way but with a high degree of accuracy, essentially it was 2017 was a key year for us. I say that was pretty much the tipping point. So, when we started in 2012, that's roughly five years.

But as with our limited resources, we didn't have much funding in the early days. We were a relatively small team. But a bigger part of all of this is the quality of the data and the feedback loops. So, even today, we have a sort of human expert stepping in and assisting. Whenever the system flags something that it doesn't recognise or seems fraudulent, we have human experts essentially processing those checks. And the feedback loops count, because we don't know, or the machine learning models don't know at the outset if something's fraudulent or not in the early days, in 2012, until the models were developed.

So, the way it's configured now and it always has been, when an ID comes through, there are times where even our machine learning models can't assess if they're genuine or fake. So, out of every 10,000 IDs that we see, roughly 203 are fraudulent. That's about 2%, and that's an industry standard across most fraud attack vectors.

After 203, as it stands today, we successfully catch 200 of those fakes, but we still miss 3. We're kind of like an antivirus software. We are not able to catch every single one of those fakes. But what matters is that we've always been open with clients and very transparent in that we are not able to catch 100%. We're able to catch more than any of your manual teams would be able to, and certainly more than any of the sort of competitors.

But what we need you to do is when we miss those very small number of sophisticated fakes, we need you to tell us a month or two later when you discover that this turned out to be a fraudulent identity. We then use those samples to build the next version of the release. And so over time, our clients, if a fraudster comes through one client and we learn those patterns, it benefits every other client. And that's how, essentially, we've been able to do so well, specifically using machine learning. And it's not just the data. It's the quality of data and building feedback loops, which take time.

3.2.3 Addressing Fintech Challenges

Characteristics of Successful Fintechs

Far more fintechs eventually fail than succeed—as many as nine out of every 10, with upwards of 20% failing in their very first year (Bryant, 2020). But many fintechs do overcome the odds. Those that succeed:

- Raise steady funding by demonstrating to investors product-market fit, traction, and the ability to scale.
- Start with skilled founders.
- Possess one or more strategic advantages over their competitors.
- Understand what success represents for their customers.
- Offer a financially viable—and sustainable—product or service.
- Understand the impact of current and future financial regulations and know how to navigate the regulatory landscape.
- Time their entry into the marketplace.

Case Study

Enfuce, one of Europe’s most successful women-founded startups, highlights these attributes.

Steady Funding

On 6 December 2021, Enfuce raised €45 million in one of 2021’s largest Series C funding rounds, achieving a total of €107 million in funding (Billing, 2021). This round built on the organisation’s previous foundation of capital. Since launching in June 2016, Enfuce had raised funds from Maki.vc, Tencent, and Vitruvian, a UK venture capital firm with a focus on sectors “characterised by rapid growth and change” (Enfuce, 2021a).

Skilled Founders

Without the expertise of Enfuce’s two co-founders, Monika Liikamaa and Denise Johansson, Enfuce would have likely struggled to raise sufficient capital. However, both women have worked for decades in the fast-paced payments industry: Liikamaa served as an interim director responsible for Aktia Bank’s Cards and Payments Business Unit, and Johansson optimised project management for mobile payments at Crosskey and Atkia (Liikamaa, n.d.; Johansson, n.d.).

Unique Value Proposition

With a strong understanding of how the payments industry worked, Liikamaa and Johansson set out to revolutionise the card issuing industry. Enfuce would be the first firm in the world to run a card issuing platform in the cloud, helping fintechs launch and scale payment cards in eight weeks (Enfuce, 2021b). Not only did Enfuce offer payment services, it helped banks and fintechs become completely PSD2-compliant to adhere to Open Banking legislation.

Customer Value

At first, Liikamaa and Johansson intended to pitch their platform to banks, but they quickly realised that banks were struggling to buy services from startups. Pivoting from the initial model, they partnered with fintechs that prioritised scalability, like Pleo, a rapidly expanding startup focused on business spending. For Pleo and other smaller financial institutions, Enfuce's cloud-based payments solution fit a critical need: the ability to smoothly and rapidly onboard customers in new markets.

Product Viability

Eventually, as Enfuce's Card-as-a-Service (CaaS) solution took off and the fintech gained visibility, it gained a mix of startups and more established banks, including Pleo, St1, Gee Finance, Qred, and Rabobank, along with 30+ industry-leading clients (Taylor, 2021; Enfuce, 2021b). As a result of these partnerships, Enfuce's CaaS platform counts 13 million users and close to 10 million end users as of December 2021 (Visa, 2021).

Regulatory Adherence

Startups usually launch in an untested part of the market, and often in a regulatory void. This can be an advantage or disadvantage. For example, fintechs may find success in their home country, but run into compliance roadblocks when they expand to new, international markets, thanks to different regulatory standards. Challenger bank, Monzo, withdrew its US banking license application following talks with regulators—a move common for fintechs navigating the complex, state-by-state legislation of the US (Shead, 2021). Enfuce intends to mitigate this risk. As it expands in Europe, the Middle East, and around the world, the startup is collaborating with “an expanding roster of consultancies” to navigate and adhere to new regulatory contexts (PaymentGenes, 2021).

Critical Timing

Finally, in November 2021, Enfuce partnered with fintech, Gee Finance, to “issue Visa debit cards to freelancers, social media influencers, and other gig workers” (Enfuce, 2021c). This move capitalised on the growing gig economy. As a result of that decision and many others, co-founder and CEO, Monika Liikamaa, explains, “2021 [was] a groundbreaking year for Enfuce” (Taylor, 2021). As Covid-19 changed the world, Enfuce embraced the new world of work and personal finance.

Guest Video: Early Challenges for Fintechs

In this video, Iain Niblock, Head of Product at ClearScore, discusses some of the early challenges fintechs face to become successful in the competitive financial market.



I think it's the same challenge that all startups face, and that is that they need to mitigate the risk of product-market fit. So any startup that is going on that journey in the early stages need to get product-market fit as quickly as they can and the market needs.

So how strong is that market needs will determine the strengths of that product-market fit. And if you've got really strong product-market fit, you're going to have a reduced acquisition cost. And you're probably going to have a sustained business model going for-- or a sustained customer adoption going forward.

If you can't get to that stage, it's very challenging. You either need to pour money into it to acquire customers and to educate them about your proposition, or you're going to fail essentially. So I think it's really about what is the market needs and then building products around that market needs and being super clear with what the customer is trying to do.

So an example of that would be on our app, we have a budgeting functionality. But from speaking to users, what we found is actually people don't want to budget. What they want to do is save more. So kindly change your application into about saving as opposed to about budgeting. How can you bring in the savings goal and then build budgets around that so that the user can hit a savings goal and actually achieve what they're looking for?

3.2.4 Partnerships Between Fintechs and Incumbents

Successful Partnerships

As in the case of Privacy.com, transformation from B2C to B2B involves partnership with larger, longer-established incumbents. In fact, many fintechs need to partner with incumbents to survive. Generally, fintechs tend to survive as stand-alone entities only when they focus on niche markets without any legacy systems, processes, or culture; use new or alternative data that incumbents do not possess; and use novel technology platforms (Deloitte, 2018). When this is not the case, fintech/incumbent partnerships are an ideal solution.

Elshof et al. identify four types of fintech/incumbent partnerships (2021):

- Fintech as a front-end solution
- Fintech as a service
- Fintech as a new brand
- Fintech as an investment

Fintech as a front-end solution occurs when an incumbent and a fintech collaboratively develop a client-facing tool or solution with the look and feel of the incumbent's brand.

When an incumbent partners with a **fintech as a service**, the incumbent uses a solution or tool developed by the fintech in the incumbent's own internal processes.

When an incumbent partners with a **fintech as a new brand**, the incumbent distributes the fintech's product under a new label.

Finally, in **fintech as an investment**, incumbents invest venture capital or private equity in the fintech.

Benefits of Partnerships for Fintechs and Incumbents

But who are the right B2B clients for fintechs, or the best B2B partners? And what are the tradeoffs of partnering—or even merging—with a large incumbent? If fintechs are looking only for data, perhaps partnerships can be outside of their sector, or even industry: for example, maybe they can find the transactional data they need from a ridesharing company, or a sporting goods conglomerate. However, what startups gain in data and resources, they might lose in control.

Generally, both fintechs and incumbents incur benefit from these partnerships. For example, banks with longstanding, slow, and/or risk averse processes can benefit from fintechs' cutting-edge technology and innovation, accelerating the banks' own agility and digital transformation. For their part, fintechs may benefit from the established reputations and customer base of their incumbent partners (Enriques & Ringe, 2020). Tips for successful fintech/incumbent partnerships include ensuring clear communication from the start, understanding the different cultures within each organisation, and identifying combined KPIs for success (Martins, 2020).

An additional benefit of partnership with an incumbent can be that of significantly simplifying regulatory concerns. Open banking did little to help startups clear the hurdle of close scrutiny from regulators, with whom the startups may not have yet built any rapport, history, or trust. Beyond equity and brand recognition, partnering with an incumbent firm who brings to the table a fluency with governance and compliance can be invaluable.

Hackathons and Accelerators' Role in Incumbents Adopting AI

To partner with smaller, more agile fintechs, banks often use accelerators and hackathons. These programmes help incumbent institutions:

- **Understand and monitor market trends.** The Bank of England Accelerator runs 4- to 12-week proofs-of-concept (PoCs) that offer smaller, innovative firms the chance to apply their technology to pressing central bank issues. Not only do these PoCs test potential future solutions, but they also help the Bank of England “understand emerging technologies first-hand” and “track developments in the sector” (Bank of England, 2017).

- **Position themselves as innovators in the sector.** The BBVA Hackathon pushes over 500 international entrepreneurs, developers, and financial experts to build solutions in under 40 hours. In 2020, the hackathon was held virtually and relied on key strategic partnerships with AWS, CISCO, and the International Finance Corporation, allowing BBVA to achieve greater visibility as an “innovative technology company” (Sánchez, 2020).
- **Nurture ideas for breakthrough products.** The Wells Fargo Startup Accelerator (2018) guides early-stage startups through a six-month programme to let them test, iterate, and validate their “technology, market direction, and enterprise-readiness”. After the six-month programme, selected startups—equipped with an understanding of the “corporate stack”—may receive an investment of up to US \$1,000,000 (Wells Fargo, 2018).
- **Build developer communities.** Barclays’ Rise platform aims to develop a global community of “the best minds in fintech” (Barclays, 2019). With virtual and physical workspaces in London, New York, and India, the Rise ecosystem has supported startups that have created 100+ new prototypes and business models, raised £50 million in new investments, and enabled over 60 deals between Barclays and startups each year.

Despite their benefits, however, hackathons and accelerators don’t automatically lead to sustained innovation. If banks cannot shift from outdated technology platforms, embrace out-of-house ideas, or collaborate on more agile timeframes, they may fail to sustain the partnership, and in turn, lose a measure of respect from the fintech and startup community (King, 2018).

Faculty Video: Why Hackathons and Accelerators Don't Work

In the following video, faculty lead, Pinar Ozcan, discusses why hackathons and accelerators might fail.



As you’re aware by now, there are some amazing initiatives by large financial institutions – both in terms of accelerators and hackathons – for fintech ventures. A great example is StepLadder, which is a fintech venture that helps people save for their first home and educates them about saving and the home-buying process. And this venture has come out of Barclays’ Rise.

However, we also need to think critically about what the function of these accelerators and hackathons are. If the goal of the firm that is organising the accelerator or the hackathon is to absorb that innovation and to work with those fintech ventures that come into the market, then we must also consider whether the large institution will be ready to work with these fintechs in the end.

We have many examples – many interviews with frustrated fintech entrepreneurs – where they’ve won prizes, they’ve gone through these hackathons and accelerators, and when it came to working with the organising financial institution, that’s where things fell apart. This is typically because the large financial institution is not ready to work with the fintech venture along three dimensions.

First is the issue of IT. Is the large institution ready to open up its data? First of all, is its data dispersed or is it harmonised? Is it available for the fintech venture to run AI applications on?

The second is the organisational structure. Typically, accelerators and hackathons are organised by one department within the large institution. Is the rest of the institution ready to work with the fintech ventures that come out of that activity? Is there an organisational structure where the fintech venture can be taken into the organisation in order to provide the correct ties for them to work well?

And finally, of course, is the large institution culturally ready? Or is it experiencing the “not-invented-here syndrome” where innovation that comes from outside is naturally rejected because it wasn’t invented in-house?

A large institution thinking about accelerators and hackathons as a way to innovate must consider these important factors to see whether they can achieve the goal of this activity. Otherwise, it will not go beyond an innovation charade.

3.2.5 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Whether helping with analysis and prediction, actual decision-making, or organisational efficiency, machine learning and AI systems have the potential to solve problems across financial market sectors—each with its own distinct challenges.
2. Fintechs must maintain a delicate balance between identifying and accessing only the data needed to avoid disproportionately high overhead costs and being able to add new data as needs evolve.
3. Fintechs that rely heavily on AI-based business models demand from customers a degree of confidence even higher than that of being entrusted with their money.
4. Beyond operational funding, it can be quite difficult for fintechs to build up an asset base to levels large enough that they can actively sustain loan programs, which in turn generate future revenues.
5. Successful fintechs tend to:
 - Be well-funded
 - Have a strong, skilled team
 - Have one or more strategic advantages over their competitors
 - Understand what success looks like for their customers, and how to create value for them
 - Have a financially viable—and sustainable—product or service

- Time their entry into the marketplace well
6. Transformation from B2C to B2B involves partnership with larger, longer-established incumbents.
7. Generally, both fintechs and incumbents incur benefit from these partnerships. For example, banks with longstanding, slow, and/or risk averse processes can benefit from fintechs' cutting-edge technology and innovation, accelerating the banks' own agility and digital transformation. Fintechs may benefit from the established reputations and customer base of their incumbent partners.
8. Tips for successful fintech/incumbent partnerships include ensuring clear communication from the start, understanding the different cultures within each organisation, and identifying combined KPIs for success.

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To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[How Is Artificial Intelligence Used In B2B Companies: Here Are Powerful Examples](#)

[The new physics of financial services: How artificial intelligence is transforming the financial ecosystem](#)

3.3 New Entrant Examples

3.3.1 Onfido

Section Objectives

In this section, we examine three AI-based fintechs more closely: Onfido, Money Dashboard, and Tully.

Onfido

Onfido is a London-based fintech that facilitates identity verification for business customers. By using AI-based facial recognition to more quickly and efficiently authenticate the legal identity of end consumers, Onfido has helped cut down on identity fraud for over 1,500 corporate clients, including Revolut, Remitly, Bunq, and Orange.

Onfido's complex technology uses optical character recognition and machine learning to analyse the validity of a user's government-issued ID, and then compares the ID against a user's facial biometrics to ensure that the end user is indeed who they claim to be.

For digital identity companies like Onfido, the goal is to provide or verify an individual's digital identity only once, and then maintain that virtual record instead of requiring or validating personal information with every transaction. This one-and-done strategy helps maintain user privacy.

Onfido has raised nearly US \$200 million in total funding since its founding in 2012, according to Crunchbase (2020). And with good reason: digital transactions had already been growing year over year before the Covid-19 crisis resulted in growth of exponential proportions. Unfortunately (though expectedly), identity theft cases have likewise exploded. According to a recent report by the US Federal Trade Commission (FTC), the number of identity theft cases in the US more than doubled from 2019 to 2020, to nearly 1.4 million (Skiba, 2021).

The world of financial services and e-commerce has responded in kind: "82% of businesses say they now have a customer recognition strategy in place—up 26% since the start of the pandemic" (Experian, 2021). This places Onfido in a position of strong growth moving forward. In the US alone, based on numbers from the first half of 2020, Onfido grew its year-over-year sales by 264% (Business Wire, 2020).

Guest Video: Onfido

In this video, co-founder Husayn Kassai discusses how Onfido's technology works, how the company utilises human beings in the loop, and future plans for the product.



Onfido uses AI and, specifically, machine learning to assess whether IDs are genuine or fake and whether the person's face that's submitted to us, via a photo or a selfie, matches that photo on the ID. So essentially, whenever we get an ID from anywhere across the world, it's to assess as to whether there are any anomalies on there. Are the fonts correct? Any other security features on there? And given the tens of millions of checks that we've done, we and our machine learning models know whether or not it seems genuine or not.

But you can get an ID that comes through that's stained, and we don't know, is that because it's a fraudulent one, or is it because it was in the washing machine? So that's when it goes over to the human experts. And that human experts not only process the checks, but also is labeling these IDs so that we know over time, with a high degree of accuracy, which one's the fraudulent ones and which ones seem genuine. So to get the trade off right around maximizing the number of people that can be onboarded onto platforms and verify their identities, but at the same time stopping the small percentage of fraudsters that are cheating these different systems, or attempting to cheat these different systems.

So insofar as what the next stage is is to continue to make progress across the three dimensions that the clients care about the most-- how fast you do the checks, how many of the countries and different ID types you cover, and crucially, how accurate you are at detecting fraud. And the benefit of machine learning is that there's driving all these three metrics in the right direction, and it's a continuous process. So in the very long term, in our vision, we're going to move to a portable identity world where a consumer is both the owner and able to control their own legal identity and provision access to all the different services that they want to gain access to.

3.3.2 Money Dashboard

Quick Facts

In a 2020 survey, 40% of respondents said they prefer PFM solutions offered by TPPs to those of their bank (Phaneuf, 2020).

Money Dashboard

Money Dashboard is the UK's leading B2C PFM, enabling customers to see and manage all of their accounts from a single secure dashboard. Within the mobile app, customers can check balances, pay bills, monitor cash flow, transfer money, track budgets and financial goals, and gain insight into how, when, and where their households spend money.

Founded in 2010, long before the Open Banking regulation made the company's business model far more efficient, Money Dashboard has raised upwards of US \$17 million in funding while keeping employee headcount low. The company uses machine learning to tag and categorise expenses and transactions, learn customer preferences, and provide management assistance.

The service is free to PFM app customers, sustaining itself on the B2B side by mining its (anonymised) data and selling consumer insights and market trends information to asset management companies. Additionally, Money Dashboard takes a cut of any cross-sold partner products or services, based on occasional personalised suggestions to save money with less expensive alternatives (for example, on a mortgage or loan).

Guest Video: How Money Dashboard Uses AI

In this video, Iain Niblock, CEO of Money Dashboard, speaks about how machine learning is used in the Money Dashboard product, what the company needed to do to build the system, and what's next for the company.



Pinar Ozcan: What are some of the ways in which machine learning is part of your business model?



Iain Niblock: So there is a couple of services that's in the application. So we have open banking, so the user connects their bank account to the application. So they can review all their accounts in one place. And then you've got transactional data coming into that application or into your backend. So you've got all these transactions from all these different banks. But from a user's perspective do they just want to see their own transactions?

Well in the PFM market we can do more with that and apply—to put tags onto the transaction to show merchant spend, or purpose, so we can show, you know, how much he spends on groceries, or how much he spends—how much are you saving? How much of it is your income each month? So we have two types of tags, which are purpose, so what's the purpose of the transaction, and then the second thing is what's the merchant that you spent it at.

So you could see how much have you spent in Amazon for the last couple of months. So that's one service that we call categorisation, and this categorisation service works with machine learning algorithms. So how that works is, when you're thinking about your tagging of your transactions—well actually everybody thinks slightly different. So as your Amazon Prime subscription, is it a household cost? Is it a bill?

How do you define that category? Well users define it quite differently. So to get 100% accurate categorisations is actually quite difficult. So over time the algorithm learns and adapts to what users are telling us. So users can go into the app and change the category. We collect that information, and the algorithms learn based on that.

Similarly, we also have another service called series service. And series, what this does, is it identifies recurring payments. So these recurring payments can be your salary, but it can also be your bills, your subscriptions,

your council tax, and your rent or your mortgage, wherever those recurring payments can be. And over time, as we identify more of these series payments, the algorithms are improving, and their identification's getting better.

Pinar Ozcan: That's great. Thank you. What are some of the systems that you had to build in order to provide those services?

Iain Niblock: Well I think it evolved out of—initially acts as a rules based system. So we had a rules based system. And then we hired some clever people that knew a lot about machine learning. And really, they built out the infrastructure. But really critically for us was, is a rules based system better than the machine learning based system? Just because it says machine learning actually, is it an improvement? So we go through a lot of rounds of testing against two separate systems, and says, OK the identification of these series service, or the tagging of this transaction, is it better?

And as I said, there's an ambiguity in what's identified or what's tagged correctly. So you need to go through quite a lot of rounds of tests and with large numbers of people and say, OK, this service has tagged 100 transactions. This service has tagged another 100 transactions. Which ones, you know, for you as a person, which one is the most accurate. And you need to do that across a large number of people to try and identify which is better.

Pinar Ozcan: Wonderful. Now that's all in place, what is next for Money Dashboard? What will they do next?

Iain Niblock: I think the big thing that's coming is payment initiation. So with open banking, you can actually also initiate payments. So in the application, you can transfer money between different accounts. But also we will start building on the functionality, so that people can pay other people or other businesses. And what does that give us?

Well that gives us the ability to think. We're essentially no longer just a PFM. We're more than that. We're almost a competitor to a banking app. So a banking app 2.0, if you could view all your accounts in one place, pick which one you want to pay from, and make a payment to the PE, you know, do you need to go to your Barclays or your Monzo account, if we've got superior analytics? Well that's maybe a direction that we could go. So I think we're quite excited about payment initiation, and the next six months to a year.

3.3.3 OpenWrks/Tully

OpenWrks/Tully

In May 2021, OpenWrks, a UK fintech company that provides open banking applications, announced the merger of four fintech companies—Tully, “the world’s first digital debt advisor”; PayPlan, which provides free debt advice; PayLink, a provider of collections software; and OpenWrks itself—into one umbrella company that will focus on tech-enabled, app-centric consumer debt planning, money management, and P2P lending (OpenWrks, 2021). The organisation seeks to enable users to plan their spending and arrange for automated payments in advance to have more control over their finances.

One OpenWrks app is Money Coaching, which helps consumers change their everyday spending habits by encouraging users to set goals and complete challenges. Money Coaching helps users make the connection between long-term goals, such as buying a home, and daily discretionary spending using what the app calls “behavior nudges”. These may be text reminders or location-specific reminders about consumers’ financial habits, combined with AI chatbots that offer context and insights around daily spending.

In addition to a suite of consumer products, OpenWrks also has a secure API for development partners that want to incorporate the tools into consumer applications. The OpenWrks API helps developers build AI chatbots, manage user data, execute purchases, and more via SMS or voice commands.

Guest Video: Tully

In this video Steve Bradford, Co-Founder & CCO OpenWrks Group, discusses the process of launching Tully including using data science to inform product design, and how they were able to get the regulator on their side.



Once we've gone past that early MVP, we actually, for about a nine month period, got to what we call pseudo live status. And then really, the big question as we sort of went into the main launch was, how many customers would complete the budget without any form of support from web chat? And if you think about that for a moment, that was fundamental to the validation of, can somebody do this digitally and complete budgeting? Big question.

And would they trust the output and sign it off? Which is necessary for people who are going through sort of an advice phase who are in financial difficulty. And what we found very early on was actually, the majority of people would go through and finish the budget. But again, in the very early phase, we gave them very little ability to edit certain features themselves.

We tried to lock down the product in certain areas. And so, when they got to the end of the budget, while they would say they were happy with it, we had a heck of a lot of web chat interaction at the very end of the process. And again, through then a combination of sort of data science work and feedback from web chat agents, we sort of very quickly optimised on, OK, which parts of the product do we need to open up more? Make the editing or the budgeting more flexible? Account for so many more educators than you can possibly imagine in people's-- how they run their finances and their lives. You find every one edge case you can't build a product around, but therefore, that's why you need to open it up and make it more flexible.

So we certainly found in those-- the first three months after, we did a huge amount of work to unpick that, give the consumer more usability in the product. And actually, that was beneficial for us because it meant our operational support team was manageable. If we'd have let that go, we'd have been very severely constrained in terms of being able to scale the platform beyond a few thousand users from where it's got to today.

What were some of the important milestones in moving Tully forward?

The very first one and the most important, actually, was to get the regulator on site. So we operate in a very regulated space. So when you engage with Tully, you first build a budget with us. And if your finances say that you are struggling with money to an extent that you have a negative disposable income, at that point, you are given regulated debt advice, which is a robo advisor sat in the background.

But that's something that the regulators had to sign off. They haven't ever signed off any regulated model like this before, so it was a challenge for them to get their head around it. They're used to a telephony based approach. So it took us about nine months to get that regulatory sign off. So that was our biggest hurdle to launch.

Once we got past the regulatory side of things, then it was very much, can we get creditors? So banks, credit card companies, energy companies, telecoms. They've got people who are in financial difficulty. Can we get them to refer to this alternate channel which is 100% digital? The new kid on the block. The incumbents are mainstream large charities like the Money Advice Trust and StepChange. So should we trust this fintech with what are our most vulnerable customers, quite frankly?

And so literally, it's been a war of attrition working around the market and building that trust up. Getting those early adopters. Providing lots of evidence back to those early clients that referred their consumers to us. And then equally playing that back to the regulator as well every quarter to make sure that they're happy.

So operating in a highly regulated environment is not for the fainthearted. We're used to it. We've been around it for 20 years. But working in financial services, it's one of the largest areas of oversight you have to have in your business. And also a constraint to pace and agility is that regulatory oversight. Even though the UK and the FCA are probably seen within the world ecosystem of regulators-- it's probably the most flexible and the most innovative-- that still has clearly barriers that we have to work within.

3.3.4 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Onfido uses AI-based facial recognition to more quickly and efficiently authenticate the legal identity of end consumers, tackling the problem of identity fraud in online transactions.
2. Onfido utilises humans in its AI model when documents may be difficult for the AI to read—for example, if an ID is stained or went through the wash.
3. Money Dashboard is a personal financial management app that enables customers to see and manage all of their accounts from a single secure dashboard.
4. Money Dashboard uses machine learning to tag and categorise expenses and transactions, learn customer preferences, and provide management assistance.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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3.3.3 OpenWrks/Tully

OpenWrks (2021, 11 May). OpenWrks merging with Tully, PayPlan and PayLink. <https://www.openwrks.com/blog/openwrks-and-tully-to-merge-with-payplan-and-paylink>

Optional Resources

[Onfido's website](#)

[Money Dashboard's website](#)

3.4 Opportunities for Incumbents

3.4.1 Opportunities for Incumbents to Deliver AI Solutions

Section Objectives

As we explored in section 3.2, nimble and innovative fintechs are competing more and more with banks that are delivering new AI-enabled services. In this section, we explore what the opportunities are for banks to compete in this space, what challenges make it difficult for them to do so, and how banks can work around those challenges and deliver successful AI applications.

Quick Fact

In an article for Top Business Tech, Eugene Danilkis writes, “McKinsey estimates that legacy financial institutions will see profits decline by up to 60% by 2025 if they fail to evolve. Threats like this are pushing incumbents to look beyond their traditional boundaries in search of growth and sustainability” (2020).

Opportunities for Incumbents to Deliver AI Solutions

Banks that are interested in AI have numerous options for exploration. Banks that can find better ways to increase customer satisfaction, especially by serving the specific needs of each customer, stand to gain in this time of customisable products, curated services, and lofty expectations. Personalised experiences that lead to high customer satisfaction return substantial value: “A McKinsey survey of US retail banking customers found that at the banks with the highest degree of reported customer satisfaction, deposits grew 84 percent faster than at the banks with the lowest satisfaction ratings” (Chung et al., 2020).

Other avenues for AI development include understanding and predicting how customers behave. Ernst & Young (EY) found that the highest-performing global banks focus on three core pillars: customer-centricity, risk mitigation, and cost reduction (Bellens & Meekings, 2020). As AI systems learn patterns of human behavior, they can enhance banks’ focus on each of these pillars.

Additionally, with the right implementation and strategy, AI can help an average bank become a high-performing bank by (DXC Technology, 2019):

- Increasing client trust by detecting and responding to fraud quickly and accurately
- Eliminating wasteful practices and becoming more efficient, particularly in terms of staffing and location planning

- Becoming more helpful and understanding of clients through personalised/customised services and interactions
- Gaining competitive advantages through the smart use of AI in key business processes

Guest Video: Use of AI in the Financial Sector in Developing Nations

In this video, David Hardoon, Senior Advisor for Data and AI at UnionBank of the Philippines, discusses the use of AI in the financial sector, specifically in developing nations.



It is an opportunity for us to no longer be shackled to very rigid approaches in terms of, if any of you watch Little Britain, when it was still out, you know, computer says no, kind of situation. But to really leverage, what is available, to build services, build products around individuals. And again, I always like to give the example of, again, it could be me.

But I don't go around walking and open my wallet and say, oh, this nice, you know, slot missing there. And I think I should fill it up with a credit card, or like I really feel like having a loan. It's about how do we now truly become customer centric? How do we go about understanding what is it that a person needs? When is it that they need it? And how do we not only go beyond a very transactional relationship of you need money, we provide money, you need a deposit mechanism, we provide a deposit mechanism, but providing financial wellness? Providing financial stability?

And I know this sounds all very, I guess, sociological in nature or borderline theological. But it is truly possible using data science and AI. And it's possible in scale. Now, the reason I say that is, think how a certain group of individuals already have that service. It's called relationship managers, where the purpose of the relationship manager is to understand is to understand you, is to know you, and to be able to provide recommendations, provide advice, see where you're going with your life, and then even create a service that is around an individual.

Now, while not everyone could have that kind of one-on-one relationship, we can essentially still provide that, still provide that specificity, that hyper personalization, but relevance using data science and AI. And it provides the scalability that perhaps, even global financial institutions may not have because you can't have a relationship manager for every single customer.

So I truly, truly believe that is one of the-- I wouldn't say untapped, because it is definitely being tapped, but maybe not to the fullest extent of its potential-- areas in which data science and AI could change the whole landscape of finance, in fact, making banking invisible, completely to a certain extent.

Guest Video: How Nium Uses AI and Machine Learning

In this video, Chee Wai Ho, Vice President of Neobank & Cards Strategy for Nium, discusses how Nium leverages AI and machine learning to acquire customers and detect fraud, as well as for treasury management.



How we leverage on the AI and Machine Learning in our organisation, you can look at it as various fronts, all the way from the way we acquire customer by understanding the profile of our existing customers and then applying some machine learning and also with AI to understand who are the likely customers that may not be our existing customers that we can approach, whether it's through social media or whether it's from the affiliate details that require-- that we think has a high propensity to sign up for our service, whether it's for our cards, or whether it's for our remittance. So by analysing the data using the AI, ML, we could draw some proxy and have higher confidence in acquiring quality customers. That's one aspect.

The other way of using AI and ML is certainly in the areas of KYC And transaction and monitoring. And this, if you are aware the departments in RegTech, R-E-G-T-E-C-H, those are substantial departments that require a lot of AI and ML. Because, you need to understand the patterns which customers have been performing the transactions. You need to apply some level of intelligence to determine whether there's a genuine transaction to a real person, or is it being used as a fraud or even used for the purpose of money laundering, or even financing of terrorism. So, there have been a lot of advancements in this area of eKYC and transaction monitoring using AI, ML.

Last but not least, in our line of business and remittance, treasury management is a key area, because the way we support customers and cross-border doesn't make use of the swift method of payment, because we view our own payment match across the world. So for example, as a customer in Singapore who wants to send money to Hong Kong, the way we do it is by having a partner FI in Hong Kong with our funds HKD have in the an offshore account in the partner FI, and when a customer wants to initiate a payment, we are able to trigger the disbursement of funds in Hong Kong, using the FPS, which is the faster equivalent or fast equivalent real-time payment system where you share the bank-bank transfer as real time.

And for that to happen, you need to make sure that we do have sufficient funds in the offshore account. And depending on the influx of payment, whether it's from the corporate institutional customers or individual customers, it is a very challenging exercise for us to forecast the amount of money we need to put in the offshore account. If we put too much money in that, then it's like idle funds sitting that don't get utilised in the short time. If we have under forecasted the amount that we need to put in the offshore account, we will end up with a situation where we do not have the funds to pay out to our beneficiaries, the beneficiaries of our customers.

So, how do you do the forecasting of the funds? And in this example it's Hong Kong, but imagine, with all the 90 plus countries that we cover across the world, it's really a very time consuming and very challenging exercise to predict the funds flow in various parts of the world.

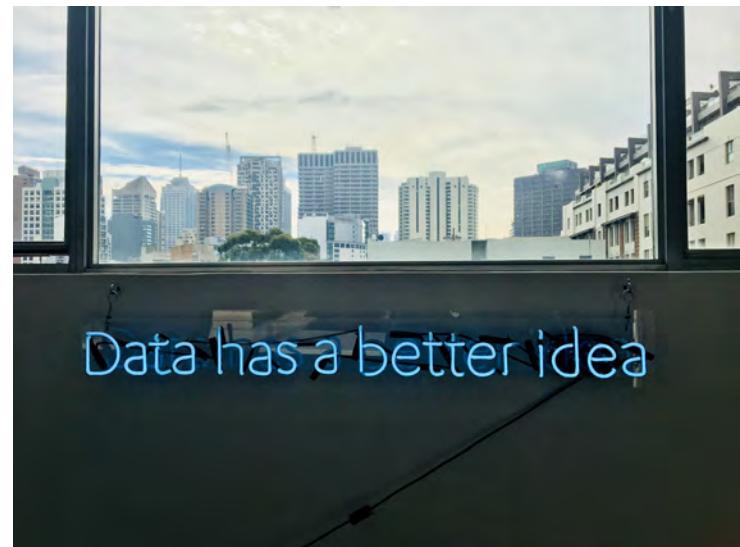
So, we certainly do see the need to apply some level of Artificial Intelligence and Machine Learning based on the past historical data, based on the trends, maybe it's time of the month. Because usually, a lot of individual

customers tend to read the later part of the month when they receive a salary. Versus there are maybe large corporates, who tend to need group out payment to specific countries or doing specific timing. So those are important historical data for the system to form a view on how much money and how much to proficient, in terms of funds, the offshore account.

3.4.2 Financial Data and Predicting Customer Behaviour

Financial Data and Predicting Customer Behaviour

Financial institutions of all types constantly produce massive transactional data sets, providing insight into their customers, such that even the most analog of banks have and can use internal account data to build basic customer profiles for a variety of purposes. Analysing everyday account transaction data can help banks to understand how to retain customers, as well as offer simple personalisation such as a savings product based on a customer's age or credit card fraud protection based on transaction location. With enough resources or computing power, it's not difficult to tease out personal details or stories from seemingly mundane account transactions: who's just gotten married, who's had a baby, who's just purchased a home, whose child is now attending university. The more data banks have access to, the more complete each consumer profile can become.



The better that banks understand each customer and their habits, the more tailored experience they can create for their customers, which can lead to success in cross-selling or up-selling. Firms that centralise data and digitise their operating model can leverage AI more effectively to personalise products and services.

Additionally, machine learning can improve and automate repetitive processes, including underwriting and risk assessment and fraud detection. Using AI-based systems for internal process automation and earlier fraud protection pays multiple dividends, as these systems can save substantial money for both customers and banks. For example, one estimate projects that for every US \$1 lost to fraud, firms actually lose \$2.40 (Joshi, 2019). Based on these figures, detecting and preventing fraud will yield measurable results. Earlier, accurate fraud detection also builds customer trust, as it increases customers' sense of safety and protection (Peters, 2018).

Guest Video: Using AI for Fraud Detection

In this video, Ajay Bhalla, President of Cyber and Intelligence Solutions at Mastercard, and David Heike, Head of Risk Modeling at JPMorgan Chase discuss utilising AI technology for fraud detection within their organisations.



Ajay Bhalla: Mastercard has been very focused on artificial intelligence for almost a decade now. We've been applying our AI expertise to solve several challenges that we see in the financial services space and across a wide range of industries by embedding AI in pretty much every part of our business. And over the years, we've developed capabilities in artificial intelligence in the payments space, in the acquirer fraud space, in the credit risk space, in the financial crimes space.

In fact, we've been in the recent years looking at health care fraud in a big way. And we continue to look at many other use cases where AI could work. And, specifically, if you look at retail, which is a very big part of Mastercard's business, criminals are increasingly targeting digital channels because card-not-present fraud, when you are doing transactions on the internet and your mobile phone, are far more dangerous than the physical world because on the internet nobody can actually see who's really doing the transaction.

And fraud on the digital channels is now 90% of our total fraud, especially during the pandemic. And just to give you a reference point, before the pandemic started, it was 75% of all the total fraud. So it's gone up in a big way, especially in the digital space, because all our behaviors have become digital right now. And that's where AI comes in, which helps us look at new behaviors, look at new risk variables, and look at all the data that comes in. And then it helps us identify fraud fairly accurately and approve all the right transactions and decline all the fraudulent transactions.

In the health care space too, we've been working with several organizations on cyber assessments to help safeguard their cyber systems, their staff, and patients at, especially, this challenging time during the last 12 months. Now, fraud constantly evolves. Fraudsters keep changing their tactics. And we need to stay ahead of them. And it would have been impossible to maintain our defense against all these new threats without the implementation of very, very sophisticated AI systems on our global network.



David Heike: The goal of the model is pretty simple. When you go to swipe your credit card at a cash register, the bank is trying to decide two things. First, they're trying to make a credit decision. Are you authorized to make that purchase?

And the second is it's trying to make a fraud decision. Are you a fraudster? Or are you the right person who's using the card?

The second is what our model is trying to solve. We use machine learning techniques, our internal data as well as some external data, to determine what the likelihood is that you're a fraudster. And this has been an incredibly successful model both for the business and for our customers.

We're able to approve a million more transactions every year, so a million fewer false positives, which makes our customers happy. We're also able to track a million more fraudulent transactions or true positives each year. And this model saves us hundreds of millions of each year. It's been a tremendously important model for our customers, for our business, and for our firm.

3.4.3 Challenges Banks Face Implementing AI

Challenges Banks Face Implementing AI

Although banks have opportunities for risk mitigation, cost reduction, and customer-centricity by implementing AI solutions, many banks have been slow to adopt these new technologies. According to a report by *Business Insider* (Digalaki, 2021):

- 54% of banks with less than US \$100 billion in assets are not implementing AI strategies
- 25% of banks with over US \$100 billion in assets are not implementing AI strategies
- 44% of financial services companies have not implemented AI in risk management
- 48% of financial services companies are not using AI for revenue generation through new products and processes

Why aren't more banks taking advantage of such seemingly easy solutions? Let's take a look at the challenges that banks who want to embrace AI encounter.

Faculty Video: Challenges Incumbent Banks Face with Adopting AI

In this video, Professor Pinar Ozcan explores the challenges banks face in implementing AI solutions.



Let's now consider some of the responses and some of the challenges that incumbent banks and other financial institutions are facing when it comes to adopting AI in finance. As a first response to open banking regulation, we see that a lot of big banks have started to do what we call account aggregation. This means that they use open APIs in order to let their own consumers connect all of their different financial services in one app.

And this app, of course, is part of the bank's offering, which means that all the different data that you might have spread across different banks then gets consolidated. This is a great idea for the consumer. It gives them a holistic view of what pensions they might have, what mortgages, credit, and investment. And all of that becomes part of one app. The bank also takes advantage of this because now the data is also available to that bank that is offering the app. And that means that they can try to entice customers with better deals in different financial services.

Going beyond the account aggregation, though, we see that the response of incumbent banks and financial institutions to the rise of fintechs has been limited. On the one hand, we see lots of new roles that are interesting at banks, such as head of fintech or head of platform collaborations. On the other hand, the banks are also struggling in terms of their IT infrastructure.

The first reason that they struggle is that their data was built in different departments across different decades

with different code. So it's difficult for them to merge this data and to make sense of it in a holistic way. On top of that, banks also struggle because they mirrored this IT infrastructure in their organisational structure over time. What this means is that they have different departments that are all profit centers and that run their businesses on their own data. And they don't have to share data so far.

So how do you become a platform business? How do you run AI when you have data that is being controlled and not shared across different departments? It becomes a nightmare.

That's why we see a lot of banks announcing digital transformation projects in the next few years. These digital transformation projects are necessary in order for them to be able to get better control of their data and to use their data more intelligently. But, of course, part of the difficulty is, how fast can you do these digital transformation projects?

One nightmare that took place in the UK in terms of a bank going through a digital transformation process was the bank, while migrating data, made consumers see other people's accounts for four consecutive days. The consequences of that are still being discussed today, both in their regulatory sphere and among consumers. But imagine what kind of damage that does and how that scares banks in terms of taking their digital transformation and making it quick.

Incumbent banks also struggle when it comes to changing their culture. First of all, they're going through what we call the innovator's dilemma. On the one hand, their products and services are successful there. They dominate the market. And the makers of those products and services are still running the businesses. And they're proud of them. So the urgency to change is not necessarily there.

In addition, we see that many banks don't have data analysis as a core part of their culture. In fact, they have the opposite. They have an aversion to data analysis. One of our informants in our research told us that they saw data as biohazardous waste that needed to be contained, because if it leaked, there would be severe regulatory consequences. How do you change an organisation's culture from that to one where data analysis is the core of competition? It requires a lot of effort, which we will talk about in the later modules.

That is one of the reasons why we see some of the incumbent banks not necessarily trying to change their own organisation but starting new organisations from scratch-- new digital-only banks in order to capture millennials and slowly let the old organisation become smaller and the new organisation become bigger. This is a good response from the point of view of not letting IT and organisational legacy interfere with innovation. The new organisation can run free and do lots of interesting things based on AI, not having to respond so closely to the older organisation.

On the other hand, can the new organisation actually get enough resources in order for it to make it big in the market. We see that many incumbent banks and their efforts to start a new organisation are failing. One example is our RBS. Their new digital bank, Bo, failed only after a year. And the main reason was that it just couldn't get enough customers in the market.

So how do you devote enough resources and give enough freedom to this new organisation in order for them to be a serious competitor to the amazing digital banks that are out there already? It's a big question.

Disparate Data and Technical Infrastructure Challenges

According to Marco Lansiti and Karim R. Lakhani, authors of *Competing in the Age of AI*, organisations who want to move successfully towards an “AI first” model must lean on the management of future-thinking innovators, integrators, and guardians, and make architectural changes within the firm (2020, p. 97). Compartmentalised silos must break down in favor of an “integrated core of software, data, and AI” (Lansiti & Lakhani, 2020, p. 80). Essentially, IT must be the very core of any digitally native business, rather than a necessary-but-retrofitted afterthought. Additionally, to deliver products and services digitally, an organisation needs agile teams with data science, engineering, and product management skills.

So, while incumbents may well have a large amount of customer data, problems can exist with the quality of the data, where it is located, how it's formatted and used, and so on. Too often, whether as a result of purposeful planning or plodding institutional inertia after mergers and acquisitions, incumbents are built up in departmental silos. And just as siloed business units can create or exacerbate human communication problems, they tend to do the same with regard to systems and data. So, the big data of incumbents is likely found in disparate legacy sets, systems, languages, and formats across departments, servers, and geographies. To make sense out of it all is a very difficult proposition.

AI-based banks and third-party products (TPPs) that can take full advantage of a data-based “engagement layer” gain a much more clear and accurate picture of each customer’s specific wants and needs. These banks and TPPs can then craft an intelligent, personalised experience for each customer (Chung et al., 2020). However, even firms who have success with pilot projects typically struggle to effect any lasting change at the enterprise level, as such widespread change demands corporate-wide alignment. As Lansiti and Lakhani put it, “The most difficult work is in changing the organisation, transforming its operating architecture and building the right skills, capabilities, and culture to drive an increasingly digital model” (2020, p. 216).

Moreover, machine learning and AI systems are not simple, and are not best served as prepackaged “black box” solutions. Implementation requires difficult operational and even ethical choices in planning and training, and systems demand continual interaction once deployed.

Guest Video: Challenges with Disparate Data

In this video, Andra Sonea, Head of Solution Architecture at FintechOS, discusses her experiences working with disparate data in incumbent banks.



Let's think about the following thing. The way the IT architecture of the banks evolved was usually centered on products, on their financial products. And one of the reasons for that was hardware, the hardware limitations at the time. So you couldn't put the amount of data that you needed, or process it for a whole bank on the same piece of machine, or cluster of machines, and so on.

So then you think, OK, how we can split it? What division, logical division of these businesses you can find? And the product, it's a natural line. Also, the panels of the banks, and of their executives, are by product. So the guy who control the panel for mortgages, he wants to be in control of his infrastructure. So we had towers of infrastructures by product, and software, and applications, and so on.

Now, the digital world centered the client. And when you see from the perspective of the client, it was for the first time when in the same application in the bank they had to see all their products. And that was the first integration between all these years.

But then, coming back to your question about AI. AI needs to be applied to a set of data in order to learn something, predict something. And now the first thing we ask ourselves, OK, what do we want to do, what do we want to predict? There are many things that we could predict but usually, in fintech, when we talk about application of AI in fintech, we talk about customer actions, or recommendations for the customer, or patterns, or behaviors, and things like that.

The reality is that until a few years ago and, for some banks not even now, there is no such layer, or there was no such layer, where the data for customer comes together. And the life of a customer, the behavior of a customer, or the events in their lives were split between various towers, which never met. And where the information, the granular information, about the customer would disappear completely.

So, first, the banks needed to solve this question. Let's put the data somewhere, in order to be able to see the client in one view. There were customer databases, of course, but they were only structured data. They were very rigid. You would eliminate a lot of information. And they were not for the purpose of prediction. So that's the first limit.

3.4.4 Implementing AI and Machine Learning Architecture

Implementing AI and Machine Learning Architecture

It is hard to imagine that Amazon has ever struggled with its IT architecture. But, in 2002, the company had reached a breaking point: Its processes were straining under the pressure of its rapid growth. In the years since its launch, Amazon had scaled rapidly, moving from books into a number of other

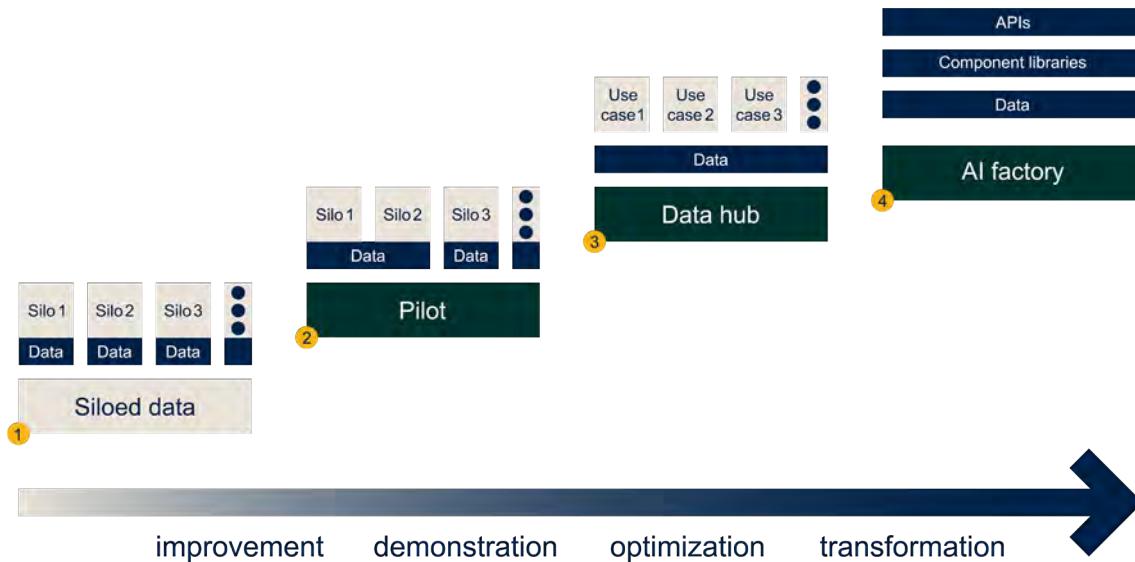
products. It had also expanded rapidly through acquisitions. All of this was stitched together through disparate sets of connections and back-doors. As Marco Iansiti and Karim R Lakhani, authors of *Competing in the Age of AI* wrote by 2002, “Amazon was coming apart at the seams” (Iansiti & Lakhani, 2020, p.79–80).

What Amazon CEO Jeff Bezos did next to begin to solve this challenge has gone down in business history. Bezos sent a memo to his development teams that bluntly commanded them to share their data and functionality through service interfaces—or, be fired. Now sometimes referred to as Bezos’ API Mandate memo, it also told developers that teams must only communicate with each other through these interfaces. (Mason, 2017). The resulting “consistency in technology [and] data architecture” and “consistent view of the customer” transformed the company, enabling Amazon not only to survive, but to scale dramatically and to continue its juggernaut expansion into a number of other products and services. (Iansiti & Lakhani, 2020, p.79–80).

Whether or not an organisation is superficially similar to Amazon, without committing to a centralised network infrastructure, that organisation cannot realise the full potential of its data sets. AI systems work best when they use lots of features, or data points, for the same customer. For example, a bank’s payments arm must share data with its credit lending arm. To take advantage of AI and machine learning, effective enterprise-level systems have developed consistent networks to centralise data and standardise data processing, enabling the reuse of integrated, modular software and algorithms.

Building the Network

So, how does an organisation build this kind of transformative network? Iansiti and Lakhani describe an incremental process similar to the following (2020, p.119):



1. Move the data from two or more silos to a pilot that combines the data from these silos.
2. Move the data from the pilot to a centralised data hub.
3. Move the data from the hub to an AI “factory” composed of data, component libraries, and APIs.

3.4.5 Digital Transformation and Culture Challenges

Digital Transformation and IT Restructuring

Even though organisations cannot analyse data holistically until they have implemented a centralised network infrastructure, which frequently requires a company-wide digital transformation, such changes are never simple. IT restructuring is generally a long and painful process that eats up resources and slows systems, sometimes for an extended time. Without proper planning and precautions, the process might expose a bank to risk. It can even be, occasionally, catastrophic.

In 2018, UK-based TSB Bank attempted to migrate legacy Lloyd's data to a new system. It did not go well. Nearly two million customers were locked out of their accounts (White & Withers, 2019), and many “flocked to Twitter to complain about missing payments, unexplained credits and views into the accounts of strangers” (Finextra, 2018). TSB underestimated the severity of the problem and did not respond strongly enough, causing issues to linger for weeks (Peachey, 2018).

The Bank of England's Prudential Regulation Authority (PRA), in conjunction with the Financial Conduct Authority (FCA), has since required that banks must now plan and build into their systems operational resilience to minimise the sort of impact and disruption seen in the TSB case (Jones, 2021).

Guest Video: Bank Challenges with Moving to the Cloud

In this video, Andra Sonea, Head of Solution Architecture of FintechOS, discusses the costly challenges incumbents face in implementing digital transformation projects—specifically, the challenges that organisations face in moving to the cloud.



We have seen, at least here in the UK, probably three or four years ago, to my knowledge, at least for the megabanks, they started the process of moving to the cloud, something which was completely forbidden before. So five years ago, for example, you wouldn't be allowed as an architect to approve a piece of software, which was software as a service. You were not allowed, and from that, the transition was to everything in the cloud. I was part of such projects, and what I realised then, so it's not like you have a shovel and you put on the software there and you put it on the other side. You all of a sudden realise how complex that is.

So banks had catalogs of applications. So these banks I'm talking about, they have between 4,000 and even 14,000 applications. If you just imagine these applications as a dot and you think how these dots are linked to each other, you realise the complexity of it.

And when you think, OK, let's move things to the cloud, to me, it's again like picking a piece of jewelry from a box with jewelry that you didn't touch in a long time. And you pick an earring and it has on it many other things. And you pick something else and still there's a lot hanging.

It's very similar with applications. You couldn't pick something which was standalone. Everything was connected to everything. So before doing such a move, you really have to understand what actually do you have there and understand the implications of what you're doing.

So if you move this chunk of applications, how much do they have to interact with the rest that you left behind? Or can they do it? Or can you take this system, which is 60 years old, and move it in the cloud? No you cannot.

So you have some options. You either rewrite it or this is still happening, and it's extremely complex work. And it's just one way of doing it. And we are creating other dependencies with it.

Cultural Challenges

Perhaps exacerbating the other challenges facing incumbents is the typical corporate culture, which tends not to be one of openness and collaboration. The Jeff Bezos memo is an outlier that worked arguably due to Amazon's newness combined with the zeitgeist and potential of the online marketplace. But in the incumbents' world—and particularly in banking—departments set on maximising and protecting their own profits are at times not interested in sharing data with one another.

Another cultural aspect centers around humans' relationships with technology. Successful AI complements rather than replaces human intelligence, but implementing effective AI solutions can still be a challenge in terms of both software and human engineering. Organisations who adopt AI often have to re-architect themselves in the process, which requires them to "understand how humans can most effectively augment machines, how machines can enhance what humans do best, and how to redesign business processes to support the partnership" (Wilson & Daugherty, 2018).

Boston Consulting Group Managing Director and Senior Partner Sylvain Duranton says that for the human/AI collaboration to work, "we need to stop thinking tech first" (2019). Rather, the recipe for success is in how the effort for each project is divided: "10 percent . . . to code algo[rithm]s; 20 percent to build tech around the algos, collecting data, building UI, integrating into legacy systems; but 70 percent, the bulk of the effort, is about weaving together AI with people and processes to maximize real outcome".



3.4.6 Addressing Incumbent Challenges

Quick Fact

In the UK, the number of bank customers who have connected their accounts to “trusted third parties” has skyrocketed from 1 million in January 2020 to over 2.5 million just one year later (Chatenay, 2021).

Addressing Incumbent Challenges

AI has great potential to help banks save money, reduce risk, and become more customer centered, but implementing a successful AI solution is not an easy road. How can these institutions address the formidable IT infrastructure, cultural, and digital transformation challenges they face?

Adopt the Fintech Business Model, in-House

Under pressure to reinvent themselves and offer far more customer-centric solutions—much as international hotel chains build boutique brands, and large food and beverage companies create homey in-house craft labels to increase market share—several incumbents have likewise set up their own in-house challenger-style banks and fintechs.

Incumbent-Fintech Partnerships

In the struggle to find a business fit and to please customers, age-old incumbent banks and newfangled fintechs often find themselves eyeing each other as possible partners—wondering if and how they might complement each other, tolerate and trust each other, work together, and mutually profit from such an arrangement.

Whether or not incumbents are immediately drawn to the idea of collaborating with fintechs, there are generally two very significant benefits to doing so:

1. The banking sector has not historically cultivated a culture of innovation, whereas fintechs were born out of innovative ideas and cutting-edge technology.
2. Banks rely on systems built on aging infrastructure, whereas fintechs are natively digital organisations, designed towards specific tasks and goals.

Even with these benefits, partners must find ways to merge cultures that, traditionally, could not be more different. But in the same way that humans must learn how to work with AI in pursuit of transformative change, fintechs and banks can successfully marry their disruptive technology and agile processes with broad customer bases and a long record of profitability. Successful banks are already taking steps to smooth the partnering process, using accelerated onboarding, data sandboxes, and the like.

Internal Transformation

Despite the challenges, enterprise-wide digital transformation is indeed possible. An example of successful digital transformation is that of Singapore's DBS Bank, which was a 40-year-old incumbent when—as DBS CFO Chng Sok Hui says—it came to “the realization that we were not just a bank, we were becoming a technology company” (McKinsey, 2021):

We were able to . . . accelerate the adoption of digital behavior . . . show that digital customers had two times higher income per customer compared to a traditional customer . . . [and] demonstrate that the digital segment had a cost-to-income ratio that was about 34 percent—20 percentage points lower compared to the traditional segment of 54 percent.

Another incumbent that got it right is the Bank of the Philippine Islands (BPI). When BPI needed to “accelerate its pace of innovation, future-proof its technology, transform digitally, and be prepared for the ever changing market dynamics” (IBM, 2019), COO Ramon Jocson put it quite bluntly: “We need to do this to stay relevant. We want to make sure we are part of everything you do every day” (MobiQuity, 2020).

Using AI was part of the initial draw towards the most recent digital transformation, as AI would enable BPI to automate repetitive processes like vouching and reconciliation, and use employees instead for higher-value jobs. Additionally, AI would help raise the bank’s efficiency and accuracy levels (Schnabel, 2017).

The bank’s efforts have indeed been successful, with online transactions doubling in four years, from 809 million in 2016 to 1.6 billion in 2020. Additionally, the bank moved from zero APIs or API revenues in 2016, to roughly 1 billion Philippine pesos (US \$21 million) over the same time period (Chipongian, 2020).

To achieve its goals so quickly, BPI outsourced many elements of its transformation to experts in the field. Among them were IBM, which provided IT infrastructure services including a “secure and scalable hybrid multicloud” (IBM, 2021), and a number of partners in omnichannel app development (Prior, 2018).

Partnerships and Platforms

Business alliances are not just for the infrastructure side of the house. Incumbent firms often look towards partnerships as a means of filling out their platforms and offering clients a more complete banking and investment ecosystem. Reporting for EY, Bellens and Meekings write that many institutions have taken to outsourcing discrete services, “especially in areas that don’t provide a material competitive advantage, such as anti-money laundering (AML) checks or know your customer (KYC). Recent EY research found that 61% of banks are looking to co-source tax-related activities with third-party vendors” (2020).

Bellens and Meekings continue (2020):

Platform models—particularly in e-commerce—gained strong traction through the pandemic, and it is now critical that banks consider their strategy in this space. Platforms that leverage data from multiple sources, combined with advanced analytics, can connect customers to hyper-personalized value propositions, such as loan forgiveness solutions or innovative pricing options for products.

Guest Video: The Importance of Partnerships and How They're Carried Out

In this video, Megan Caywood, Chief Platform Officer at Barclays, explains the importance of partnerships and how they're carried out.



per se, but very much a thought leader in terms of cloud-based accounting. They started out of New Zealand, and they were really quite fascinating, if you don't know Xero, because they IPO'd almost immediately. So the biggest thing on their books was the purchase of their domain name for about NZ \$20,000, which was quite funny.

But they were known for really overtaking the market in New Zealand because the incumbent there, namely MYOB, was perceived to be asleep at the wheel. They were desktop-based. They hadn't moved online. And then Xero came in. They offered a cloud-based accounting solution, which did two things really well. It enabled this interaction between the accountants and the business owners very seamlessly.

Then also they did something innovative around bank reconciliation, which I won't go into here because it's a bit beside the point. But as a result of that, they were really able to sweep through the market and did the same thing in Australia, and then moved to the UK and the US, and so on.

What they did really notably well is, back in 2007 when they were starting, they built out an API in lockstep with their core product, which at that time, APIs were just coming to the forefront of technology strategies. It wasn't just a natural thing that you do, to build the API with your core product, so they were really quite advanced doing that in 2007.

But from the beginning they realised that a lot of small businesses would have their accounting software, but then they could integrate it with up to an average of 15 other pieces of software and tools that they would be using alongside it, maybe timesheets and payments, and all these other tools that they would use. So actually, by having an open API and integrating the APIs of other services in, they could have a much more fully fledged offering that was much stickier. It would retain customers much more effectively.

One of them was payroll. If someone uses accounting and payroll together, they're much less likely to switch. But then they would do things like integrating the PayPal API into Xero. As a result of that, the incumbent, Intuit, in the US, very much followed suit and said, you know what? If our customers are using on average around 15 different tools but we only offer three, then to stay competitive we either have to build them or integrate. You don't want to have to try to be the leader on every different tool and service, so it just made more sense to strategically integrate the things they didn't want to specialise in.

Similarly, then, I went to Starling and helped to start Starling Bank. The thought there was that we wanted to focus on being the world's best current account. But we knew we couldn't be that, and the world's best mortgage, and every type of insurance, and bill management, and all of these amazing tools that other fintechs were coming up with around, for example, receipts and loyalty. There was so much innovation happening, particularly in the UK, in fintech.

So we decided instead that we would do two things. One, a Xero-type approach where we built out our own API in lockstep with our core product, meaning Starling data could be shared with the likes of someone like Flux, or Tail, Wealthify; fintechs who had registered onto the Open Banking committee or who we'd done due diligence on. But similarly, we would integrate the APIs of these third parties into Starling. What that meant is we had three types of partnerships. On the one hand, we had deeply integrated partners: so deeply integrated, customers might not know the functionality was served by a partner.

An example of this is, if you go into Starling Bank and you tap into a transaction, you'll see it laid over a map. Starling didn't build out the mapping technology, they integrated the Google Maps API. That was just the customer's location based on information around their transactions, very similar to how Uber integrated the Google Maps API when they first started. They just wanted to focus on ride-sharing service but not building mapping technology, so they would just pay Google for the ability to have that service. Other things like foreign exchange, so Starling Bank integrating Currencycloud. Those are deeply integrated types of partners.

The second type of partners are the exact opposite. They don't appear in Starling at all, they are only external. An example of that would be Tail. What Tail does is, they integrate with point of sale systems at lots of small businesses throughout the UK, mainly in London to start, and then spreading out from there. Effectively what they do is, instead of having a coffee card saying, you've bought five coffees, now you get one for free, they would automatically just register what you purchase and give you loyalty and cashback.

And then each week you would have a payment that would go from Tail into your bank account, so people would just be spending on their Starling card, and if they were spending it at authorised retailers – whether or not they knew it – then they would be able to get loyalty in the form of cashback directly into their Starling account, so they could get a few pounds back into their account each week.

And then the third type were those that were a hybrid of those two, where they appeared in Starling and you knew it was a partner, and you could discover Starling in the partner externally as well. An example of that would be someone like Wealthify. If you're in Starling and you go into what's called their marketplace section, if you want an ISA, Starling doesn't offer that, but you could see Wealthify within Starling.

If you were to tap on Wealthify to go into that experience, what would happen is, you'd hit what's called an OAuth 2.0 flow. Effectively, Starling would ask your permission to be able to... Wealthify would ask Starling's permission to be able to access your transaction data, and view your transaction history and your account information, pull it into Wealthify, in part to auto-populate the setup.

Back to that point on friction. The more friction you have – and this is in any product – the more steps you have to sign up, the worse your conversion funnel will look. The tricky thing with financial services is, if you just take

out all the steps to sign up, people lose confidence because it's an ISA or it's a mortgage. If you don't give them your name, you're like, you're not doing it right. I don't want to... I don't want a mortgage with you if you don't know who I am. So you have to have this balance of, you've securely gathered my data from somewhere, but I have less steps and it's easier.

That fills people with belief then. For us, that meant Wealthify saying, can we access this data from Starling? User saying yes, and all of a sudden your name, your address, your account number and information was automatically populated within Wealthify, therefore speeding up your setup. Then once you've set up in terms of your ISA that you want with Wealthify, that information – if the user authorises it – displays in Starling. So you can see your ISA balance alongside your current account balance. So there's a two-way integration.

Those are the three main types within Starling. Barclays and other large banks are a bit different, because being larger and more established, they of course have much more capital and therefore can do investments and other types of partnerships as well.

Guest Video: Addressing Challenges

In this video, David Heike, Managing Director and Head of Risk Modeling at JPMorgan Chase, discusses what types of skills are needed to deal with interdisciplinary teams working on innovation together, and how to both embrace technology and mitigate risks.



I think the biggest skill that people will need is listening. You flag a challenge that I think is one of the most pernicious ones in machine learning. The people who are experts in AI techniques often don't understand the business problem. And on the contrary, the business folks have a lot of trouble understanding what AI engineers might be trying to accomplish.

So the ability to understand each other's perspective and be able to, if you will, translate, for example, a business request into a specific model or AI model to develop, that's a very difficult skill set to have, a challenging skill set to develop. And the ability to really bridge that gap by having good listening skills is critical.

There are folks that can help with this. Often we'll have scrum masters in that scrum room to help facilitate that dialogue. But that will always be one of the more challenging questions, getting the two folks together as well as the technology folks, the data folks, to be able to design a model that can achieve the business purpose.

I think that we're on the cusp of a massive transformation of the financial services industry through AI and machine learning techniques. It's critical for business leaders to embrace this new technology because I really think it's going to transform the way we manage risk, we generate revenue, and we service our customers. At the same time, it's important to think about risk controls around this emerging technology.

There are a number of risks that have always been there around models, about making sure that you're using data in a careful way and you have good controls around data quality, that you manage the operational risks around technology, that you manage issues around bias. If you have bias in the data, you're going to have bias in the models. And you have to find ways to mitigate that.

In order to manage all of these risks, you need to have a good set of controls-- model risk controls, fair lending controls, data controls. And you need to stay on top of that. Testing on an ongoing basis is incredibly important because, at the end of the day, we want to service our customers. We want to treat them fairly. We want to give them the best products. We also want to be a safe and sound institution that will be here for centuries to come. In order to do that, you need to make sure that you're using AI in a safe and sound way.

3.4.7 Key Takeaways, References, and Optional Resources

Let's review the key points of this section:

1. The goal for incumbents is to enhance their services and transform themselves through the implementation of AI-based systems. When well planned and executed, AI can help to enable better customer engagement, reduce costs, and generate more consumer data to feed a new algorithm or continue to improve existing ones.
2. The better that banks understand each customer and their habits, the more tailored experience the banks can create for their customers. Firms that centralise data and digitise their operating model can leverage AI more effectively to personalise products and services.
3. While incumbents may well have a large amount of customer data, problems can exist with the quality of the data, where it is located, how it's formatted and used, and so on.
4. Effective enterprise-level systems have developed a consistent network to centralise data and standardise data processing, enabling the reuse of integrated, modular software and algorithms.
5. Even though organisations cannot analyse data holistically until they have implemented a centralised network infrastructure, which frequently requires a company-wide digital transformation, such changes are never simple. Without proper planning and precautions, the process might expose a bank to risk. It can even be, occasionally, catastrophic.
6. To maximise the effect of human/machine collaboration, companies must understand how humans can most effectively augment machines, how machines can enhance what humans do best, and how to redesign business processes to support the partnership.
7. Whether or not incumbents are immediately drawn to the idea of collaborating with fintechs, there are generally two very significant benefits to doing so: The banking sector has not historically cultivated a culture of innovation, and banks rely on systems built on ageing infrastructure.
8. Incumbent firms often look towards partnerships as a means of filling out their platforms and offering clients a more complete banking and investment ecosystem.

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Optional Resources

[Bank of the Philippine Islands \(BPI\): Accelerating digital transformation with IBM for the future of banking](#)

[Knowledge @ Wharton Podcast: Humans Plus Robots: Why the Two Are Better Than Either One Alone](#)

[Reimagining customer engagement for the AI bank of the future](#)

3.5 Incumbent Examples

3.5.1 Mastercard

Section Objectives

In this section, we examine two incumbents who have successfully implemented AI solutions: Mastercard and Union Bank.

Mastercard

Mastercard—established in 1966, before the widespread adoption of computers, let alone smartphones and AI—has stood apart from many incumbents as an AI success story (Wilson, 2020). One reason has been the company's approach to making deep-seated, potentially difficult changes: in its digital transformation, Mastercard saw infrastructure change as a priority rather than an afterthought. Mohammed Kamal, Mastercard Senior Vice President & COO, Consumer Applications, remarked,

“It is important to move from a place where the digital and core businesses are not separate to be successful. The core business itself has to evolve into being digital rather than adding a digital veneer and keeping the existing core processes in place. . . . It’s visible when you look at a company, which ones have added digital as an afterthought, versus which companies actually reinvented themselves to be digitally native” (Wilson, 2020).

As part of its journey to becoming “digitally native”, Mastercard introduced its Digital First Card Program, which not only acts as a “digital wallet” solely for mobile payments, but enables cardholders to complete all account-based activity digitally. According to Jessica Turner, Executive Vice President of New Digital Infrastructure and Fintech, the Digital First program “is about recognizing that cardholders want to apply for, receive and manage banking products and services digitally. The digital-first financial experience fits within a lifestyle (particularly among younger consumers) that does almost everything online, from shopping to scheduling doctors’ appointments” (PYMNTS, 2020).

As another step in its transformation to next-generation tools and services, Mastercard adopted “the objective to stop competing with other payment processing firms (like Visa or Amex) and start competing with cash”—in the process “mov[ing] from an undifferentiated processor of payments to a builder of unique technological platforms” (Duvauchelle et al., 2020). Additionally, as if to underscore its shift to digital platforms, Mastercard announced early in 2021 that it would support cryptocurrencies with strong compliance measures in place, and has likewise tested a platform to support central bank digital currencies (CBDCs) (Dhamodharan, 2021).

Mastercard also pursued strategic alliances, announcing partnerships with Samsung as well as fintechs including SoFi, Pay with Privacy, and Neo Financial (PYMNTS, 2020). These fintech partnerships allow “the flexibility to create ‘customized’ solutions for different end users’ money

management desires. The digital-first push allows cardholders to manage their payment credentials and also gives them access to transaction history and balance information, as well as the ability to set alerts,” says Turner.

One partner is US-based fintech Deserve, which began offering a Mastercard-certified Digital First Card in April 2021 (Business Wire, 2021). The Digital First Card can grant consumers approval “in minutes,” allowing them to begin spending money on the card instantly. Deserve seeks to partner its “proprietary mobile-first platform” with additional organisations, eventually making every step of the consumer’s credit card journey—from application and spending to payments and rewards—an “embedded and seamless” experience.

Mastercard emphasises that the digital-first strategy does not benefit the consumer only. Mohammed Kamal said, “Mastercard [brings] together different parties—merchants, billers, acquiring banks and consumer banks—in a network. These new, digitally native products . . . enable a richer exchange of data than their analog counterparts . . . [which drives value,] enriches the whole ecosystem, and provides for a more symbiotic relationship between us and our partners” (Wilson, 2020).

Guest Video: AI as a Crucial Part of Mastercard’s DNA

In this video, Ajay Bhalla, President of Cyber and Intelligence Solutions at Mastercard, speaks about how AI became a part of Mastercard’s DNA.



AI is already established at the core of our network. All our critical platforms can handle almost a billion transactions a day. And to achieve this with a high degree of accuracy, reliability, and to be able to perform sophisticated analytics on it, advanced AI is almost a necessity.

And in the last few years, we’ve been using AI as a key force behind all our platforms. So the systems have been architected in such a way that data from these systems can flow correctly. It’s labeled correctly, so you can actually do advanced analytics on them very, very quickly. So that’s been really helping. So I guess the key point is the architecting of the platforms and the architecting of the network is extremely critical when you’re using AI.

The second big thing which we are doing is we are making sure that in all the interactions that are happening on a network, whether they are happening in the physical world, whether they’re happening in the digital world, whether they are happening on devices, that all this data is properly captured and used for interpretations because that’s where the value of the data comes in. Because you can have a lot of data. But if you don’t actually label it properly, you lose the value of interpretation right away. So that’s one key big thing.

The second big thing is the architecting of the network because speed is critical. You have to remember that when you are doing transactions, you are actually waiting to check out in a queue, whether it’s in the physical world or in the digital world. So speed is really important. So the way the network is designed-- again, that it can process transactions at very fast speed-- that means all the data, which needs to be interpreted for risk management, also has to work at that kind of speed.

And then, thirdly is the entire infrastructure-- the latest in processing cards, graphic technology, et cetera-- have to be all put in. And we've been doing all these investments. And that has actually really helped us that pretty much in everything we do, AI has now become part of the DNA of our company.

3.5.2 UnionBank

UnionBank

Another incumbent success story stems from the Philippines, where UnionBank's drive to "Tech Up Pilipinas" has led the company to create immersive experiences in its innovative ARK branches, as well as EON, known as a "selfie banking" app, and APIs and a platform aimed toward serving the underbanked (UnionBank, 2019).

Asian Banking and Financing describes the original ARK, which opened in September 2017, as a first-of-its-kind, fully digital "third space" branch, where instead of having to "wait in long lines. . . . secure slips of paper with queue numbers . . . wait for their turn on the cue of an overhead digital signboard. . . . [and] fill out papers for specific transactions," customers interact solely with self-service machines and tablets (2018). The article describes the physical space: "comfortable, bright-coloured couches, free-flowing refreshments, and a host of technologies and gadgets for banking transactions, including standalone terminals, tablets, touch screen TVs, and virtual reality goggles"; bank staff within the ARK are called Ambassadors, and their purpose is to help customers to take advantage of UnionBank's plentiful digital financial services. The move was a bold one, specifically designed to transform the customer experience in banking: maximising both customer convenience and the education of future banking technologies, including loan and product applications using virtual and augmented reality.

Driving the ARK and UnionBank's other digital initiatives is data science and artificial intelligence (DSAI), which Dr. David Hardoon, Senior Advisor for Data and Artificial Intelligence, explains "is a key element within UnionBank's digitize or perish journey. It is the differentiator between just 'digitize to survive' and 'digitize to flourish'" (Embudo, 2020). Combining DSAI with 5G and the internet of things (IoT), UnionBank has leveraged the success of the original ARK into ARK 2.0 branches, where 5G provides connections that are 20 times faster than in older networks and Ambassadors can connect as many as 32 IoT devices at once—empowering UnionBank to "harness the always-on, real-time data coming from devices, which will allow better prediction and anticipation of a customer's preferences and behaviors" (Globe, 2020).

Outside of the ARK branches, customers can take advantage of UnionBank's in-house fintech, EON, which offers digitally-based prepaid account debit cards. Using biometric facial authentication to enable login via the camera on a user's smartphone, EON has been dubbed "selfie banking" (Uy, 2017)—a winning marketing strategy in a country known as the "social media capital of the world" (Sanchez, 2020).

In addition to improving customer-centric offerings and internal operations, UnionBank has focussed on providing services for the 70% of Filipinos who remain unbanked or underbanked (ConSensys, 2019). The organisation's revolutionary Send-i2i platform, where "i2i" can mean "island-to-island",

“institution-to-institution”, and “individual-to-individual”, uses blockchain technology to help connect rural, underserved banks with the country’s financial system, increasing rural residents’ access to banking services in the process (ConSensys, 2019). Send-i2i experienced “exponential growth” in its first months (Bloomberg, 2019) and led UnionBank to win the 2020 Model Bank for Financial Inclusion Award (PR Newswire, 2020).

Meanwhile, the bank has also developed a massive API Marketplace that includes over 600 APIs—which not only “cover the bank’s various capabilities like bills payment, funds transfer, inquiries, authentication and other functions”, but also enable third parties to develop technologies to serve even more of the island nation’s population (Manila Times, 2019). Another of the bank’s social offerings, UShare, is a cloud-based fundraising donation and fee collection platform meant to empower community-based non-profits and similar organisations (UnionBank, n.d.).

UnionBank appears to be focussed on the big picture: in addition to building platforms, the organisation is embedding banking into the lives of its customers, and, arguably, community. What’s next? According to UnionBank’s Chief Technology and Operations Officer, Henry Aguda (Alarilla, 2020):

We are in the midst of the Fourth Industrial Revolution. . . 5G and IoT will enrich transactions and bring forth new services by leveraging AI that will automate in real-time many simultaneous processes from big data. By using a combination of these technologies, this will give birth to Smart Cities and Smart Communities wherein financial services become a seamless transactional experience.

Guest Video: AI at UnionBank of the Philippines

In this video, David Hardoon discusses some successful examples of how UnionBank of the Philippines uses AI, and some of the challenges the bank has experienced in rolling out AI solutions.



Some of the examples of how Union Bank of the Philippines has been using, well, data science and artificial intelligence-- quite honestly, sometimes an interchangeable term-- has been, as you would expect, across multiple pillars from internal operations, like really identifying where are those operational opportunities to driving further efficiencies. Think of it as Six Sigma on steroids. In the case of Philippines, where you still have approximately 65 million people who are underbanked or underserved, where AI and data science really, really shines is, how do you start looking at the possibilities from alternative creditor scorings and providing services to people who may previously were unable to attain those financial access to a certain degree?

And then finally, of course, is on the traditional sense, where it's not just on the retail side, but corporations, small-medium enterprises, or micro-medium enterprises, where it is about, similarly, how is it possible-- what's the possibility, excuse me, in providing access to financial services? And before I give you perhaps some examples of how and ways to take some of the areas of best return on investment, or value perhaps is a better word to the bank is one of the key things about using data science in AI is what I like to call putting finance in supporting moments of life, because that's what it allows you to do. It allows you to understand behavior.

It does allow you to understand tendencies. It allows you to understand changes. So rather than someone waking up in the morning, as they do, and saying, I would love that loan, because you know it's marketed so lovely, it's understanding that purpose, the intent as to why they need it. Is it because they're trying to grow the business? Is it because they're getting married, planning a family, whatever it may be?

So some of the areas that for me, personally, I think are some of the great successes of applying data science in Union Bank. And some of them really nice benefits for both our consumers and for the organization is in the mass market and financial inclusion, where someone who previously could not attain a loan due to not having financial statements, not previously having a bank account or whatnot, can now essentially avail a loan. And the way we do it is by looking at alternative data, understanding the consumer, building those services around them, and providing them a loan, effectively.

So it's a win-win. It's a win for the consumer in having that access to finance. And it's a benefit for the organization, because that essentially is one of the main revenue streams, providing loans.

Some of the challenges that Union Bank has faced in rolling up data science and AI is, I believe, very similar to any financial institution, bank, who's going about and rolling out AI and data science within the organization is first and foremost, how does it sit within the existing regulatory and compliance environment? Because, as you can imagine, if you think of credit scoring, it's a fairly-- I mean, very established field with very set-in-stone, to a certain extent requirements. And then suddenly, you have this new kid on the block, data science, looking at alternatives, being able to estimate risk, looking at telco data, for example.

How does that fit? So at the first front is to understand, well, actually, we're not reinventing the wheel. We're actually doing the same thing, but looking at different ways of doing it.

So how do you bring it back? And how do you align it to the existing terminologies or existing requirements? So that's, I believe, one of the first and most important considerations of applying. So I don't know whether you consider it a challenge, but let's call it a challenge that needs to be addressed on the forefront.

The second one-- and again, I guess I'm an optimist-- I prefer calling challenges opportunities-- is, how does it then get incorporated within the business process? When you have a very systematic approach from a loans provisioning, a customer engagement, how and exactly where does this mechanism, this algorithmic information, this decisioning come into play? And how does the business use it? So, again, none of these are insurmountable. But without initially considering it, without initially thinking about it, designing it, it can be a challenge that needs to be, well, solved.

3.5.3 Databricks

Case Study: Databricks

In 2013, the creators of Apache Spark, an analytics engine, Delta Lake, a storage layer, and MLflow, a logistics planner, set out to offer an “open and unified platform for data and AI” (Databricks, 2013). Previous data architectures, which used separate tools to store and analyse data, no longer worked for modern needs: Data warehouses couldn’t store unstructured data, and data lakes, despite storing vast amounts of unstructured data, lacked many of the tools to analyse it (Lorica et al., 2020).

As a result, Ali Ghodsi, Ion Stoica, Matei Zaharia, Patrick Wendell, Reynold Xin, Andy Konwinski, and Arsalan Tavakoli-Shiraji co-founded Databricks, a company that pioneered the world's first lakehouse platform: an open data architecture that imposed the structure of data warehouses on the cost-efficient, cloud-based storage model of data lakes. According to Brian Njuguna in SiliconANGLE, the lakehouse model eliminated inconsistent data formats and data silos, enhancing the ability of data analysts, scientists, and engineers to collaborate (Njuguna, 2021).

Now, as Databricks' network of startups, companies, and partners grows, the company is focused on scaling its lakehouse ecosystem. Databricks' Partner Connect portal links customer lakehouses to advanced machine learning and analytics tools, whilst its new venture capital fund invests uncapped amounts of funding in startups that adopt the lakehouse model (Whiting, 2021; Williams, 2021).

Whether these initiatives will be enough to shift businesses to a new system of data storage is not yet clear. As Joe Williams noted in Bloomberg, "unlike software-as-a-service applications...storage systems, like the data warehouse, are often much more difficult to swap" (2021). Yet as companies search for new, innovative ways to simplify data architectures, more than 5,000 companies—from H&M Group to Shell—have given Databricks' new model a shot (Databricks, 2022).

Guest Video: Tips on Implementing AI into an Organisation

In the following video, Alexandra Mysak, Director of Sales, Financial Services at Databricks, discusses leveraging data and AI for corporate success, building open platforms, and using the right tools for the right workload.



There's a few stats I'll share with you, first of all, that we love to quote internally. In terms of those companies that don't manage to implement, Gartner says it's about 85% of big data projects that fail. VentureBeat published a report that said 87% of data science projects never make it to production. And just this morning I read from my old customer that I mentioned, a new report from S&P Global, and they stated that 31% of organisations take six days or more to generate insights from raw data. If you think about the time value of data, record is most valuable when it's first created and then it quickly deteriorates in value.

But then when you group together collections of those records, the volume and the history over time is also incredibly valuable. So the fact that 31% of organisations can't derive value in sub-six days means that they're probably only able to leverage an already-decreasing-in-value data set, if you follow what I'm saying.

Factors to address when implementing AI

If you think about companies that are disrupting entire industries, like Uber and Airbnb, they have a common driver in their competitive edge: it's data and AI. For those brands, big data and analytics; machine learning essential to customer experiences; predicting when food's going to arrive; visualising your next vacation.

What's really interesting is, in today's fiercely competitive markets, the incumbents can be ousted by savvy database startups every single day. Companies that thrive in this era are going to follow Uber and Airbnb as lead, and similarly incorporate data and artificial intelligence into the heart of the products and services.

We saw this ever more prevalently during Covid-19 last year, where Databricks, as a US-centric company in some ways, saw some of the winners, which are our customers – the likes of Walmart and CVS, the drugstores and grocery chains – able to pivot and more precisely target the business, things like that; inventory management processing from using daily reports based on data and AI for running their business.

What was also really interesting is, some of what you might call the so-called losers of Covid-19 – companies like airlines, ticketing companies – were also sharply spending on their tech and IT budgets around data and AI, because they needed to understand what their business was doing more critically than ever, and data was at the heart of it.

What I think is really interesting, just to have a bit of fun with you, is it isn't just conjecture. You just need to look at the stock market for proof. Today, success in corporate America is more concentrated than any other period in modern history with just a few select innovators. Specifically, we call them the FAAMG stocks – Facebook, Amazon, Apple, Microsoft, Google. They account for more than 20% of the S&P 500 by market cap, and so the winners are concentrated around companies where cloud data and AI capabilities are central to operations.

Because of this, from Databricks and from the likes of Goldman, we came up with the Databricks 30, and that index tracks marquee customers across our top five verticals plus partners. If you look at that Databricks 30, as of February this year, analysis showed that the Databricks 30 customer index outperformed the S&P by 21 percentage points, and that's over the last three years.

In other words, if the stock market went up by 50% over that time frame, the Databricks 30 would have gone up by 71%. So, outperformance of 21 percentage points. The reason I say this to you is if you're asking the question, people are starting to look at AI, I think you need to get with the programme because this is now a key competitive differentiator, and the market's already ahead of companies that don't have this competence.

So then what? Technology strategy is likely to evolve. The best advice: you need an open platform – one that doesn't tie you to a certain vendor. And it's pretty well acknowledged at this point that for many years, customers felt locked in to their on-prem data warehouses, so, the likes of Oracle. The key is not to make that same mistake, and also to ensure that the data is in your own environment – it's your asset, of course – and then also in a non-proprietary format. You may also want to be cloud agnostic, using a platform that can be hosted by any of the major clouds, and multi-cloud is upon us. I've seen such an acceleration in this trend in the last year, even in financial services, which was very late to get to cloud adoption as an industry vertical.

I think the final question as well is the question of build versus buy. Given the complexity of weaving together the chain of cloud-native applications that would in any way emulate the data pipeline and Databricks, is only the very largest of enterprises have access to that expertise and resource to even try a DIY approach.

So in addition, those cloud-native applications, the leveraging open source code basis versus optimised commercial versions. Even if you did it yourself, we tend to see that the end results are night and day different in terms of cost and performance.

I think, perhaps, the most important advice to understanding the tooling is, very honestly, the right workload for the right tool, as I mentioned earlier. So, BI SQL workloads today are still likely most effective in your data warehouse, but that has the potential to change in the coming one to two years.

ETL, today, should be executed in an ETL tool for performance and low costs. I think it's the combination of these two things, creating yourself a technology platform and architecture that is open, and therefore, future-proofed with no vendor lock-in. And then making sure that you understand the right tool for the right workload.

3.5.4 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. As part of its journey to becoming “digitally native”, Mastercard introduced its Digital First Card Program, which enables cardholders to complete all account-based activity digitally.
2. Mastercard also pursued strategic alliances, announcing partnerships with Samsung as well as fintechs including SoFi, Pay with Privacy, and Neo Financial.
3. As part of UnionBank’s “Tech Up Pilipinas” drive, the company has created immersive experiences in its innovative ARK and ARK 2.0 branches, as well as a “selfie banking” app, EON, and APIs and a platform that focus on the underbanked and small businesses.
4. UnionBank has combined data science and artificial intelligence (DSAI), 5G technology, the IoT, blockchain, and its massive API Marketplace to not only improve customer-centric offerings and internal operations, but also to focus on providing services for the 70% of Filipinos who remain unbanked or underbanked.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[Mastercard's "digital first" card program](#)

[UnionBank of the Philippines: Data Driven Digital Transformation Video](#)

[EON by UnionBank](#)



Module 4: Platforms as Key Market Players

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford Artificial Intelligence in Fintech and Open Banking

Module 4: Platforms as Key Market Players



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4.1 About Module 4

4.1.1 Module 4 Overview

Overview

Welcome to Module 4 of the AI in Fintech and Open Banking Programme!

In Modules 1 and 3, you learnt about the importance of numerous data points and about the shift in power that AI, driven by data centralisation, has fueled in the finance industry. This week, we will examine the platform business model and explore how the Big Tech platforms are disrupting the financial sector. We will start by looking at the platform industry and what has contributed to its success. We will examine how platforms are disrupting the financial sector with data—specifically, what kind of data do big platforms like Google and Apple have that financial sectors don't? We will analyse how regulations like open banking will affect the platform business model, and what businesses should be doing about the possible effects of such regulations. We will also hypothesise how platforms may shape the future of banking.

Faculty Video: Big Techs in Finance Using Open Banking & Frameworks

In the following video, Professor Pinar Ozcan shares what to expect this week.



Welcome to module 4. Now that you've seen what opportunities and challenges incumbents face when they're adopting AI-based services based on the data that they possess, as well as having looked at the Fintech Ventures that come into the market wanting to offer AI-based services either in a B2C or B2B setting, we are going to now turn our heads and look at a very important and different type of player, big tech coming into finance using open banking and related frameworks.

Section Objectives

At the end of this module, you will be able to:

- Explain how the platform business model is so successful.
- Describe how platforms are disrupting the financial sector with data.
- Hypothesise how platforms may shape the future of banking.

Graded Assignments

You will complete individual and group assignments, which count towards your completion of the programme. This week, you will:

- Meet with your group to analyse the feasibility of the AI use cases you explored last week, and determine which one is most feasible to pursue. Complete a quiz on the module's content and key takeaways.
- Reflect on what you have learnt this week by applying it to your personal or professional experiences.

You must submit all graded assignments in Module 4 by **12 July, 2022, 23:59 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

Additional Activities

As in each module, we present additional content related to the core learning. This week, we:

- Discuss China's superapps, explore whether this model could be replicated elsewhere, and consider the implications for other businesses.
- Consider what the Ant Financial 3-1-0 model of making loan decisions would look like in the context of your own organisation.

Vocabulary Check

The terms below are industry specific terms that appear in this module. Before beginning the module, check your knowledge of these words, and, if you need to, review the definitions in the programme glossary.

[Big Tech](#)

[GAFAM](#)

[Platform](#)

Time Commitment

Plan to spend seven to ten hours on Module 4 this week. As there is a lot of reading material, and many videos, you might want to divide up your work into several sessions. The module is broken up into sections by theme, giving you potential break points.

Make sure you plan time to meet with your group, and to complete the assignments.

4.2 Platforms in the Financial Sector

4.2.1 Platforms in the Financial Sector

Section Objectives

In this section, we will explore the platform-based businesses of the Big Tech companies, what contributed to their success and growth, and how they are disrupting the financial services industry.

Platforms in the Financial Sector

Jamie Dimon, the CEO of JP Morgan, minced no words in his 2020 annual letter to shareholders: “Banks have enormous competitive threats—from virtually every angle,” he warned. “Fintech and Big Tech are here... big time!” (JP Morgan, 2020).

This is not the first time that Dimon has sounded the alarm on the rising threat that tech companies pose to banks—and in particular, the big platforms, Google, Amazon, Facebook (Now Meta), Apple, and Microsoft collectively known as GAFAM, despite the recent name changes of both Google to Alphabet and Facebook to Meta. However, as the pandemic continues, and people the world over have been pushed online to conduct their lives, his warning is especially salient. Big Tech keeps getting bigger.

Before Covid-19 struck, GAFAM were already amongst the world’s most valuable companies, and enjoyed a deep and widespread dominance. In 2021, GAFAM reached a combined market value of over US \$4 trillion (Clement, 2021). By early February 2022, following a volatile 2021, their collective valuation had more than doubled. Apple alone had reached a US \$2.8 trillion valuation; Microsoft stood at US \$2.26 trillion; Google (Alphabet) at US \$1.9 trillion; and Amazon at US \$1.41 trillion. Only Meta dogged by sharply falling ad revenues driven by Apple’s new privacy policy, its shares fell steeply, giving it a market capitalisation of US \$637 billion (Robertson, 2022).

Big Tech firms have catapulted to dominance thanks to their platform-based businesses, a model that has allowed them to quickly move from controlling their core offerings into a number of other sectors. While most know Apple for its iPhones, its services business is even more profitable, delivering gross margins that are the envy of the business world. In its Q2 2021 earnings, Apple reported that its services—from the App Store to subscription-based services such as Apple Music, iCloud, and Apple Pay (Gartenberg, 2019)—now have a gross margin topping 70%, while the services business itself increased 27% from a year earlier (Levy, 2021). Apple’s services business has spawned entire individual platform ecosystems that are highly valuable in their own right, such as the App Store.

What threats could Big Tech platforms potentially pose to banks? According to Dimon, at a minimum, GAFAM could embed payment systems into their platforms and create a marketplace of financial products and services. Indeed, all four have already expanded into payments, with apps such as Apple Pay and Google Pay. Some could strike white label banking partnerships, as Google attempted

with Citibank, to launch a checking account (Rooney, 2020). Finally, some might even acquire banking licenses to launch directly into the market. As Dimon noted in his letter, “Their strengths are extraordinary, with ubiquitous platforms and endless data” (JP Morgan, 2020).

Faculty Video: How Open Banking Affects Platforms

In this video, Professor Pinar Ozcan describes how open banking regulations have opened up opportunity for Big Tech platforms to enter in the financial market. She explores the Big Tech platforms that are poised to disrupt the financial market, and why they have a competitive advantage over both incumbents and fintechs.



The topic of whether big tech is going to dominate finance is a very important and interesting topic. You've already seen in Module 2 that big tech has the ability now using open banking regulation to come into finance and get access to data that they did not have access to before. But will all big tech players come in the same way? Will they all play the same role in finance? That is an important question to ask ourselves.

Let's consider the different big tech players and what competitive advantages they have in order to come into finance and to make a difference, starting by Amazon. Amazon is a big tech player with a large retail platform. What does this mean for finance? It means that they have millions of sellers and buyers on their retail platform that might need financial services in the process of selling and buying. That's why we see Amazon starting with small to medium business lending when it comes to their entry into finance.

On the other hand, Facebook has the largest social media platform in the world. They have the largest numbers of subscribers, people who exchange thoughts and ideas and emotions on that social platform. Many of those people are people who don't even have bank accounts. However, they have smartphones and they know how to use Facebook. This gives Facebook the opportunity to use peer-to-peer payments in order to start going into finance. They can take advantage of their large number of subscribers in order to allow these subscribers to do microfinancing and to do peer-to-peer payments and lending without ever needing banks.

Google, on the other hand, has already announced that they're going to start providing banking services in the US, starting with checking accounts. Why does this make sense for Google? It makes sense because they have the largest database in the world of any types of users and different types of searches. They understand what's in our thoughts. So, when they are able to combine that with our financial data, with our payments and income data, this gives them an amazing advantage when it comes to their main revenue base, which is advertising.

So, you start to see that different big tech players will play different roles in finance based on the competitive advantage and the history that they have. They will collect different types of data, and they will build different financial products and services with that data. They might partner with fintechs because they already have the platforms that reach consumers, so adding fintechs as complementers on those platforms will be extremely easy for them. Both players will be digital born, so it will be very easy for fintechs to be onboarded onto Google's or Amazon's platform. So, what we see is that the future will hold a big big tech presence in finance, and that might be in the form of offering services directly or in partnership with fintech.

4.2.2 The Rise of Big Tech

Banks as Traditional Platforms

Before the rise of the internet, banks were the platform businesses of the 20th century, argue authors Ryan Jones and Pinar Ozcan in their industry paper, “Rise of Big Tech Platforms in Banking” (2021). Banks often enticed consumers with a free current account that would allow the banks to build a relationship through which the banks could sell additional products, a method that created economies of scale and scope for banks.

More importantly, once customers were comfortably ensconced in a banking relationship, and consumer inertia crept in, customers increasingly viewed their banks as one-stop financial shops. One report found that British current account holders would sooner leave their marriage than their bank, sticking it out with their bank for an average of 17 years, but hanging on to marriage for just 11 (Collinson, 2013). The biggest British banks were so successful at cross-selling additional products that the metric “products per customer” (PPC) became an outright bragging point; PPC for premium account holders amongst the UK’s incumbents could be as high as six.

The New Platform Model

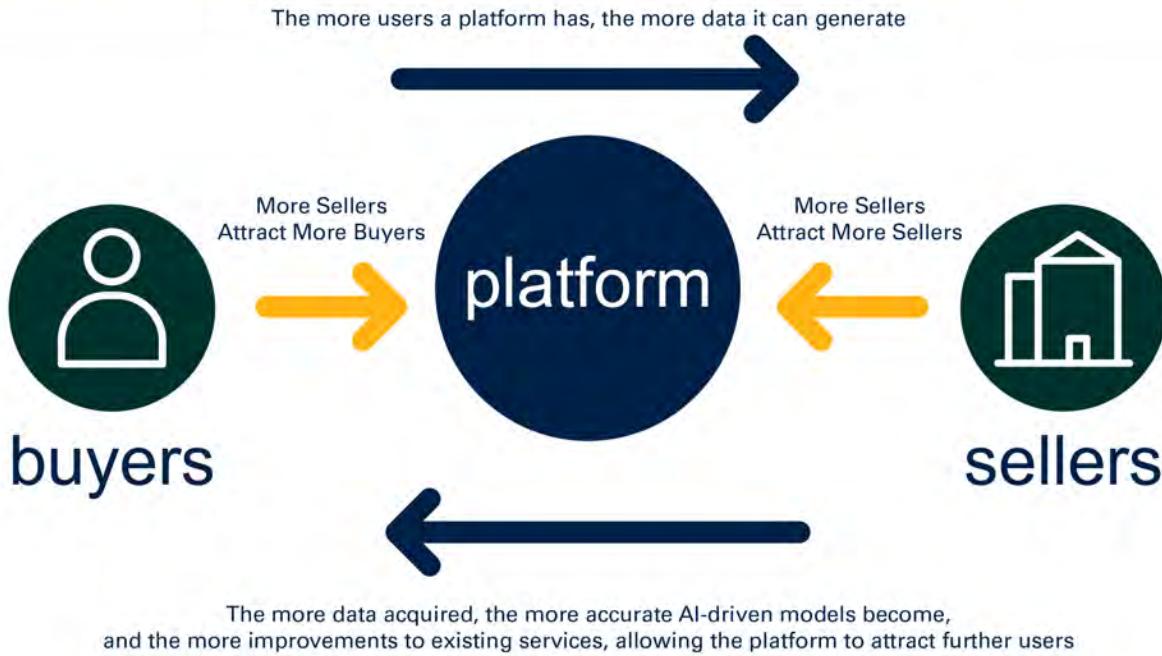
The 20th century platform, however, has been superseded by a new model, perfected for the digital age. According to Parker, Van Alstyne, and Choudary, the authors of *Platform Revolution*, the new platform is a business focused on “enabling value-creating interactions between external producers and consumers”—in simple terms, creating a two-sided online marketplace (2016).

In such a marketplace, each side continually augments the other. As a platform acquires more and more users on both sides of its marketplace, network effects begin to gather pace, quickening growth and increasing returns to scale. Every single user creates more value for the entire network. More buyers attract more sellers, and more sellers attract more buyers. The more users a platform has, the more data it can generate. The more data the platform acquires, the more accurate its AI-driven models become, and the more improvements to existing services follow, allowing the platform to attract further users.

The App Store, for example, is a platform that allows app producers to offer their apps to consumers. The more apps that the App Store has, the more users find what they want, and the more users the App Store attracts. The more users the App Store amasses, the more developers are incentivised to build apps to sell.

The revenue models of platform companies can range. As in the App Store, platforms might take a percentage cut from a sale of a product, or they may sell ads, as Meta and Google do.

Buyers and sellers benefit from each other



The Rising Success of Platform Models

These new platform models, as we have seen with Big Tech, are radically upending business, the economy and society. Successful platforms can invade and conquer a major industry sector in months, despite having none of the usual resources an older competitor might have (Parker et al., 2016). Airbnb, for example, began in 2007 with a few air mattresses on the floor of the San Francisco flat rented out by its founders. Today, Airbnb offers rooms in 220 countries and 100,000 cities, with some 5.6 million listings—without owning a single hotel, or even a room (Airbnb, 2021). At the end of 2020, when the firm listed on Nasdaq, Airbnb was valued at US \$100 billion (Hussain & Franklin, 2020). By comparison, the combined market caps of four of the largest hotel companies, Hilton, Hyatt, Wyndham and Marriott, fell short at US \$82.9 billion (Duggan, 2020).

But how do platforms amass such power in such a short period of time? *Platform Revolution* outlines several key points:

1. Platforms are in the business of creating value for both sides of the matches they facilitate. For example, Airbnb gave travellers a cheaper alternative to hotels while giving hosts an extra way to earn money. On average, an Airbnb host typically earns US \$7,900 a year (Airbnb, 2021).
2. Platforms build businesses using resources they don't own, or in some cases even control. Although Apple controversially vets apps before the apps appear on the App Store, Airbnb does not control the room being rented out. This allows these platforms to quickly scale.

3. Platforms derive value from the communities they serve and use data-based tools such as machine learning to create community feedback loops. For example, Netflix's recommendation engine uses data from its community and machine learning to help determine what viewers might want to watch next, and even what films or series to commission.

Faculty Video: Platforms and What They Have Done

In this video, Professor Pinar Ozcan describes the network effect that is one of the reasons why platforms are so successful.



What drives platforms to grow fast is what we call the network effect or network externalities. This simply means that every single member that joins that platform or that network, simply, makes it more interesting, more valuable for the rest. So for example, if there's one more Uber passenger in my area, then Uber drivers are marginally more interested in staying in my area. And the fact that another Uber driver serves my area, makes me more likely to keep using Uber because I know that when I need a car, I will get one.

There's also another very important type of network effect that digital platforms can take advantage of, which is data network effects. What this means is that as more users or providers join the platform, the more data is being generated. And that more data makes the platform smarter in terms of its algorithm. And with a smarter algorithm, the platform is able to serve the needs of the users as well as providers much better, and therefore becomes the choice of platform in the future.

4.2.3 AI-Driven Digital Operating Model

Disrupting the Financial Sector with Data

As Big Tech platforms expand into banking, a question often arises: do Google, Apple, Meta, Amazon, and Microsoft (collectively called GAFAM) actually want to be banks?

According to the industry paper “Rise of Big Tech Platforms in Banking”, industry informants are split (Jones & Ozcan, 2021). Some believe such an outcome is inevitable. Others doubt whether Big Tech players would want to saddle themselves with the onerous regulatory and capital requirements that come with being a licensed bank.

However, according to McKinsey, Big Tech doesn't need to acquire a full licence to make deep inroads that could “destroy” the financial industry’s margins (Dietz & Yasenovets, 2019). GAFAM can simply disintermediate banks by picking off areas where the data they gather and their platforms give them an advantage. The consultancy notes that Big Tech is currently advancing in areas that aren't necessarily measurable by traditional market share. Instead, their approach is to disintermediate in capital-light and digitizable areas of business closest to their existing business, using an operating model they have already perfected.

AI-Driven Digital Operating Model

What is this operating model? In *Competing in the Age of AI*, authors Marco Lansiti and Karim R. Lakhani note that AI has become the “universal engine of execution” (2020). Platforms prioritise data collection from across their network and enable analytics and AI to parse the data to inform and scale operational execution. In other words, humans may design the operating model, but computers are doing the work in real time. As Lansiti and Lakhani note, this AI-driven digital operating model allows firms “unprecedented levels of scale, scope and learning”, obliterating the limits that traditional firms face as they grow (2020).

One example is Amazon. The digital juggernaut started out by selling books, and then began expanding into more and more items. For traditional retail businesses that sell physical items, high growth can be a double-edged sword: even as high growth brings in economies of scale, traditional retailers can be constrained by an increasingly complex operating model, leading to higher operating costs and reduced service levels. Amazon’s digital operating model, however, where machines do the routine work of making and executing predictions, has allowed the company to scale rapidly into a wider scope of products, and learn how to improve.

4.2.4 Disrupting the Financial Sector with Data

Big Tech and the Financial Sector

Meanwhile, confirming McKinsey’s assertion that Big Tech platforms only need to enter financial services areas that are already close to their core business, Amazon launched Amazon Lending in the US in 2011 and in the UK in 2015. Amazon Lending provides loans to small to medium businesses selling on Amazon, using the e-commerce transaction data that Amazon collects on its sellers from the platform to underwrite the loans. In 2018, Amazon reported that it had originated US \$1 billion in loans for the year (Wack, 2018).

Platforms are also more efficient at distributing new services, which in turn collect data to inform even more products and services. Apple, for example, has moved into the consumer payments space with Apple Pay and consumer finance with Apple Card, its credit card issued by Goldman Sachs. Both Apple Pay and Apple Card can be accessed from Apple devices, including iPhones, laptops, and certain watch models. In the US, Apple earns 15 cents for every US \$100 spent from the card. By September 2020, five years after its launch, Apple Pay had been activated on 51% of all iPhones worldwide, totalling some 500 million devices (Phillips, 2020).

Compare Apple’s ability to tap into its existing network with its new financial offerings to the traditional method that card issuers often use to lure consumer sign-ups. In September 2020, as the pandemic devastated the airline industry, CNBC reported that the American carriers Delta, American and United planned to use their frequent flyer programmes—not their physical aeroplanes—as collateral for the billions in federal and private loans they were taking out to weather the crisis (Josephs & Lucas, 2020).

Why? In the convoluted world of loyalty marketing that sprang up around credit card sign-ups, banks bought airline frequent flyer points to entice consumers, giving away bundles of miles when a consumer successfully took out a credit card. Gaming credit card and airline frequent flyer points to get free flights grew from a niche hobby into an entire industry dedicated to maximising loyalty travel. Meanwhile, airlines earned more on the sales of their frequent flyer points to banks marketing credit cards than they did on actual seats on planes, making these programmes more valuable as collateral (Keiles, 2021).

Financial Services Everywhere

Big Tech companies aren't the only platforms that are using AI-driven digital operating models to encroach on banks. Big Tech and the smaller platforms have been inspired in part by the Chinese super apps WeChat and Alipay. WeChat began as a messaging app, whilst Alipay grew out of e-commerce app Alibaba. Both have leveraged the masses of user data they collect through AI to rapidly expand into financial payments, loans, investment and insurance (Yang, 2021).

Other platforms that have amassed large user networks are also moving into financial services, including the Asian ride-hailing apps Grab, Gojek and Ola. In 2019, Uber launched a new company division, Uber Money, to offer its drivers a raft of financial services, including loans, credit cards, and an Uber debit account to get real-time payments (Hazelhurst, 2019). Though the effort was "deprioritised" during the pandemic, Uber has recently restarted its efforts to make the unit operational (Hinchliffe, 2020).

Guest Video: The Predictive Power of Data and the Advantage it Gives Big Tech

In this video, Ajay Agrawal, co-author of *Prediction Machines*—the critically acclaimed Amazon best-selling book about the current and future economic impact of artificial intelligence—discusses the predictive power of data and the advantage it gives Big Tech.



Pinar Ozcan: You mentioned that banks have to increasingly compete with non-banks. Can you tell us your views about big tech coming in to finance?



Ajay Agrawal: The big technology companies are certainly creeping into financial services sectors, and banks are very worried about it. I've seen a number of bank presentations when they're talking about the future of their business where they list that as a first-order threat. Because these tech companies are learning more and more, they're the learning customer preferences, like what they want, what media they consume, what searches they conduct, things they buy.

And in some environments, like in China, for example, a company like Tencent covers all those areas in one company. In the US, in contrast, Netflix does media, and Amazon does retail, Google does search, Facebook does social, but in China, Tencent does all of those things.

And so that gives them a lot more breadth of the data that they can use for training and making predictions, for example, when someone's going to buy a house and therefore need a mortgage, or buy a car and therefore need a loan, or go to college and therefore need a student loan, or retire and all of the financial services that come along with retirement.

And so there is a lot of predictive power in these related areas of data, and big tech is certainly posing a threat to the traditional financial services industries in some of their core areas of business.

4.2.5 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Big Tech is positioned to make inroads in the financial industry without going "all in" as a bank, by advancing in areas where their data and platforms give them a strategic advantage and by circumventing banks as intermediaries.
2. Big Tech's digital model—which prioritises data collection and AI analysis, with computers doing the heavy lifting—allows these companies to reach "unprecedented levels of scale, scope and learning."
3. By staying in financial areas that are close to their core business, Big Tech platforms are able to tap into existing customer bases and brand loyalty.
4. Data begets data. As Big Tech platforms distribute new services, these services set in motion yet another way to collect data to inform even more products and services.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[How Big Tech Built the Iron Cage](#)

[Big tech threats: Making sense of the backlash against online platforms](#)

[The five best arguments that Apple's App Store is a monopoly](#)

[Beyond Fintech: A Pragmatic Assessment Of Disruptive Potential In Financial Services](#)

[Big Tech vs Big Banks: Two Giants Meet \(video\)](#)

[Platform vs. Linear: Business Models 101](#)

[The platform play: How to operate like a tech company](#)

[Every Tech Company Wants to Be a Bank—Someday. At Least](#)

[Big Tech's credit ambitions are the latest digital threat to banks](#)

[The Banking Dilemma: Do we really want Big Tech to control our financial data?](#)

4.3 Platforms and the Future of Banking

4.3.1 Reshaping the Future of Finance

Reshaping the Future of Finance

Even before Covid-19 struck, banks were under increasing pressure as Big Tech and fintechs expanded into financial services. The pandemic, however, has pushed more consumers into digital banking than ever before, causing a shift in consumer behaviour over months that, pre-pandemic, had been expected to take years (CNBC, 2020).

The pandemic has also strengthened the already powerful position of the Big Tech platforms, whose increasing foray into financial services is being fuelled by a sizable war chest that has grown exponentially during the crisis. Indeed, the “surge” in Big Tech’s profits, as reported in the first quarter of 2021, “stunned” Wall Street (Waters, 2021).

How will this reshape the future of banking? In JP Morgan’s annual shareholder letter for 2020, CEO Jamie Dimon highlighted the “extensive competition” from Big Tech and fintechs that will, in part, force banks into playing an increasingly shrinking role in the financial system (2020). “As the importance of cloud, AI and digital platforms grows, this competition will become even more formidable,” Dimon warned.

Disruption of Retail Banking

In comparison with China, Big Tech platforms in the global west are just getting started in their disruption of retail banking. Like Alibaba’s Ant Group and Tencent as well as Google, Apple, Facebook (Meta), Amazon, and Microsoft (GAFAM) could come to dominate insurance, credit provision, and banking itself—but as of yet, they’ve struggled to compete in the field of fintech.

In 2020, Google started to build promising inroads. In November of that year, CNBC reported that Google had agreed to partner with Citi and Stanford Federal Credit Union (SFCU) to launch bank accounts in 2021, with plans to add a further 11 partners in the coming months (Rooney, 2020). Google’s “Plex” checking and savings account would have no monthly fees, overdrafts or minimum balance requirements. Customers would also be able to request a physical debit card, which would run on the Mastercard network. Google’s bet seemed simple—the tech company would avoid a banking charter and rely on Citi and SFCU to handle client accounts (Cowley & Bernard, 2019).

At the time, some questioned the value of this partnership for incumbents. Though the Google-Citi partnership would connect Citi with younger, digitally-savvy consumers, CNBC’s Kate Rooney (2020) noted that it could relegate banks to a secondary role—one that provided the “plumbing” of the banking, but relinquished the direct relationship with the customer, and thereby weakened the bank’s ability to cross-sell other products.

The joint project would also allow Google to accumulate valuable client data. Potentially, the tech company could develop new products and services aimed at the same customers, leaving banks with lower-margin business. Global consultancy, BCG, warned, “There will be banks that survive in this manner, sustaining their cost of capital with a B2B model. However, the B2B market has room for only a few banks” (Erlebach et al., 2020). Or, as Dimon predicted in his annual letter, banks would play an ever smaller role in the financial sector.

Other experts, such as Ron Shevlin in Forbes (2020), argued that companies like Amazon and Google would eventually sell technology infrastructure to banks, not compete with them for clients. Without the checking and debit accounts that banks offer, he pointed out, tech companies have no product to sell. What they do offer is name-brand recognition amongst customers and advanced machine learning (ML) techniques. Partnerships benefit both sides; lesser-known credit and debit solutions gain traction with the Google brand attached, and as AI redefines the financial services market, banks could mine tech companies for out-of-house ML expertise (Shevlin, 2020).

But Google and Citi’s partnership failed to materialise. A year after announcing the joint project, the tech company updated its banking tactics, cancelling its Citi partnership and shelving its Plex checking and savings accounts (Surane & Grant, 2021). According to a Google spokesperson, the tech giant would be “updating” its approach “to focus primarily on delivering digital enablement for banks and other financial services providers, rather than us serving as the provider of these services” (Elias & Son, 2021). That decision, Surane and Grant claimed, marked Google as the “latest tech giant to dial back its ambitions for financial services” (2021).

Overall, the path for Big Tech in financial services isn’t entirely clear. Debate remains over whether GAFAM firms aspire to be the sort of banks that exist today or if they want to act as the architects of a new financial ecosystem. And either way, the question remains: should regulators, banks, and clients lend them their trust?

Financial Services Offerings By Big Tech Companies

Big Tech	Main Business	Banking %	Credit Provision	Payments	Crowdfunding	Asset Management	Insurance
Google	Internet Search/Advertising			X			
Apple	Tech/Producing Hardware		X	X			
Facebook (now Meta)	Social Media/Advertising			X			
Amazon	E-commerce/Online Retail		X	X	X		X
Alibaba (Ant Group)	E-commerce/Online Retail	X	X	X	X	X	X
Baidu (Du Xiaoman)	Internet Search/Advertising	X	X	X	X	X	X
JD.com (JD Digits)	E-commerce/Online Retail	X	X	X	X	X	X
Tencent	Tech/Gaming & Messaging	X	X	X	X	X	X
NTT Docomo	Mobile Communications	X	X	X	X		
Rakuten	E-commerce/Online Retail	X	X	X		X	X
Mercado Libre	E-commerce/Online Retail	X	X	X		X	

X Provision of financial service through big tech entity and/or in partnership with financial institutions outside big tech groups in at least one jurisdiction.
 % The core activity of an entity engaged in banking is taking deposits, though regulations vary across countries.
 Sources: BIS (2019); Citi GPS (2018); IBFED and Oliver Wyman (2020); van der Spek and Phijffer (2020); public sources; FSI.

4.3.2 Regulating Big Tech in Financial Services

Regulating Big Tech in Financial Services

Banks aren't the only ones worried about Big Tech's manoeuvres into financial services. Increasingly, these companies are drawing the ire of politicians and regulators concerned by Big Tech's power over public discourse, handling of privacy, power to distort or control market competition, and the seemingly smug nonchalance their CEOs displayed when questioned about their dominance (Massie, 2021).

In the financial services sector, incumbent banks are complaining, and financial regulators are increasingly inclined to hear out their arguments. A recent briefing from the Bank for International Settlements' (BIS') Financial Stability Institute (FSI) laid out the following four particular areas of regulatory concern as Big Tech platforms, including GAFAM, expand into finance (Crisanto et al., 2021):



Too Big to Fail

Whilst GAFAM's current financial services activities are minuscule compared to their overall business, regulators have flagged the speed at which Big Tech companies, through network effects, could quickly dominate a sector and become "systemically important", or "too big to fail".

License to Bank

Regulators require Big Tech firms to obtain and hold the "appropriate licences" that banks are required to hold to perform regulated financial activities. For example, Amazon, Facebook and Google hold payment licences in the EU, UK and US. When it comes to a current account, however, both fintechs and Big Tech firms typically favour partnerships with existing banks, as the joint venture allows them to operate without obtaining their own licence. Regulators have flagged this as potentially problematic. Firstly, as these partnerships "unbundle" banking services, which party is legally accountable for which risk or activity becomes unclear. Secondly, concern exists that if accountability becomes more "diffused", "excessive risk-taking behaviour" will occur in signing on clients and monitoring these clients' activities.

Risky Networks

Another concern as platforms disintermediate banks is that current regulations do not cover the risks caused by Big Tech's entry into finance. Financial regulations cover entities or specific activities, but not the risks created by "possible spillover effects" across all the activities that Big Tech companies perform. One of the big complications of regulating GAFAM is that no two Big Tech companies are completely alike, and what might constitute a risk on a social media platform, for example, might not apply to an e-commerce platform.

Bespoke, Cross-Border Cooperation

To effectively regulate Big Tech activities in the financial sector, regulators will need to consider a more bespoke mix of entity-based and activity-based rules to cover the increasing “interlinkages” between the services that platforms offer. Moreover, enforcement will require more cross-border cooperation as platforms offer their services across the globe.

4.3.3 Banks on the Back Foot

Banks on the Back Foot

Banks are calling on policymakers to realise that the regulations that govern banks are putting them at a disadvantage compared to Big Tech platforms in the same market activities. One example is the US’s 2010 Durbin Amendment, part of the Dodd-Frank Wall Street Reform and Consumer Protection Act, which limits the interchange fees that banks can charge merchants accepting debit cards (Kagan, 2020).

One of the original goals of the Durbin Amendment was to enable smaller entrants to compete in the market; thus, the fees that banks could collect were structured according to the size of their assets. As JP Morgan CEO Jamie Dimon noted in his 2020 shareholder letter, banks the size of JP Morgan are capped on the interchange fee they can charge merchants to process a debit card payment—currently 21 US cents plus 0.05% of the transaction value (Dimon, 2020). Banks with less than US \$10 million in assets, however, can charge fees that are sometimes 10 to 20 times higher.

Fintechs and Big Tech platforms have taken advantage of this rule by partnering with these small banks—a tactic that venture capital often upholds as savvy regulatory arbitrage. As Silicon Valley venture capitalist Andreesen Horowitz and backers of US neobank Chime noted, “By collecting an interchange fee every time you use your debit card, neobanks like Chime can achieve significant gross margins” (Acharya, 2019). In fact, the high interchange fees are one reason many European start-ups, like Monzo and Revolut, are driven to expand in the US. In an effort to lower costs for consumers and merchants, the EU’s Interchange Fee Regulation imposes a cap of 0.2% of the value of a transaction for debit cards and 0.3% for credit cards, far less than what fintechs can achieve in the US (Eddis et al., 2020).

Incumbents claim that Big Tech and larger fintechs like PayPal are exploiting the Durbin Amendment by partnering with small banks (Wack, 2021). For a customer with a small bank account who spends US \$20,000 a year on a debit card, a large bank would receive US \$120 in debit revenue, whilst a small bank or



non-bank would earn US \$240, according to Dimon. "This difference may determine whether you can even compete in certain customer segments," he said (Dimon, 2020).

How could this be fixed? The Clearing House, a non-partisan organisation in the US, urged the US Federal Reserve Board in a letter to consider the combined assets of both the bank and the tech partner, meaning that a Big Tech firm wouldn't be able to deliberately partner with a small bank to sidestep the cap (US Federal Reserve, 2020).

This chart from JP Morgan shows how a bank vs a fintech or a Big Tech company is regulated:

Bank and Nonbank Regulation Requirements	
Bank	Fintech/ Nonbank
<ol style="list-style-type: none">1. Higher capital requirements (which also require expensive debt and non-tax-deductible preferreds), even on deposits2. Operational risk capital3. Extensive liquidity requirements4. FDIC insurance (this cost JPM ~\$12B over the last 10 years- and not tax deductible beginning in 2018)5. U.K. bank levy and surcharges (this cost JPM \$3.2B over the last 10 years)6. More costly regulations (e.g. , loans, CFPB, OCC) , including resolution planning and CCAR7. Heavy restrictions around privacy and use of data8. Extensive KYC/ AML requirements (CRA)9. Substantial social requirements (CRA)10. Extensive public and regulatory reporting requirements (e.g., disclosure, compensation)11. Lower revenue opportunities (i.e., Durbin- this cost JPM ~\$17B over the last 10 years)	<ol style="list-style-type: none">1. Lower capital requirements, set by market2. No operational risk capital3. No liquidity requirements4. No FDIC insurance5. No U.K. bank levy or surcharges6. Less costly regulations7. Fewer privacy restrictions, virtually no data restrictions8. Less extensive KYC/ AML requirements9. No social requirements (CRA)10. Limited public and regulatory reporting requirements11. Higher debit card income

FDIC = Federal Deposit Insurance Corporation

CFPB = Consumer Financial Protection Bureau

OCC = Office of the Comptroller of the Currency

CCAR = Comprehensive Capital Analysis and Review

KYC = Know your customer

AML = Anti-money laundering

CRA = Community Reinvestment Act

4.3.4 Open Banking: Disruption Through Data

Open Banking: Disruption Through Data

Another area of regulatory concern for incumbents as Big Tech continues its rise is open banking and the question of data reciprocity. European and UK bankers have long fretted that open banking rules force them to share their data with their Big Tech rivals, without getting reciprocal access to the data that these platforms hold on the banks' users. As AI increasingly enables organisations to parse through larger and more diverse data sets, banks argue that GAFAM can use both the open data that banks must supply in real time, in a standardised format, and at zero cost to third parties, as well as their own rich data sets to better understand their customers, giving GAFAM an edge in areas like credit scoring. In 2018, as Payments Services Directive 2 (PSD2) rules took effect across Europe, Francisco González, executive chairman of Spain's BBVA, predicted, "There will be a wild west with a few platforms dominating the world. I think regulators need to wake up" (Arnold, 2018).

Banks may get their wish. As public and political opinion on the power of Big Tech begins to shift, regulators are questioning if current rules are robust enough to ensure a level playing field, with much of the focus once again on control and access to data. In 2020, the European Commission proposed that dominant tech firms including Amazon and Google should have to open up their data, not just to banks, but to any third party who wanted it (Espinoza et al., 2020). In the US, a House of Representatives subcommittee report in late 2020 recommended that Congress consider data interoperability and portability to open up competition in Big Tech platforms, which could potentially allow consumers to share their data to banks in an open banking type scenario (Nadler, 2020). Currently, however, no such reciprocity or open access to Big Tech's data exists, and incumbents can only hope that proposals and rules develop soon.

4.3.5 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. The pandemic has led consumers to move to digital banking more quickly than expected pre-pandemic, and has strengthened Big Tech's position by increasing their overall profits.
2. As Big Tech and fintech continue to grow, banks will play an ever-diminishing role in financial services, likely moving to a B2B model as Big Tech develops new products and services aimed at customers.
3. Compared to China's mega-fintechs, Big Tech in the global west is just beginning to disrupt retail banking and has a lot of room for growth.

4. Big Tech is drawing the ire of politicians and regulators concerned by GAFA's power over public discourse, handling of privacy, power to distort or control market competition, and seemingly smug nonchalance when questioned about their dominance.
5. Banks argue that regulations currently put them at a disadvantage compared to Big Tech, with GAFA exploiting regulatory loopholes by partnering with smaller banks to be able to charge higher interchange fees.
6. In Europe and the UK, banks must share data openly. Big Tech companies are not required to do that. Big Tech thus has a significant advantage in that they are able to utilise a robust dataset and their AI expertise whilst not reciprocally sharing any data or learnings. The US and Europe have proposed regulations to open up data sharing, but no such access currently exists.

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To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[A European Strategy for Data](#)

[Investigation of Competition in Digital Markets](#)

[The Platformization of Banking](#)

[Are Banks Destined To Become The Next “Dumb Pipes”?](#)

[Facebook relaunches WhatsApp money transfers in Brazil](#)

[The value and challenges of regulating Big Tech](#)

[How to Regulate Big Tech](#)

[So the EC gives open banking to bigtech via PSD-2 and Apple closes its doors to banks in return?](#)

[Open banking – the quest for a level playing field](#)

[Facebook slaps down Admiral’s plan to use social media posts to price car insurance premiums](#)

4.4 Preparing for Disruption

4.4.1 Preparing for Platform Disruption

Faculty Video: Preparing for Disruption from Platforms

In this video, Professor Martin Schmalz introduces how a business should respond to disruption from platforms and the challenges that may come with responding.



So what should businesses be thinking about as they face a possible threat of disruption by tech platforms in their traditional domains? Well, from an economic standpoint, what is happening is that a low cost competitor comes in. And not only do they, on average, have lower costs, but a very different cost structure. If you have a competitor that manages to make loan underwriting decisions, for example, without the use of humans, their business model just scales much better than yours, in case you employ humans for the same business processes.

So the question is, how do you respond to that? One is, of course, to try and copy the cheap processes. In some cases, this will be impossible. In some cases, you might be in a better position to do so because you sit on a wealth of data the other company does not have, such as lots of payment data that the tech companies are just starting to acquire.

In other cases, you might see that you're at a disadvantage, either because you don't have the capabilities in-house in terms of technical know-how, or you don't have the culture. Or there are other impediments inside the company that prevent you from copying the low cost product.

In that case, cooperation with the challengers might be an option as well. Perhaps you have some data that can be useful to make predictions. They have other data and technical capabilities and human resources to pull it off. So oftentimes, it just boils down to analysing your competitive advantages and disadvantages vis-a-vis the tech companies, and not only that, but also to realise what the synergies might be from a possible cooperation.

Preparing for Platform Disruption

Incumbents facing down the threat of Big Tech seem to be headed toward a “Titanic moment”, the point where averting disaster is impossible and lifeboats are scarce. JP Morgan CEO Jamie Dimon has confessed to being “scared s***less” of fintechs and Big Tech (Son, 2021), whilst Citibank analyst Ronit Ghose has, for several years, been exhorting the industry to “react and evolve” so as not to “get wiped out by an extinction event such as digital disruption” (Finextra, 2018).

Global management consultancy BCG also warns that banks have no time to lose, saying that they “must start acting more like digital giants before digital giants—including Amazon, Facebook,

and Google—start acting like banks” (Erlebach et al., 2020). Banks need to go beyond incremental changes and overhaul their core processes to start offering the type of consumer-focussed, digital services that Big Tech companies have perfected. As Ghose acknowledged, Big Tech and fintech platforms are “doing what banks struggle to do: operate across multiple products and have a laser-like focus on the client” (Finextra, 2018).

Further, say Erlebach et al. of BCG, banks need to concentrate on two “big plays”: reconceiving how banks operate, and extending their business model beyond banking. Much like Competing in the Age of AI by authors Marco Lansiti and Karim R. Lakhani, BCG urges banks to rethink core operations to harness data, analytics and AI and embed them “as organizing principles” across technology, operations, and customer service. This will allow banks to industrialise the use of AI into their operating model, and start taking out the human bottleneck that will enable what Lansiti and Lakhani call “digital scale, scope and learning”, or the flywheel that allows Big Tech platforms to achieve their rapid dominance in new sectors (Lansiti & Lakhani, 2020, p. 4).

Overhauling or reconceiving operations to enable banks to act more like Big Tech hinges on three key elements:

- 1. AI and Insight:** Because banks are driven by information, BCG notes that AI is widely applicable to large parts of the existing business, including customer service, credit risk analysis and loan decisions, and compliance and operational risk. Banks need to start now to find existing processes where human decision-making can be replaced by AI-driven prediction machines
- 2. People and Organisations:** The introduction of AI will affect current employees. It will shrink headcount in operations, but will also create new roles. Banks will need to either hire for those new roles or upskill existing workers. They will need to consider how employees are augmented by AI, and put in place extensive retraining in processes and culture.
- 3. IT and Technology:** Finally, banks will need to become AI-driven platforms themselves, which will allow them to introduce new products or use cases incrementally, just as Big Tech does. This platform will enable “AI at scale” whilst liberating data and modernising a bank’s “legacy core”.

4.4.2 Focusing on the Customer

Focusing on the Customer

Once banks have moved toward a platform model, Erlebach et al. continue, they will need to focus on the customer, “serving [them] in ways that the financial world has barely begun to envision.” As they note, Big Tech and fintechs are expert at providing cheaper, faster, more user-friendly digital services, and will no doubt do so in financial services with products like current accounts or loans. If banks don’t want their direct relationships with customers to turn into B2B relationships, they will need to build their own fintech or Big Tech-style financial services: what Erlebach et al. call “their premium margin capabilities”. Banks will need to recapture their trusted position as a financial advisor to a customer, rather than just a place to park money. The bank might do this “with financial tips, advice or offers tailored to a client’s interests and needs” (2020).

This guidance dovetails with the growing vision that regulators are imagining beyond open banking. In the UK, for example, the Competition and Markets Authority (CMA) is exploring “open finance”, which will bring the open banking ethos to a broader set of financial services and sectors—including wealth management and mortgages, for example. The goal is to give consumers an even better, more holistic view of their financial lives, and to enable consumers to authorise third parties—be it other incumbent banks or Big Tech platforms—to access their data in return for better financial services (Financial Conduct Authority, 2021). For banks, however, to stay relevant, they will need to be as fleet as their Big Tech rivals at delivering the services that their customers want beyond core banking.

4.4.3 Analysing Strategic Options and Tactics Against Challenger Banks

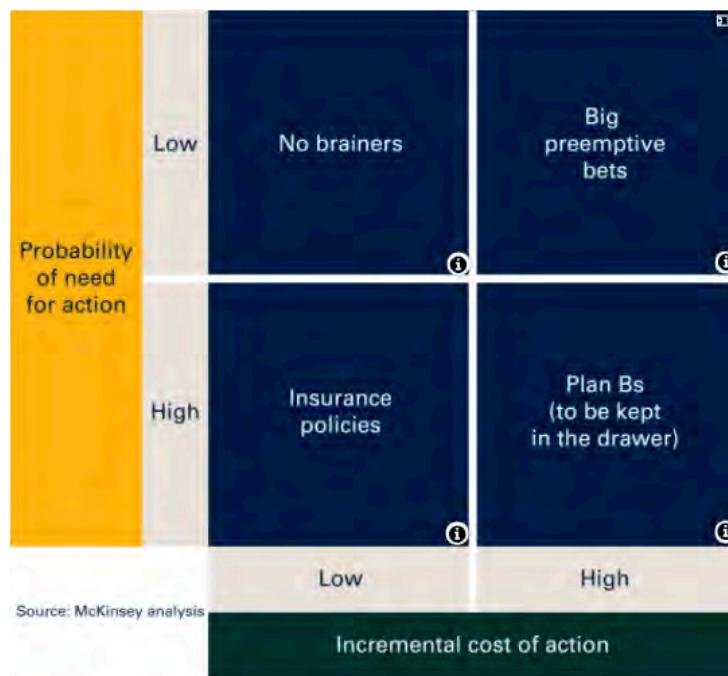
Quick Fact

JP Morgan allocated US \$11.5 billion to its tech spend in 2020, making it the biggest spending bank (Butcher, 2020). This budget, however, is less than half of Amazon’s annual tech spend of US \$28.8 billion.

Analysing Strategic Option and Tactics Against Challenger Banks

As fintechs and Big Tech have moved into financial services, banks have responded in several ways, from allocating ever-increasing budgets to their tech spend, to acquiring promising start ups, to partnering with fintechs or Big Tech.

McKinsey examined each strategic option and tactic, then ranked these into a need/cost matrix, from low-cost “no brainer” tactics to future, high-cost “plan Bs” (Dietz & Yasenovets, 2019):



No Brainers

These are actions that the global consultancy deems are necessary, and come with low incremental costs. Guidance includes conducting “black hat” strategy exercises to figure out what a challenger would do, closely monitoring the market for potential start-up threats, and tracking any partnerships that competitors are pursuing. McKinsey also recommends that banks should “engage” with regulators early on to have wider input into new rules. Meanwhile, banks should carry on with digitising their processes and customer loyalty programmes.

Big Preemptive Bets

These are the most important of the “higher-cost” actions, with success not guaranteed. They include focussing on the local payments space and building better services for merchants, such as biometrics. The end goal is to secure more unique and valuable customer data that the banks can then use to inform other products. The other “big bet” would be for banks to build out their own ecosystem of services.

Insurance Policies

These actions have “relatively low” costs and are potential ways to “future-proof” the business. McKinsey recommends “raising barriers”—that is, diversifying into more product offerings and bundling the products to meet a broader set of customer needs. To do this, banks should experiment with new technology or with “pre-emptive partnerships”. In particular, this strategy might include teaming up with e-commerce partners to create embedded payment or loan services. Banks should continue to work with regulators, whom McKinsey notes are invested in maintaining a “healthy, profitable banking sector”.

Plan Bs

McKinsey calls the actions that fall under Plan B the “nuclear scenarios”, warning that they are only to be used as “last resorts”. One such option would be to temporarily cut margins so thin that a challenger would hesitate to compete head-on, whilst simultaneously offering customers generous incentives not to switch. This tactic would be better suited against a fintech, rather than a deep-pocketed Big Tech platform who would most likely win in this type of challenge.

Other “nuclear” Plan B options include partnering with tech entrants to become their “back office of choice”, or the “plumbing” that powers the fintechs’ consumer-facing services. Another last resort would be to build a separate but adjacent digital bank that would give consumers a similar experience to tech challengers. This would risk “cannibalising” the main business, but it would defend overall market share.

Size Matters

Of course, strategy doesn't always fit into a perfect need/cost matrix. While Covid-19 has pushed more consumers into online banking and highlighted the need for banks to improve their customers' digital access, the pandemic has also hit bank earnings hard, and as S&P Global reported, has hurt their appetite and ability to make acquisitions. Medium and smaller banks are especially "constrained" in their capacity to build or even buy their way to a more defensible market position (Furber, 2021).

In fact, McKinsey notes that size matters when it comes to mounting a defence against Big Tech and fintechs. Larger banks that have sizeable market shares will be able to invest in the tech that will be required to compete. JP Morgan, the biggest-spending bank globally, budgeted US \$11.5 billion to its tech allocation in 2020 (Butcher, 2020)—though this figure is less than half of Amazon's US \$28.8 billion tech budget. Meanwhile Alphabet, Google's parent company, earmarked US \$21.4 billion. Medium banks have "some options": either building a niche offering, or partnering with Big Tech (Dietz & Yasenovets, 2019). For smaller banks, however, McKinsey admits, "in the longer run their prospects are grim" and, from a shareholder point of view, "divesting such an asset" might be the right strategy.

4.4.4 Fintech Frenemies

Fintech Frenemies

Though some banks have struck alliances with large fintechs and Big Tech challengers, such partnerships are fraught with anxiety. Banks are in the uneasy position of both competing with and yet enabling the very entities that may end up usurping their relationship with the consumer, leaving them to play the role of the utility, or the dreaded "dumb pipe". JP Morgan recently partnered with Robinhood, the free online broker, to process the transactions for Robinhood's cash management accounts (Son, 2021). JP Morgan, however, has its own trading app, Self-Directed (formerly You Invest), that was built directly to compete with Robinhood—and that did not fare well in a Business Insider comparison of the two (Rapier, 2018).

Other partnerships are similarly strained. When Google announced that it had partnered with Citi to provide the processing behind the tech giant's new "Plex" current accounts, industry players questioned Citi's wisdom. Bloomberg columnist Brian Chappatta described Citi's role as "puzzling" and a "willing participant in Silicon Valley's invasion of Wall Street's turf" (2020). This wasn't just "enabling" a fintech, but potentially giving Google the valuable data it needed to start building a better banking service. Citi, for its part, has expressed interest in the quick scaling abilities and in the younger digital natives that Plex is expected to deliver.

In a company blog post introducing Plex, Caesar Sengupta, Google's General Manager & VP of Payments and the Next Billion Users initiative, promised that the tech giant would not share an individual consumer's data with "the rest of Google for targeting ads" (2020). He made no promises, however, about where else in the company the data might be used. Sengupta also wrote that by sharing transaction data with the app, consumers would get a more "personalised" experience—but did not add that Google, would have access to richer transaction data that would allow it to potentially launch another financial product, setting off yet another AI-enabled flywheel of data collection and product scaling.

4.4.5 Key Takeaways, References, and Optional Resources

Let's review the key points of this section:

1. To compete with Big Tech, banks need to take a leaf from Big Tech's playbook, leveraging technology to make themselves more efficient and more nimble to better serve their customers' needs.
2. Banks need to re-envision their offerings to make them as user-friendly as Big Tech services, positioning themselves as a trusted value-add versus just a place to keep money.
3. Incumbent banks who do not make changes could be pigeon-holed as B2B providers rather than maintaining direct relationships with their customers, drastically decreasing their potential profits.
4. Banks can defend themselves against the threat of Big Tech and fintech in a variety of ways, ranging from low-cost initiatives to bigger bets.
5. Medium and smaller banks are particularly constrained in their abilities to compete in the digital banking world.
6. Partnerships between banks and Big Tech or fintech are fraught, and have resulted in banks partnering with companies with which they are also in active competition.

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To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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4.4.3 Analysing Strategic Options and Tactics Against Challenger Banks

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[Banks or fintechs: who will be shaping the future of the financial industry?](#)

[Financial services technology 2020 and beyond: Embracing disruption](#)

[Former Barclays CEO's fintech venture raises \\$187 million with backing from BlackRock and JPMorgan](#)

[Big tech rather than banks to drive fintech M&A in 2021, with payments key](#)

[A Year in Fintech: 2021 Mergers and Acquisitions](#)

[The role of fintech partnerships in bank growth](#)

[FinTech, BigTech, and the Future of Banks](#)

4.5 Case Study: The Rise of China's Financial Super Apps

4.5.1 Case Study: The Rise of China's Financial Super Apps

Case Study: The Rise of China's Financial Super Apps

In October 2020, 48 hours before Ant Group, the financial subsidiary of China's tech behemoth Alibaba, was to jointly list on the Hong Kong and Shanghai stock exchanges, the Chinese government abruptly cancelled the initial public offering (Economist, 2020a). It was a dramatic end to the mega IPO expected to raise US \$37 billion, a figure that would surpass Saudi Aramco's debut as the world's biggest IPO, and, as the Economist wrote, would also serve "as a symbol of the world's transition from a century in which oil was the most valuable resource to an era that prizes data" (Economist, 2020b).

Instead, the quashed IPO is being seen as a watershed moment for China's own Big Tech sector, one that could potentially force a change in the highly successful business models of the leading platforms and diminish their thus far stunning profits. Just as the US and European governments are grappling with how to deal with Google, Amazon, Facebook (Meta), Apple and Microsoft (GAFAM), the Chinese government, after years of a largely "hands off" approach, is now stepping in to take firmer control of its own tech giants, which have amassed a concentration of wealth, power and consumer data that exceeds even GAFAM.

Meet the "Supers"

China's Big Tech platforms have long awed start-up entrepreneurs around the world for the sheer speed in which they scaled and came to dominate their target markets. The country's tech giants are Baidu, a search engine; Alibaba, an e-commerce platform; and Tencent, a messaging service, together often referred to by the acronym BAT. Of these, Alibaba and Tencent have as subsidiaries Ant Group (formerly Alipay) and WeChat Pay—a duopoly that together processes 90% of all Chinese mobile payments (Economist, 2021). These payment capabilities have proved a crucial gateway, giving the companies the valuable data they need to expand into other services.

Smaller platform rivals, including e-commerce firm JD.com, food delivery app Meituan, and wealth management platform Lufax, have all moved to offer their own payment services (Economist, 2020b). Along with Ant and WeChat Pay, these platforms are often referred to as "super apps," where multiple, seemingly disparate services are offered up to users, multiplying their already considerable network effects. For example, without leaving the app, WeChat users can do everything from sending messages and paying for offline goods to ordering food, booking taxis, and taking out loans.

The super apps' growth has been dramatic. Ant Group started in 2004 as Alipay, Alibaba's online payment service, and used AI-driven techniques to rapidly expand into mobile payments, loans, money market savings, and wealth management. In 2014, Ant began offering loans to consumers through its Huabei service, which operated much like a virtual credit card, determining the creditworthiness of its users through the payments data it already held. Ant later began offering larger loans through its Jiebei service, as well as loans aimed at small businesses.

Ironically, Ant's real growth came after the Chinese government, fearing a securitisation crisis similar to the one preceding the 2008 global financial crisis, ruled that originators of loans had to hold capital, much like banks. This, however, would bite into Ant's margins. Ant began to allow other third-party companies to sell through the Ant platform, taking a small cut of each transaction, and building an even deeper, more wide-ranging network of services. In 2015, Ant launched a wealth management platform inside the app, encouraging users to add as little as 1 renminbi (US \$0.15 or £0.11) into their account. Five years later, Invesco Great Wall Fund Management CEO Li Li told the *Economist* that it had grown on Ant faster than on any other platform. Its two money market funds rocketed from ¥665 million (US \$103 million) in assets under management in early 2018 to ¥114 billion (US \$18.5 billion) in June 2019 (Economist, 2020b).

Super Powers Sapped?

Many interpreted the government's halting of Ant Group's IPO as a way to punish Alibaba's outspoken former CEO, Jack Ma. A month before Ant planned to list, Ma, speaking at a banking conference in Shanghai, roundly criticised Chinese regulators as being too focused on minimising risk and accused the country's banks of having a "pawnshop" mentality (Zhai et al., 2020).

Chinese regulators, however, said that the action was part of a larger move to get the country's large tech platforms to adhere more closely to the rules. According to a statement from the People's Bank of China, "some financial services were running without licenses, and there are serious rule violations in areas such as regulatory arbitrage, unfair competition and damaging consumers' interests" (Reuters, 2020). Meanwhile, regulators launched an investigation into Alibaba over "suspected monopolistic practices" and handed it a US \$2.8 billion fine for "abuse of market dominance" (Guardian, 2021).

Thirteen of China's other big platforms, including Tencent, Bytedance, Baidu's Du Xiaoman, and JD.com, were also put on watch. Regulators have commanded them to draft "business rectification" plans that address "improper links between their payment tools and other financial products, break monopolies in holding data, and prevent risks in internet mutual aid businesses" (Reuters, 2021).

A Super Battle for Data

Alibaba's US \$2.8 billion fine is not expected to do much damage to the firm, which in 2020 earned US \$24 billion in net profit alone (McMorrow & Yang, 2021). What could hurt Alibaba, and the country's other super apps, is the Chinese government's growing interest in the massive reams of data that the platforms hold on their users. The People's Bank of China has long wanted to create a pool of credit data that state-run banks could use to assess consumers' creditworthiness, but the platforms have resisted the move (Yu, 2021). In some ways, Beijing is grappling with its own "open banking" challenges, but the tech platforms instead of the banks hold the valuable data.

Moreover, in an ever-expanding digital economy, Beijing sees data as the fuel that could extend its power beyond its own borders. In 2020, the Chinese government officially added data as a new type of "production factor" that would "boost the development of the digital economy" (Shijia & Jia, 2020). Bloomberg reports that China has been "pouring money" into digital infrastructure, including building

new data centres and upgrading data usage laws, all to better position China in transforming not just its own digital economy, but the world's (Bloomberg, 2021). The Chinese government has also floated the idea of setting up a state-backed joint venture that would oversee the data that the platforms collect from their hundreds of millions of customers (Chen, 2021).

Despite these efforts, the Chinese government has struggled to get the platforms to give up their data; Ant Group has reportedly handed over a “fraction” of what Beijing has demanded (Yu, 2021). Some Chinese critics of the platforms have called for “nationalising” or seizing the data outright: Xiamen University professor Zhao Yanqing argued that because China had originally blocked Google and Facebook from entering the country’s market, companies like Alibaba and Tencent received benefits that should now be shared with all of society. Such a drastic move, however, might harm innovation, and for now, Beijing has chosen not to do this.

What will happen to the data going forward? Even in China, data privacy matters. In 2020, the Chinese government published a draft version of its Personal Information Protection Law (PIPL), a set of rules around data collection and protection. The rules could help the government rein in the power of the big platforms, but as CNBC notes, whether these same rules will also apply to any state-backed venture is unclear (Kharpal, 2021).

Case Analysis

Having explored this case, consider the following questions:

- How does the speed of scale impact regulatory decisions, and vice versa? Do you think these companies would have been able to scale this rapidly with regulations in place?
- What are the most common arguments for regulatory practices? And against?
- What impact could open data have on China’s Big Tech?
 - What are the advantages and disadvantages for consumers?
 - Who benefits from open data?

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To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[China orders fintech firms to stick to the rules as clampdown widens](#)

[Webinar: Ant Financial: Unpacking The \\$150B Fintech Giant](#)

[From imitation to innovation: How China became a tech superpower](#)



Module 5: Legal and Ethical Constraints

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford Artificial Intelligence in Fintech and Open Banking

Module 5: Legal and Ethical Constraints



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5.1 About Module 5

5.1.1 Module 5 Overview

Overview

Welcome to Module 5 of the AI in Fintech and Open Banking Programme!

In Modules 1 and 3, you learnt about the importance of numerous data points and about the shift in power that AI, driven by data centralisation, has fuelled in the finance industry. In Module 4, we were introduced to the platform business model, and how the Big Tech platforms are disrupting the financial sector with data. This week, we will examine the legal and ethical issues within data-driven business models, such as discrimination and privacy. We will discuss what particular issues of discrimination and privacy affect the finance sector in terms of using data, and what regulations around the globe are in place to combat such issues. The discussion will culminate in an evaluation of what businesses can do to combat such issues, and how you can apply this within your own organisations. We will also consider the issue of competition, and the importance of fair competition between Big Tech companies discussed in Module 4, incumbents, and new entrants.

Faculty Video: Legal and Ethical Constraints

In the following video, Professor Martin Schmalz shares what to expect this week.



Welcome to Module 5, legal and ethical constraints. In this Module, we'll take a look at the many complex legal and ethical issues that surround the use of data and AI. Big data brings us all kinds of business opportunities, but it also presents a whole host of legal and ethical challenges that employees, managers, and executives need to understand. Issues around discrimination, privacy, and competition, for example.

So, how can we avoid discriminating unintentionally against protected characteristics like race and gender? What are some of the current legal challenges surrounding data privacy, and how are they dealt with in different jurisdictions around the world? We'll spend some time comparing the ethics of competition between small and large companies, and we'll talk about why it's so important for organisations to set clear guidelines for data availability and data governance.

This week, you'll participate in a team case study activity and you will also complete a team exercise for your Capstone project to help you build a strategy around dealing with legal and ethical issues when implementing your AI business solution. We hope you enjoy module 5.

Section Objectives

By the end of this module you will be able to:

- Describe why it is important for organisations to establish and uphold clear guidelines around using data.
- Identify discrimination and privacy issues in data usage.
- Recommend ways to avoid discrimination and privacy issues in data usage.
- Outline the importance of fair competition and how legislation can be built to address issues of competition with Big Tech's presence.

Graded Assignments

You will complete individual and group assignments, which count towards your completion of the programme. This week, you will:

- Meet with your group to weigh and determine how you will handle legal and ethical issues regarding discrimination and privacy for the AI solution that you chose in previous exercises.
- Complete a quiz on the module's content and key takeaways.
- Reflect on what you have learnt this week by applying it to your personal or professional experiences.

You must submit all graded assignments in Module 5 by **19 July, 2022, 23:59 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

Additional Activities

As in each module, we will present additional content related to the core learning. This week, we:

- Complete an individual exercise illustrating the dilemma an organisation faces in crafting a loan strategy, and in which you must choose between creating an advantage in one group and a disadvantage in another group.

Time Commitment

Plan to spend seven to ten hours on Module 5 this week. As there is a lot of reading material, and many videos, you might want to divide up your work into several sessions. The module is broken up into sections by theme, giving you potential break points.

Make sure you plan time to meet with your group, and to complete the assignments.

5.1.2 Introduction to Legal Issues

Legal Issues

Legislation is never static, and as the use of AI increases, regulations surrounding data and machine learning will develop quickly over the next five to ten years. It is imperative that executives, entrepreneurs, and institutions employing data-driven business models understand developments in the jurisdictions in which they employ their data—especially within the laws of discrimination, privacy, and competition.

Algorithmic decision-making processes might lead to more objective and potentially fairer decisions than those made by humans; however, AI has its own potential to enhance discrimination, information and power asymmetry (Lepri et al., 2018). To future-proof the application of AI and machine learning, and to safeguard both consumers and businesses, clear legal agreements need to be in place around fairness, accountability, and transparency.

In medical sciences, both patients and practitioners are protected by binding agreements pertaining to non-discrimination, privacy, and consent. As the use of AI technology immeasurably scales within banking and finance, similar legislation is likely to develop.

Legislative changes often occur at a pace slower than that of technological advances. Further, delays can occur due to a disconnect between the legislative bodies who enact laws, and the regulatory agencies tasked with deciding how those laws will be enforced. Yet, as we will see in section 5.5, relatively fast legal and regulatory changes in China show how quickly the landscape around the world can change, and the importance of keeping up.

Faculty Video: Introduction to Legal Issues in AI

In this video, Professor Martin Schmalz introduces some of the legal issues in AI.



There are many legal issues to consider when employing data-driven business models. One area of the law managers should be aware of is discrimination laws, another is privacy laws, a third is competition law, and of course, there's many more. But for the purposes of this class, we'll focus on these three.

So as you'll learn as we move forward, the field of discrimination is an entire area of law that applies also to data-driven business models. So for example, you have to make sure that the data you use to train your models has similar characteristics as those areas to which it applies. You cannot use data from one jurisdiction and apply it in another, or you might easily run in a foul unintentionally of discriminating against parts of the population along a dimension that is protected in that particular jurisdiction.

So the best way to deal with that is, of course, to have a lawyer on board that is both trained in discrimination law and understands how data-driven business models and machine learning work. And of course those are

scarce and far in between. So another high level point you should be aware of is that the legislation is not a static concept, it changes all the time.

In particular, existing discrimination law has been applied to statistical discrimination with machine learning algorithms only in a limited number of circumstances. But I can guarantee to you that this area of the law will develop very fast over the next five or 10 years as more and more cases are developed and more precedents are established.

There are just so many cases that have not been decided yet. For example, what happens if a company used the photos you posted on social media in order to inform say insurance underwriting decisions, or employment decisions, or loan underwriting decisions, fraud detection decisions and so forth?

Perhaps the machine learning algorithm implicitly uses skin colour, maybe not of you but of your friends that are in these photos you posted on social media. Now, is that the same as discriminating based on race, or is it what is known as proxy discrimination? Those are some of the issues that have to be decided going forward, and that decision makers need to be aware of.

And this is true, in particular, but not only in common law jurisdictions where precedent is important. The law also develops elsewhere. For example, let's go back to China. Ant Financial was planning the largest IPO in history in the fall of 2020. But with just weeks before, the government not just imposed roadblocks on the IPO, but on the entire business model, not only of Ant Financial, but of the entire industry. They put limitations on to which extent price discrimination was going to be legal and the use of data was going to be legal in the Chinese tech space.

So what that example illustrates is that the legal constraints develop in sometimes very surprising and unexpectedly fast ways, and as a result, decision makers need to be aware how the law and legal constraints develop in the various jurisdictions in which they intend to employ their business models.

5.1.3 Introduction to Ethical Issues

Ethical Issues

Whilst laws are binding rules that govern what actions are legal within a given jurisdiction, ethics are a set of socially accepted moral values by which humans are meant—but not legally bound—to live, and by which organisations are meant to conduct business. Data ethics, for example, is the system of moral principles that govern the responsible collection and use of data, as well as the actions of the individuals, groups or machines that apply these principles (Starita, 2020).

Many challenges in the deployment or use of AI and machine learning, whilst legal, might run counter to common societal values and raise specific ethical concerns. Lack of transparency, privacy infringements, Big Tech competition laws, embedded bias, governance and accountability, and algorithmic discrimination toward portions of the population could all be roadblocks in the journey ahead.

When it comes to big data, society views the employment of certain collection and use techniques as clearly illegal or unethical. Equally problematic, however, is a lack of visibility: over how consumers' data is used, how algorithms arrive at their conclusions, and whether these conclusions are distorted by undetected biases embedded in training data. If data sets are not neutral, real world biases and prejudices can be reinforced online, and might have huge consequences at scale.

Organisational Responsibility

Organisations need to establish and uphold clear guidelines for data availability and governance beyond current regulations to increase or ensure customer trust, and need to be proactively compliant with evolving regulations. In this module, we will explore the legal landscape to help ensure you are addressing any legal issues with your AI projects. We will also examine ethical considerations regarding discrimination and privacy, and provide guidance on how to address these within your organisation when implementing AI technology.

Guest Video: AI & Ethics

In this video, Ajay Bhalla, President of Cyber & Security Solutions at Mastercard, outlines the conversations around ethics in AI and the direction in which the discussion is headed.



AI and ethics is a very interesting question, which comes up almost every day. And there are various schools of thoughts.

There is a school of thought which believes that government should put guidelines, put rules, put everything really tightly locked.

There is another school of thought, which believes that if that happens, it will stifle the progress in the development and innovation in the AI space.

I am in the middle. I believe that the governments can play a big role by putting guidelines in place, but in a way that it does not stifle innovation, because I do believe that organisations have to actually ultimately own it. It's a very new space. There is a lot ahead of us. And it will be premature if we put very, very tight guidelines on what organisations can do and what they cannot do.

On the other hand, if organisations voluntarily embrace that, they want to follow principles, they want to have a governance framework, they want to keep ethics in mind very, very clearly and policies in place for ethics, I think we will see a good balanced development of artificial intelligence in the future.

Ultimately, we all realise that it's important for society to develop. It's very, very important that there is a balance to development of society. And AI can play a major role if AI is done securely, transparently and fairly. And that's what organisations have to do, make sure that these algorithms actually help in the balanced development of society.

5.1.4 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Legislation is never static, and as the use of AI increases, regulations surrounding data and machine learning will develop quickly over the next five to ten years.
2. It is imperative that executives, entrepreneurs, and institutions employing data-driven business models understand developments in the jurisdictions in which they employ their data—especially within the laws of discrimination, privacy, and competition.
3. Data ethics, for example, is the system of moral principles that govern the responsible collection and use of data, as well as the actions of the individuals, groups or machines that apply these principles.
4. Many challenges in the deployment or use of AI and machine learning, whilst legal, might run counter to common societal values and raise specific ethical concerns.

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Optional Resources

[The UK Government's Centre for Data Ethics and Innovation](#)

[The European Union's AI Alliance Platform](#)

[The UK Information Commissioner's Office](#)

5.2 Discrimination in AI Systems

5.2.1 Introduction to Discrimination

Section Objectives

In this section, we will define what discrimination means in the context of AI technology analysing data and what particular discrimination issues apply to the finance sector. We will then discuss how different jurisdictions handle these issues legally, and how even legal ways to combat these issues may overlook ethical issues. And finally, as managers and executives, we will discuss how organisations can address these issues of discrimination when implementing AI technology.

Introduction to Discrimination

Humans naturally classify information and things in a variety of ways, including colours, objects, or tastes, using the complex learnings that have formed our understanding of the world. Such classifications help humans to differentiate. Machine learning systems that are similarly able to classify data can help organisations build an accurate understanding of consumers and determine the best ways to serve them. Banking and finance can use data statistics to determine which customers might want a certain product, how likely they are to use it, and even who might be willing to pay more for it.

Matching prices to segments of a consumer audience can be advantageous to both businesses and users, promoting flexibility, lowering prices and increasing sales volumes. Similar measures were already possible over a decade and a half ago: in 2006, Jeff Bezos said, “With fair accuracy, we can predict that a price reduction of a certain percentage will result in an increase in units sold of a certain percentage” (Bram & Schmalz, 2019).

Classification helps humans form decisions; however, if the information that helps form these classifications is skewed with underlying bias



or inaccuracies, prejudicial treatment can result. This can lead to harmful and unjust treatment of different people, especially on the grounds of race, age, sex, or disability. Whilst machine learning has the potential to reduce human bias, businesses, banks, and organisations remain legally obligated to ensure decision-making algorithms are informed by only certain data, and do not discriminate based on protected characteristics.

Protected characteristics are specific aspects of a person's identity that are legally protected from discrimination. Whilst laws around protected characteristics can vary between different jurisdictions, the UK and US have created complex legal frameworks to protect consumers and employees from intentional and harmful disparate treatment. The Equality Act of 2010 in the United Kingdom and federal law in the United States prohibit discrimination based on the protected characteristics companies may identify from personal data, including:

- Age
- Disability
- Gender reassignment
- Marriage and civil partnership
- Pregnancy and maternity
- Race - including colour, nationality, and ethnic or national origin
- Religion and beliefs
- Sex
- Sexual orientation

Businesses are subject to legal penalties if they intentionally use protected characteristics to form decisions on employment, credit and loans, insurance underwriting, or memberships and subscriptions. Laws are in place to ensure that consumers understand why they are denied access to services and products such as loans (Schmidt & Stephens, 2019). Thus, businesses must ensure that they do not directly expose artificial intelligence systems to inputs defined by those characteristics. The most certain way for businesses to uphold anti-discrimination principles, says Professor Martin Schmalz, is to employ a lawyer who is trained in discrimination law and understands how data-driven businesses and machine learning work (Bram & Schmalz, 2019).

5.2.2 AI Ethical Constraints

AI Ethical Constraints

Beyond the law, algorithms based on consumer data may contain underlying unintentional bias and could be susceptible to unethical and discriminatory outcomes. As with all algorithmic decision-making, financial processes that involve human data, such as determining prices, are subject to the pitfalls of unintentional discrimination (or disparate impact). However, removing all data sources that could serve as “proxy biases”—which could make determinations with regard to protected classes—is a complex challenge, especially at scale.

Although technically legal, decisions based on AI that is biased toward or against income, home ownership, and postcodes, such as loans or fraud detection, could easily cross the line into unethical proxy discrimination over protected characteristics, such as religious beliefs or race. This kind of discrimination is particularly critical to monitor and address within the sphere of finance, where data-driven decisions and failure to uphold ethical standards can have important and far-reaching consequences on both an organisation and its customers.

In the United States, for example, census data shows historic racial gaps in loans, such as mortgages, where financial institutions were more likely to deny products and services to Black and Hispanic borrowers than white people (Federal Deposit Insurance Corporation, 2017). Poorly designed decision-making algorithms might connect these historic data points with new applicants and deny them services, even if the applicants are eligible (Hamilton, 2019).

A further example of unintentional or proxy bias can be found in life insurance, where systems might be trained on alternative data, such as data gathered from an applicant’s Facebook (Now Meta) group pages. If the insurer’s AI model calculates a more expensive policy for applicants who are members of Meta groups that relate to health issues, such as cancer, the insurer will almost certainly be proxy discriminating for genetic information (Prince & Schwartz, 2020).

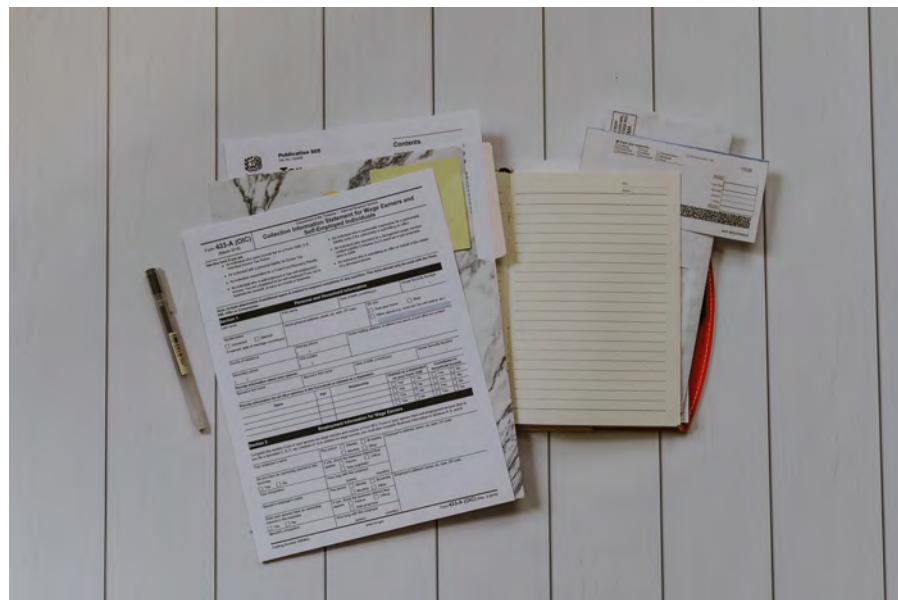
5.2.3 Example: Discrimination in Credit Modeling and Algorithmic Lending

Example: Discrimination in Credit Modeling and Algorithmic Lending

In an effort to simplify the loan process, reduce default risk, and possibly reduce discriminatory lending practices, many banks and their fintech partners are leveraging AI to assess creditworthiness based on customer data.

The predecessor to today’s technology emerged in 1955, when researchers at the SRI Institute, appointed by Stanford University and under contract with Bank of America, unveiled the Electronic Recording Machine of Accounting (ERMA) and “established the foundation for the future of automated banking” (Kim, 2019). Machines have been assisting humans in making decisions on loans, banking and insurance underwriting ever since.

Historically, this process was quite simple: the digital system provided a small set of data points, and bank managers made the ultimate decision on a candidate's viability. The process upheld human discretion and provided transparency, at least theoretically. But when predictions and financing decisions are made using large data sets, the decision-making process of these "black box" algorithms is no longer transparent, and the risk of unintentional discrimination exists.



Today's algorithms might examine not just a potential borrower's credit score, but the credit scores or default rate of individuals who live in the same postal code, or of the borrower's social media contacts. This presents a delicate balance in terms of ethical programming, as financial institutions might also choose to include personal data not traditionally used to assess creditworthiness—like social media usage, email domain, mobile device type, or even grammar (Faircloth, 2019).

On the regulatory side of these advancements, although data-driven algorithms can mitigate typical human bias in a loan application process, these same algorithms might have their own biases—unwittingly programmed, trained in, or machine "learned"—or they might be weighing potentially negative data sets that are not directly related to the borrower's financial situation or ability to repay. Financial institutions must be able to prove fairness in both gathering and analysing data.

Moreover, the effects of biased algorithms only increase when machine learning is added to the lending equation, as AI can compound existing issues. In 2015, an Amazon hiring algorithm was found to be biased against women simply because more men had submitted resumes over the past decade, and these resumes had trained the algorithm (Shin, 2020).

As similar training bias can occur in AI-based underwriting, effective policy must enable the potential borrower to opt out of automated decision-making (and put lending decisions back into the hands of bankers themselves), and to opt in to sharing personal data. In Europe, the GDPR specifically requires that consumers actively opt in to sharing personal data, and includes strict limits around the use of that data.

Guest Video: Combating Bias in AI Lending Decision Models

In this video, David Heike, Managing Director, Head of Risk Modeling at JPMorgan & Chase, discusses the efforts JPMorgan & Chase puts into combating bias in AI lending decision models.



This is a critical question for banks to make sure that we are making unbiased decisions when it comes to the provision of credit. We start with making sure that we use data that is approved for building credit models. We don't want to build models using data that we know already has severe issues around bias.

And so we go through a day to use council to get clearance to use data. And we use structured data. We're not using data that we don't understand coming from the unstructured world.

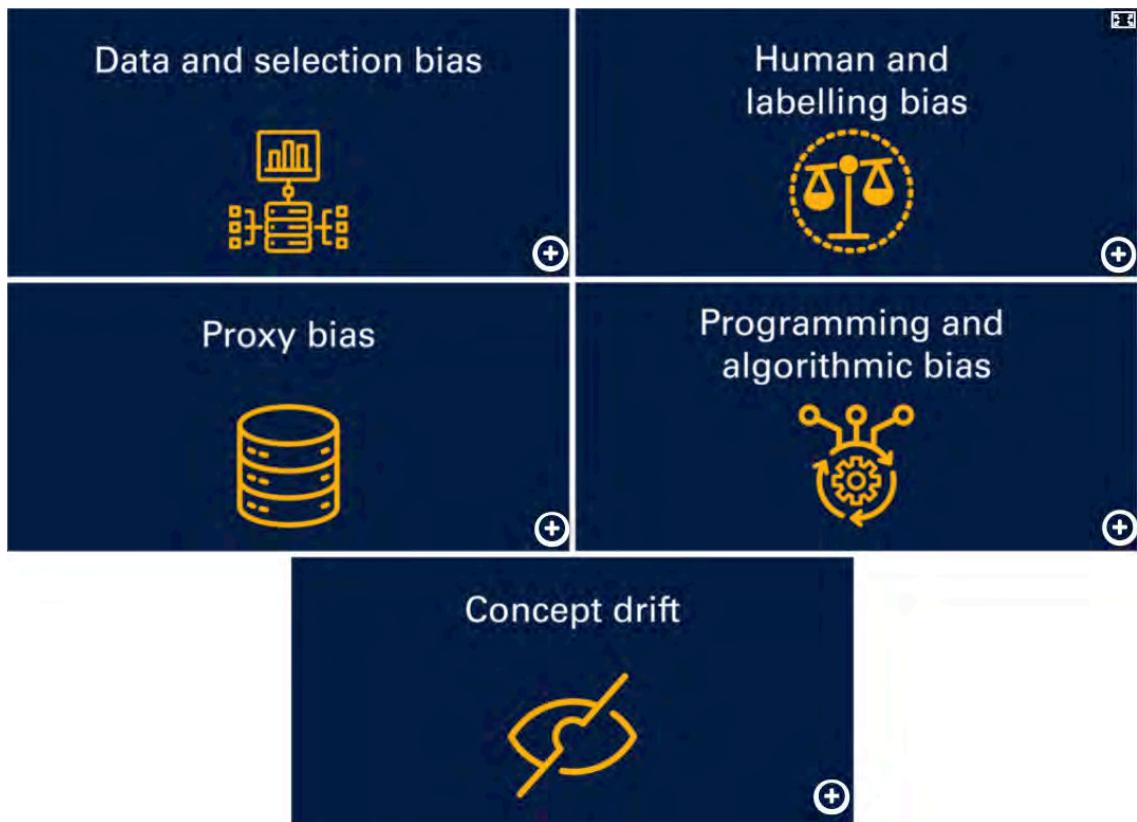
We build the model. And then as you noted, after you build the model, if there's bias in the data that's still there or there's bias and some combination of factors that results in a biased model, that's something we need to address. We don't use data on protected classes within our models. But there's a separate organisation that does the secondary review of our models to assess whether there is bias in a model. And if there is, they recommend ways to mitigate the bias. So I think it's important to have a second set of eyes on our models to make sure that we're managing this important risk.

5.2.4 Addressing Discrimination in AI Systems

Addressing Discrimination in AI Systems

Discriminatory bias can infiltrate any stage of AI model development and implementation—and once the bias exists, the process only amplifies that bias as the machine model continues to train itself on those patterns. However, organisations can develop tools and procedures to address the risk of biases such as:

- Data and selection bias
- Human and labelling bias
- Proxy bias
- Programming and algorithmic bias
- Concept drift



Data and selection bias

This type of bias occurs when the input data set that trains the algorithm does not include enough data from a particular population. For example, when an algorithm excludes or underrepresents data from consumers or loan applicants of a certain demographic, members of that demographic may not receive loans they should qualify for. Developers who create algorithms must gather or choose data in a way that accurately represents and contextualises the things being analysed—especially if the algorithm uses an uncustomised, open source data set. Companies and other organisations have a responsibility to try to ensure that any algorithms they use are bias-free.

Human and labelling bias

To be useful, data must be properly tagged or labelled. The humans who tag and compile data, write algorithms, or interpret algorithmic output must have an understanding of implicit and explicit biases, perspective with regard to algorithmic purpose, and a keen eye towards minimising those biases.

Proxy bias

Certain data sources can serve as proxies for discrimination. It is illegal to use gender or race as a determining factor in assessing creditworthiness or pricing, but other sources of data—from products purchased to movies watched—might effectively serve as a proxy for determining

gender or race. Organisations must take care to avoid making predictions or decisions based on data that might be biased in this way.

Programming and algorithmic bias

This type of bias occurs when the data that trains the AI models causes unforeseen real-world problems. For example, if a GPS driving app were to direct all cars to the same route to avoid an accident, the app might consequently create an even greater traffic problem for drivers on that suggested detour route. Those who design AI and train models must do so proactively, and anticipate the real-world results of the model's decisions.

Concept drift

Data—and therefore, ML results—can shift incrementally over time. To ensure that incremental shifts remain minimal, developers and organisations must closely monitor algorithms and correct or re-train models to curb what could develop exponentially into unintentionally biased results.

AI and Ethics

According to the World Economic Forum and Deloitte, ethical AI is especially critical to the future of finance (2018). Artificial intelligence, the authors point out, may “subject segments of the population to unfair and inequitable exclusions from certain products or services”, making decisions based in part on race, gender, ethnicity, or proxy variables tied to those factors (McWaters et al., 2018). For example, factors such as state residency and car mileage can—when coupled together—act as a proxy for race, targeting the likelihood that a borrower is Black (Zest AI, 2020).

But, as Karen Hao explains in MIT Technology Review, “a growing crop of startups [are] promising organizations ways to develop, monitor, and fix their AI models” (2021). One of these startups is Zest AI, a company that builds models for ethical, debiased credit underwriting. “[I]n high-stakes domains like consumer lending”, the Zest team argues, “[we have to] set high standards” (2020).

In MIT Technology Review’s podcast Can AI fix your credit?, CEO, Mike DeVere, explains how these high standards work in practice (Green, 2021). To hold its AI credit underwriting system accountable, Zest uses neural networks—a subset of machine learning in which a computer “learns” how to perform a task by analysing huge amounts of training data—and pits them against each other. The first algorithm predicts the borrower’s credit risk, while the second tries to predict the borrower’s race based on the results of the first. If the second network can correctly predict race—meaning that “the system is encoding bias”—Zest adjusts the weighing of its credit model signals to minimise those that may act as a proxy for race (Green, 2021). The result, DeVere explains to Green et al., is “a model that is nearly colorblind”—helping provide borrowers equal, ethical access to credit (2021).

Guest Video: Bias in AI Systems

In this video, Maria Axente, Responsible AI Lead at PwC Frontier Lab, discusses the role of bias, how AI can introduce bias into systems, and how we should guard against data bias.



Maria Axente: The biggest problem we have is that we don't have clear mechanism of making bias explicit. Whenever we collect data, we look at processing it and also build the algorithms behind it. So pretty much what AI does is to replicate existing human biases--the biases of the developers themselves and engineer that participate in the design and developing AI; the biases of the data engineers and data processes that are in the main responsibility to source, collect, and process this data; but also those who ultimately use, the final users of the solutions, plus the owners because there are a certain level of certain biases—they're associated with the objective that the tools are set to accomplish.

Question: How do you guard against data bias?

Maria Axente: Guarding against data bias starts with understanding that those biases exist. And they are not as negative as has been portrayed in the media or is something that we need to bring up to the light and being able to understand those biases and how they manifest themselves in every single stage of the design and development and use of the AI solution with the view of being able to correct when biases turns into unfair and unjust treatment and even more turns into discrimination. So the first step is to raise awareness. And the social movements we have seen happening in society in the last two to three years, from Me Too to Black Lives Matters to the climate awareness campaigns, have put us in a good position to be able to discuss about this sort of problems in a much wider and with understanding all the implications that comes attached.

The second step is to be looking at the whole lifecycle of an AI solution, not focusing solely on data set or the biasing, for example, a data set on the algorithms, which are two discrete stages in the life cycle, but start much more early, as early as defining the problem and understanding all the different implications the different impact and different perspectives that need to be brought together when we define a problem. And then further down the line as we look at how to source this data and what's the source of this data-- how do we collect it, how do we aggregate it and label it-- make sure that we understand that each of the stage-- what is the type of bias related to the data itself or the biases of those in charge to processing data will manifest and being able to come with mitigating actions to reduce this bias.

And let's not have an unrealistic expectation. Bias can be reduced. And on long term, AI, in fact, can help us mitigate some of the unfair bias in society. We will never be able to remove it completely. Bias is part of the human nature. It's part of how societies function.

5.2.5 Safeguarding your AI

Safeguarding your AI

There is no “one size fits all” approach to avoiding discrimination in AI, as discrimination is specific to each contextual case. However, existing regulatory standards for larger corporations can form a foundation of practical measures in everyday settings that help smaller businesses to monitor algorithmic fairness and address data and selection bias in AI systems. Organisations and academic leaders in AI have recommended the following best practices.

- Clearly document and monitor all the ways you have attempted to minimise unintentional bias within your models.

Documenting the ways in which you've attempted to minimise unintentional bias could help your organisation if legal questions arise.

- Generate justifications for the models you deploy.

If fairer models exist that could have generated the same results, you may be liable for penalties (Burt, 2020).

- Promote transparency with consumers who interact with AI systems that help to make decisions and automate routines.

Without transparency your consumers may lose trust, which can have a long-term negative impact on your brand.

- Create data sets that represent the population you are interested in.

Data sets that do not represent the population you are interested in do not generate accurate results or predictions about that population.

- Think about what you are trying to solve and what AI tool might deliver the best solution for this, rather than adopting multi-purpose AI into your routine or workflow.

The context in which the algorithm operates is critical for understanding its impact.

- Ensure that, from the outset, data is structured, labelled, and free from existing bias, or badly designed or errant data.

The data volume and variety affects the accuracy of algorithmic decision-making.

- Address immediately any remaining bias—or a combination of factors leading to bias—that remain after the model has been created.

Undetected or unresolved bias can self-amplify, with wide-reaching consequences.

Technology Solutions for Tackling Discrimination

Technology solutions are available that can help spot and solve discrimination issues. Newcomer Parity AI increases algorithmic fairness “by using patent-pending language processing technology” to assess risk (Parity AI, 2020), while Arthur.ai specifically seeks to mitigate concept drift (Miller, 2020). Meanwhile, Fiddler—launched partially in response to questions about Facebook’s content ranking algorithms during the 2016 US presidential election—seeks to augment transparency and explainability (Hao, 2021).

Faculty Video: Advice on Tackling Bias and Discrimination in AI Systems

In this video, Gina Neff, Professor of Technology & Society at the Oxford Internet Institute and the Department of Sociology at the University of Oxford, describes her team’s work on ethical AI, and provides advice on how to implement ethical values into AI.



So in terms of thinking about diversity, one of the projects that I've worked on is working with an organisation called the Women's Forum for the Economy and Society. And as part of that, I've gone to organisations to do focus groups about how they can learn and what they're doing to better address the problems that organisations know around AI bias.

And we call it, in our report, we call it an implementation gap. So companies know that there's problems and challenges with bias and discrimination in artificial intelligence systems. But when we ask them, so what are you doing about it? They don't really have good answers.

And these aren't just small companies. These aren't just startups. These are some of the biggest companies in the world. So we know this is really hard work to be doing. So what are some of the things we have learned? Well, one of the good things for this particular audience and for all of you listening, is that we've learned that financial services companies tend to be a little more careful in the ways in which they approach data about their customers.

And this is because they're in a highly regulated industry. And because they have to be able to explain to regulators how choices are made, they really need to be incredibly careful in how they document how their systems were designed, and how they document how their systems are working.

And so for that, when we talk to financial services broadly defined companies, they report that they have a little bit easier time imagining what non-discriminatory AI systems look like, because they've had to explain non-discriminatory banking systems.

The second thing we've learned is that it's not enough simply to have women at the table. We know in developing AI products and services that women are really underrepresented. Women of color are particularly underrepresented. We have to do more in making sure that we have diverse voices at the table to help guide, manage, and lead these systems in ways that are fair, transparent, and ethical.

However, it's not enough simply to have people in the room to help make these design decision choices. We

actually have to be very careful in how people perceive these systems, and what choices they make around those perceptions. So this is work that I have done around how we imagine or perceive these systems having an influence about what people do or don't do in response.

So for example, another team at Duke University found when they released an AI diagnostic system to help the emergency room understand and manage sepsis, a terrible condition that's sometimes hard to recognise, they actually did not tell the users that it was an AI-enabled system. They were afraid that users would over rely on the system if they thought that it was AI.

And so we have to be really careful about designing not just to where people are today about how and what they think about artificial intelligence, but we have to be willing to design for those changing perceptions of our users. And those could be users in your organisation, it could be your customers, it could be your clients. You have to think through how is the system going to be understood when it's in practice? And what are you doing to ensure that it's safe, fair, and effective?

Faculty Video: The “Ethics for AI in Business” Report

Felipe Thomaz, Associate Professor of Marketing at the University of Oxford, co-authored a report commissioned by the ICC Research Foundation called "[Ethics for AI in Business](#)".

In this guest speaker video, Felipe Thomaz shares more information about the study, the reasons the authors developed this report, and their findings.



The ICC, which is the International Chamber of Commerce, came to Oxford because we had been – especially in the marketing group – publishing and talking about consumer privacy. So there was an interesting side-interest in that area that they picked up on and said, can we study this a little bit further? And they were particularly interested because they represent millions of global businesses that are too small: so, really, the small- and mid-sized companies that are just starting to think about their AI journey.

They don't have policies in place. They don't have resources, very often, in place. And this was meant to be a guidance on how to do it correctly, how to do it ethically, but with a strong business purpose or a business sense of, how do we actually get value out of this as quickly as possible, as well? It's not just fluffy, but it's how do I get a good business result? Which was obviously important to them.

The crucial thing that we found – and I think what motivated this to become, actually, more of an academic pursuit rather than just, here's a quick report, here's some thoughts – was that looking at all of the guidance existing around the globe, so coming from companies like the leaders in the field that have their policies, that have their guidance documents, but also the UN, and governments, and intergovernmental or non-governmental organisations, and so on.

The number of publications on, here's what ethical AI looks like, it's kind of enormous. If you look at computer science, if you look at mathematics, you can go to any academic literature. And they have a point of view on what is correct, what is good, what is not. We started looking at that body of work, and the scary thing is that

there was no agreement. You have all of these brilliant, well-resourced minds telling you what you should do, but there was no common language. There's no agreement on what it was.

There's a paper published in *Nature Machine Intelligence* in 2019 by Jobin, where they found something like 1,200 separate constructs or concepts relating to data ethics. Now give that to a manager: all you have to worry about is 1,200 separate ill-defined things, and you're good to go. It creates an impossible-to-deploy kind of thing, and that's part of the other problem. When you look at these guidances, they're very esoteric and there's never a managerial component to it. How do I deploy it? How do I act this way?

There's no such strategy. It was always, oh, you need to consider this thing... Well, that's really fluffy and really difficult if I actually want to effect change. You know, we always like to aim low at Oxford, so how about we just resolve that issue? So we tried, and one of the first ideas then was, we are going to use artificial intelligence to understand this large corpus of information, which is in our wheelhouse. We're going to go and use natural language processing; entity recognition; emotional recognition, and created structural knowledge graphs so we can start organising this information from the corpus that exists.

We know these individuals that wrote everything are highly competent. They know they've put thought. This just puts this – to your point, this disagreement – in an obvious format. You can see where things are in contrast; things that are highly related; things that are separate, and this started to let us organise it.

That was the nascent part of the project, organising all of this information, getting an understanding of how all of it related, and then we started overlaying the ethical theories. What do we know about ethical management? And then what do we know about management frameworks, management measurement, KPIs, and actually effecting change into a structure for a business? That was steps two and three, and so on.

What should managers be aware of?

There's a couple of very interesting things that fell out just from that first pass and first analysis. There's no agreement, and different stakeholders had different definitions, much to your point earlier. So, setting the ground when you're talking to somebody is incredibly important: just what are you actually talking about?

What do you mean when you say "X", like if you say transparency? For some, it means your ability to look into a system and understand what is happening in the system. In some of the computer science world – parts of the world – transparency means that the system itself is transparent to the user, meaning that they can't see anything. So the same word can mean completely different things on that spectrum.

5.2.6 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Classification helps humans to form decisions; however, if the information that helps form these classifications is skewed with underlying bias or inaccuracies, prejudicial treatment can result.
2. Whilst machine learning has the potential to reduce human bias, businesses, banks, and organisations remain legally obligated to ensure decision-making algorithms are informed by only certain data, and do not discriminate based on protected characteristics.
3. Although technically legal, decisions based on AI that is biased toward or against income, home ownership, and postcodes, such as loans or fraud detection, could easily cross the line into unethical proxy discrimination over protected characteristics, such as religious beliefs or race.
4. On the regulatory side of these advancements, although data-driven algorithms can mitigate typical human bias in a loan application process, these same algorithms might have their own biases—unwittingly programmed, trained in, or machine “learned”—or they might be weighing potentially negative data sets that are not directly related to the borrower’s financial situation or ability to repay. Financial institutions must be able to prove fairness in both gathering and analysing data.
5. Discriminatory bias can infiltrate any stage of AI model development and implementation—and once the bias exists, the process only amplifies that bias as the machine model continues to train itself on those patterns.
6. There are several types of bias that can occur in AI model development and how companies can address bias: Data and selection bias; human and labelling bias; proxy bias; programming and algorithmic bias; concept drift.
7. There is no “one size fits all” approach to avoiding discrimination in AI, as discrimination is specific to each contextual case. However, existing regulatory standards for larger corporations can form a foundation of practical measures in everyday settings that help smaller businesses to monitor algorithmic fairness and address data and selection bias in AI systems.

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To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[Perspectives on Issues in AI Governance](#)

[Reducing Bias in AI-Based Financial Services](#)

[The Ethics of Artificial Intelligence: Issues and Initiatives](#)

[An Introduction to Artificial Intelligence and Solutions to the Problems of Algorithmic Discrimination](#)

[How to Fight Discrimination in AI](#)

[Discrimination, Artificial Intelligence, and Algorithmic Decision-Making](#)

[ML-Fairness-Gym: A Tool for Exploring Long-Term Impacts of Machine Learning Systems](#)

[Human Bias and Discrimination in AI Systems](#)

[What Do We Do About the Biases in AI?](#)

[A Practical Guide to Building Ethical AI](#)

[\(Podcast\) In Machines We Trust, MIT Technology Review](#)

5.3 Privacy Issues in AI Systems

5.3.1 Introduction to Data Privacy

Quick Fact

A 2020 European Parliament report cites research showing the most common privacy concerns amongst people who use “intelligent personal assistants” (IPAs) (Panel, 2020). Surveyed users worried that their devices would:

- Be hacked (68.63%)
- Collect personal information (16%)
- Listen to conversations at all times (10%)
- Record private conversations (12%)
- Not respect their privacy (6%)
- Store their data (6%)

An additional 4% even said their devices were “creepy” in nature. However, the surveyed users also felt comfortable using the devices, and overall were “very positive” about them.

Section Objectives

In the previous section, we discussed what discrimination means in the context of AI technology analysing data, and how to combat these issues within your organisation’s efforts to implement AI technology. This section will define what data privacy is for AI technologies, and what particular privacy issues apply to the finance sector. We will also explore how these privacy issues are dealt with legally in different jurisdictions and discuss how organisations can address these issues of privacy.

Introduction to Data Privacy

Data privacy focuses on individuals’ rights over their personal information and how it is collected and used. The issue of data privacy protection does not apply to solely the use of data in AI systems; however, because machine learning algorithms rely on vast amounts of data showing human behaviours and spending patterns, privacy is a significant concern. Robust data security management and compliance with data protection laws are crucial when personal data is collected at scale and used to make predictions or decisions on areas such as credit and financial services.

The European Union's 2016 General Data Protection Regulation (GDPR) limits what personal data organisations can collect with and without consumer consent. For training or deploying AI that includes personal data, compliance with this and similar laws is imperative to mitigate potential risk and avoid the pitfalls of legal penalties.

Financial institutions are facing increasing pressure from regulators to prove accountability and improve measures on how they collect, store and use personally identifiable information (PII). However, the use of personal data doesn't just bear legal consequences—there are ethical implications too.



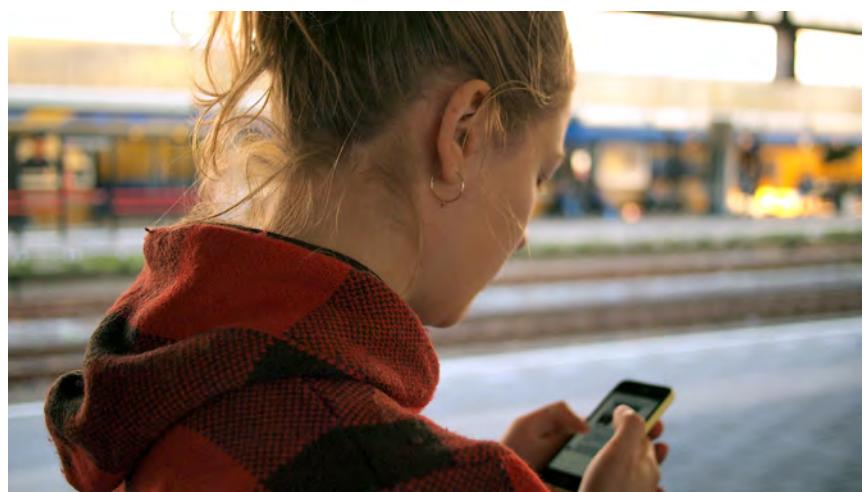
5.3.2 Data Privacy Breaches and Tradeoffs

Data Privacy Breaches

In 2019, app-based challenger bank Revolut came under fire for “single-shaming” its customers in a Valentine’s Day spoof ad (Plummer, 2019). The advertisement, which said, “To the 12,750 people who ordered a single takeaway on Valentine’s Day: You ok hun?” sparked numerous complaints to the UK Advertising Standards Authority (ASA).

Interestingly, the complaints were not solely based on the “tone deaf” messaging of the ad and the potential discrimination against single demographics. Revolut was accused of misleading consumers in terms of its financial services—and, more importantly, in the granular detail of private spending data the company accessed.

Although Revolut conceded that the company should have made clear that figures in the ad were not real data, the damage was done. The ASA passed the case on to the Financial Conduct Authority (FCA), stating, “As the complaint touches on the potential misleading financial services provided by the advertiser, we will be referring the matter to the FCA, whose remit this would fall under” (Plummer, 2019). However lighthearted the ad intended to be, it raised an ethical dilemma in privacy.



While the Revolut case may seem benign or even frivolous, a far more serious privacy breach occurred in March 2018, when the Facebook/Cambridge Analytica scandal saw vast amounts of personal data harvested from social media for the manipulation of political votes. (Notably, this violation preceded the legal implementation of the UK GDPR by only two months.) Every big-news data breach brings increased public awareness of privacy risk, with even consumers who are not directly affected starting to take notice. As public concern grows, organisations and governments must begin placing more importance on the ethical implications of their privacy regulations.

Convenience Versus Risk Tradeoff in Data Privacy

A 2020 McKinsey study on the consumer perception of data and privacy found that, overall, trust remains incredibly low (Anant et al., 2020). Consumers were more likely to share their personal data with providers in healthcare and financial services (although only 44% said they would), but no industry scored a trust rating of 50% or higher for data protection.

As fintech evolves to become part of daily life, so does an awareness of the convenience-versus-risk tradeoff surrounding privacy. Of course, consumers want privacy, and as a concept, that's simple. But many people are also willing to give up some measure of privacy in return for online accessibility, decreased charges, and competitive money management and trading tools. With this new wave of adoption comes increased caution about what types of data consumers are willing to share, and with whom they share it.



A survey of 1,000 North Americans showed they were more likely to trust companies that limit the use of their data, who ask only for information that relates to their product, and who publicly share their approach for protecting data (Anant et al., 2020). Further, as a comprehensive 2018 report by Foresight Factory found, “consumers increasingly understand the part data has to play, but want organisations to be accountable and transparent about what they’re doing. 88% of consumers cite transparency as the key to trust. This strikes at one of the core principles of GDPR: accountability” (DMA, 2018).

5.3.3 Data Privacy Regulations Around the World

Quick Fact

The United Nations Conference for Trade and Development (UNCTAD) has reported that 128 out of 194 (member state) countries—66%—have enacted legislation to protect their nation’s data and privacy (United Nations, 2020). A further 10% are in the drafting stages of new data privacy legislation.

Faculty Video: Data Privacy

Addressing concerns with data privacy requires understanding the data privacy regulations in your jurisdiction. Before we dive into data privacy regulations in different jurisdictions, let's hear from Professor Martin Schmalz on some of the similarities and differences in how data privacy is regulated in different parts of the world.



So most of you will be familiar with GDPR, which is a European law that covers mainly which kind of data can be collected with or without consumer consent, although it doesn't regulate as much how the data can be used. At the same time in China, legal constraints to privacy are much less developed and imposed much less of a constraint on data driven business models. The US is even more complicated.

During the first few months even of the Trump administration, data protection has got significantly weakened. For example, internet service providers were able to use the information they collected about the consumer's internet usage without consumer consent. But just a few months later, California passed a data protection law.

So not only across countries but even within countries across the different states in the US, different laws apply, which makes compliance with them challenging. And consumer tastes with respect to privacy differ as well. So in China, for example, it's not that people don't care about privacy. It's just that the convenience of the apps and the products are so great that it trumps any privacy concerns or most of the privacy concerns. Also,

Some of my Chinese friends tell me they don't really have a reasonable expectation of privacy in the first place. Which is why this is just a much less important constraint in their jurisdiction. By stark contrast, if you go to Germany, people petitioned Google to blur Google Street View of their main doors. Because that apparently infringes on German sense of data privacy.

Another example from Germany is that during the coronavirus pandemic, when companies scrambled to get vaccination doses and Israel was far ahead and Germany was far behind, the public commentary was, oh, but Israel gave anonymised data but still data to the pharma companies developing the drugs. And it's just because of that. That population is now save and well vaccinated.

So it is hard to overstate how strongly consumer tastes with respect to privacy differ across countries, cultures, and jurisdictions as well.

Data Privacy Regulations around the World

Now, let's take a look at some of these regulations.

Europe

In 2016, the European Parliament and Council of the European Union enacted a framework of data protection laws, designed to protect consumers against the heavyweight power of big data platforms and enforce accountability. The General Data Protection Regulation (GDPR) governs how businesses and organisations in Europe collect and process personal data, and unifies the regulations on data privacy across all jurisdictions in the EU and European Economic Area (EEA). This means that anyone who processes personal data within these realms—including businesses on other continents that transact with the EU—must establish “appropriate technical and organisational measures to implement the data protection principles” (Information Commissioner’s Office, 2016).

UK

Although the UK has since left the EU, an agreed “Frozen GDPR”, enforced in the UK by the Information Commissioner’s Office (ICO), has determined that all organisations in the United Kingdom must comply with the GDPR as if the UK were still in the EU (Information Commissioner’s Office, 2016). Non-compliance could ruin a business, with fines of up to €20 million or 4% in annual turnover (Irwin, 2021).

China

China does not currently have a comprehensive national data privacy protection law, although the government published a draft of the national-level Personal Information Protection Law (Draft PIPL) in October 2020 (DLA Piper, 2021). Currently, personal privacy protection is maintained via a complex framework of laws and regulations, most of which are unofficially viewed as guiding directives. Companies within China, and international companies who wish to trade or transact with China, have been advised to closely observe the policies within the Draft PIPL, even before the regulation is officially passed. Much like the GDPR (which inspired many of the PIPL concepts), the PIPL has the potential to create a far-reaching impact (Zhang, 2020).

United States

As with China, the US currently has no federal law binding states across the country on data privacy protection. Instead, hundreds of state and federal laws interweave in a complex governance system that varies from state to state. As a result, internet privacy in the US is an unregulated territory, which many tech companies and social media platforms have used to full advantage (Green, 2021). Individual states are beginning to clean things up, with California in 2020 enacting the California Consumer Privacy Act (CCPA), aimed at handing consumers more control over their personal information. Pursuant to this, in early 2021, California Attorney General Xavier Bacerra announced a new global privacy opt-out tool, called Global Privacy Control (GPC), which enables users to block companies from selling their personal information, via a browser plug-in (Kaye, 2021).

Emerging Policies

Around the rest of the world, countries such as India, Australia, Japan, Canada, and Brazil have all implemented (or are introducing) comprehensive data laws with similar policy concepts to the GDPR. South Africa's model, the Protection of Personal Information Act (POPIA), goes one step further, with jail time of up to 10 years for business owners who fail to comply (POPI, 2018).

5.3.4 Data Privacy Across Borders

Data Privacy Across Borders

If you are operating a business that stretches across more than one jurisdiction, you must ensure that you are abiding by the regulations of each jurisdiction.

As we've seen, data privacy regulations vary widely from country to country, and it is commonplace for individual territories within those countries to have their own data protection laws. Any business processing personal data that wishes to trade or transact with another country or region must make provisions for the regulations of that locale. As the disparities of geographical protective legislation continue to grow, these differences could prove to be a potential roadblock for AI innovation. For data-driven businesses trading internationally, the differing regulations create a potential minefield.



Countries such as China and Russia impose strict regulations on the sharing of data across borders to other regions in an effort to localise and protect this data (Tomiura et al., 2019). Data localisation policies such as these negate the need for cross-policy contingencies. However, Tomiura et al. (2019) also point out that data localisation has the potential to provide advantages to domestic firms over international companies.

Other countries are more eager to transact freely as part of global economic systems. For these regions, data residency may prove to be a more advantageous solution. Data residency allows personal data to be stored in accordance with the regulations of the region from which it was sourced, allowing businesses to offer their services globally whilst adhering to local security requirements and laws (Day, 2019).

5.3.5 Addressing Data Privacy Issues in AI Systems

Addressing Data Privacy Issues in AI Systems

Although the intersection of data privacy protection, convenience, and value might seem to present a minefield, clear processes of information governance (IG) exist to mitigate risk, demonstrate accountability, and prove compliance. All of these processes help to build trust from consumers, and, therefore, benefit your bottom line.

According to Deloitte, strategy, people, processes, and technology can help a business manage and protect against privacy risk by upholding the following guidelines (Deloitte, 2019):

- **Data minimisation:** Minimise the data you store to help solve the issues of storage costs, security breaches, reduced effectiveness (too much data), and non-compliance with changing regulations.
- **Data inventory:** Inventory the types and sources of data information you collect, store, and use.
- **Classification:** Classify the types of data you are retaining (private versus public) in accordance with privacy regulations to ensure compliance and consumer access.
- **Third-party relationships:** Use contracts for third-party relationships (and the data collected, stored, or shared with them) to hold third parties accountable to new privacy standards.
- **Portability and erasure:** Effectively manage customer requests that involve moving or deleting personal information.
- **Data security:** Implement and maintain reasonable security procedures and practices and respond effectively to data breaches.
- **Consent:** Install effective management tools and processes for handling consumer consent and requests, including permission for cross-market affiliation.
- **Oversight and monitoring:** Set up a robust but flexible program that can adapt to changing regulatory requirements.

Staying ahead of new and emerging data regulations can be a complex and ever-evolving task for any data-driven business. As companies become more focused on privacy compliance, emerging technology solutions are cashing in on the big business of new and changing regulations. In Atlanta, a data privacy compliance platform called OneTrust, which helps businesses self-assess their compliance with regulations around the world, such as the GDPR, CCPA and Privacy Shield, raised US \$200 million in its first round of funding, at a US \$1.3 billion valuation.

Historically, many companies' data protection responses revolved around satisfying specific regional privacy regulations, whilst fire-fighting new, and sometimes more complex, issues as they arose. Now, data-driven organisations must take a more holistic approach, with cross-communication and privacy held as a key concern across all functions. This is known as "data protection by design and default", and it is an integral element of the "accountability" principle in the GDPR.

5.3.6 General Data Protection Regulation (GDPR)

General Data Protection Regulation (GDPR)

As one of the most comprehensive frameworks developed thus far on data privacy protection, the GDPR has become the conceptual model for numerous regulations outside of the EU (Lucarin, 2020). Full compliance (and the transparent demonstration of compliance) with the EU's GDPR in the UK, in accordance with the Data Protection Act of 2018, provides a solid foundation for privacy protection for both businesses and consumers.

The GDPR sets out seven key principles:

1. Lawfulness, fairness and transparency
2. Purpose limitation
3. Data minimisation
4. Accuracy
5. Storage limitation
6. Integrity and confidentiality (security)
7. Accountability

According to the UK Information Commissioner's Office (ICO), the regulating body enforcing the GDPR in the UK, organisations must implement the following measures to ensure a project's compliance (Information Commissioner's Office, 2018):

- Adopt and implement data protection policies.
- Take a "data protection by design and default" approach.
- Put written contracts in place with organisations that process personal data on your behalf.
- Maintain documentation of your processing activities.
- Implement appropriate security measures.
- Record and, where necessary, report personal data breaches.
- Carry out data protection impact assessments for uses of personal data that are likely to result in high risk to individuals' interests.
- Appoint a data protection officer.
- Adhere to relevant codes of conduct and sign up to certification schemes.

Accurate, transparent data protection policies and a comprehensive privacy management framework are key ways for an organisation to demonstrate both compliance and the steps the organisation has taken to protect people's data rights. What policies are, and how detailed they are, depends on what an organisation is doing with that personal data (Information Commissioner's Office, 2018). When setting the groundwork for the safety of an organisation and its customers, a leader's first thoughts must be on personal data: how will the organisation collect, store, and share it?

Additional Impacts of GDPR

Some critics contend that GDPR's heightened focus on user protection has impeded the EU's technological advancement. In the *Journal of Global Information Technology*, He Li, Lu Yu, and Wu He argue that "stricter regulations on data handling and processing... will inevitably increase the cost to develop new technologies" (2019). They note that Articles 13 and 22 of GDPR forced firms to manually review and explain algorithms, while Article 17 required that firms erase personal data upon request—disrupting the datasets upon which AI systems are built and increasing the costs of compliance (He et al., 2019).

Despite the costs, Michael Fimin (2018) wrote in *Forbes* that GDPR incentivised companies to improve cybersecurity protocols, develop better systems for managing data, and rightfully gain consumer trust. Protecting user data can be expensive. But for EU companies, studies found that the short-term costs of GDPR—especially for small- and medium-sized businesses—"were substantial", costing companies about 1.7 to 3.4 percentage points as compared to their US counterparts (Heli & Nelli, 2020). As a result, GDPR mandates may have given Chinese and American companies a competitive edge in developing artificial intelligence (He et al., 2019; Wallace & Castro, 2018).

Guest Video: Biggest Challenges Associated with Data Privacy

In this video, Paula Kift, EU Data Protection Lead for Palantir Technologies discusses some of the biggest challenges organisations face with data privacy. She provides advice for organisations on dealing with data privacy issues when implementing AI solutions.



So I think one of the biggest challenges associated with data privacy is that it's notoriously difficult to define. So some might define privacy about control or about secrecy or about limiting access to certain types of data. Others might define it as limiting the appropriate flow of data.

And laws, such as the GDPR, try to codify a normative conceptions of privacy into law.

Then I think one of the biggest challenges implementing privacy on a technical level then is to, A, being able to define what privacy is and then design your technologies accordingly. And oftentimes, things can get lost in translation from law to technology to practical implementation.

When organisations try to start working with privacy technologies, it's important to think about how you want to implement privacy into the design of those technologies from the beginning, particularly, when you try to work

with AI and other technologies. And here I think we need to be aware of the fact that AI is as not always as easy to define as privacy. One thing to keep in mind is that humans should always be kept in the loop.

So laws such as the GDPR include a right for data subjects not to be subject to wholly automated decision making. And so one of the things one needs to think about when building technology is for privacy protection, precisely, that the human stays in the loop. And that data processing remains transparent and subject to full human oversight.

5.3.7 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Data privacy focuses on individuals' rights over their personal information and how it is collected and used.
2. Robust data security management and compliance with data protection laws are crucial when personal data is collected at scale and used to make predictions or decisions on areas such as credit and financial services.
3. As fintech evolves to become part of daily life, so does an awareness of the convenience-versus-risk tradeoff surrounding privacy. Of course consumers want privacy, and as a concept, that's simple. But many people are also willing to give up some measure of privacy in return for online accessibility, decreased charges, and competitive money management and trading tools.
4. Addressing concerns with data privacy requires understanding the data privacy regulations in your jurisdiction.
5. Although the intersection of data privacy protection, convenience, and value might seem to present a minefield, clear processes of information governance (IG) exist to mitigate risk, demonstrate accountability, and prove compliance. All of these processes help to build trust from consumers, and, therefore, benefit your bottom line.
6. Accurate, transparent data protection policies and a comprehensive privacy management framework are key ways for an organisation to demonstrate both compliance and the steps the organisation has taken to protect people's data rights.

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Optional Resources

[Data Protection Laws of the World](#)

[Guide to the UK General Data Protection Regulation \(UK GDPR\)](#)

[Complete Guide to Privacy Laws in the US, Compliance and Regulation](#)

[Data Privacy as a Strategic Priority](#)

[Risk Issues Before Considering AI for Financial Services](#)

5.4 Regulating AI

5.4.1 Introduction to Regulating AI

Section Objectives

In this section, we will explore regulation regarding AI technology around the world, and the difficult task policymakers face in writing effective legislation for this new technology.

Introduction to Regulating AI

So far in this module we've looked at discrimination laws, and regulations around data privacy. But what is being done about regulating AI technology itself?

Policymakers walk a very narrow line between writing effective legislation to lower risk and protect customers, and trying not to stifle entrepreneurial creativity and transformative disruption. With each emerging technology comes new challenges in both regulation and governance. In terms of widespread industrial use cases, machine learning and AI are still so new, and present such difficult complexities, that regulation of AI is justifiably evolving.

The question remains as to how the algorithms that power new products or services might be regulated. To regulate a predictive or decision-making algorithm, or even the data that feeds such algorithms, policymakers need visibility into the process. Could lawmakers require algorithm development, training, and deployment to integrate transparent anti-bias measures? How could such measures be standardised and documented? And who is responsible, or legally liable, for an algorithm that makes what appears, with added human context, to be a poor decision—or even a decision that breaks the law?

Industry providers can help by working hand-in-hand with regulators on a local and regional basis. Often, with close communication, both sides work together to build regulatory “sandboxes” that enable real-world experimentation in a controlled, supervised environment, and that further hone new processes into a solution to benefit both parties.

In Norway, for example, the data protection authority, Datatilsynet, used government funding to establish a sandbox for new fintechs, with the goal of promoting “the development of innovative artificial intelligence solutions that, from a data protection perspective, are both ethical and responsible” in addition to being compliant with regulations (Datatilsynet, 2020). So far, roughly two dozen companies of different types, sizes, and sectors have applied to “play in the gray zone” (Datatilsynet, 2021).

Faculty Video: Regulating AI

In this video, Professor Nir Vulkan discusses ethical AI in banking and finance. As a chair member of a committee that advises the EU on ethical AI and its implications for banking, Professor Vulkan also focusses on a few issues of AI in banking that his committee has delved into and provides recommendations to policymakers and entrepreneurs.



Hello, everyone. I want to talk to you today about regulating AI and, particular, about what we now call ethical AI in banking and finance. I just finished chairing a committee that advises the EU on ethical AI, the implication of ethical AI. And my committee was focusing on the implications for banking and finance. And our report is being published as we speak now.

Now it's a big, big issue. And this is a short video. But I wanted to maybe focus on one or two issues around AI and banking and finance that will explain to you our thinking and, particularly, our recommendations both to the policymakers and to the entrepreneurs.

Technology in banking and finance is not new. When I, as a kid, went with my father to the bank over 20 years-- sorry, over 40 years ago, 30 years ago and they were discussing loans, there were computers. There were computers and they looked at them when they made the decision whether to give loans or how much money to loan, and so on.

The difference between then and now is that, A, there was more discretion at the time. The bank manager at the end made their decision. And that it was a lot more transparent, so the data was clear. So if computers said no, it was clear why. It says, well, you haven't made these payments, and so on.

The problems we have now is there's no discretion because there's no more bank managers and they're not involved. And the data isn't transparent, so we don't really understand what the algorithm is doing when the algorithm is making its decisions. So really that's the problem in a nutshell.

And people are thinking about it, of course, all over the world, and how to get our heads around it. So things like what is fair, who's accountable when an algorithm comes up with a wrong decision. It says no when it should say yes, or it says yes, but it should say no. That becomes clear.

Who's responsible? Is it the person who wrote the algorithm? Is it the manager of the bank? Is it the regulator, and so on. So these are the kind of issues that we as a committee dealt with. And people around the world are also thinking about it.

And for the EU, they came up with the Seven Principle of Ethical AI, which you can look up. And they include things like fairness and accountability and transparency, and so on. And our job was to translate them to the sector. And it's actually not that hard to do that, but a problem that became clear is that we need a clear agreement about what it means.

And I think this is really the problem. The problem is having a clear, agreed definition of what is fair, and so on, in this context. And actually, my colleagues here and some philosophers here in Oxford are very good thinking

about that. And they have this nice analogy between what happens in medical sciences and what's happening, let's say, in ethical AI and banking and finance, for example.

And the medics had the same issues, but what the medics have, I think, that we don't have is that they have an agreement about the meaning of these concepts. And that agreement is part of everybody's training. So when you become a doctor, you understand what the profession means, what the profession mean by fairness and transparency, and so on.

And I think that is what we need in banking and in finance. And, of course, this was the recommendations that we have made. And how do you achieve that is by closely working together, the entrepreneurs or the banks, with the regulators. And we're seeing things like AI sandboxes appearing around the world. There's one in Norway.

And I think that's the way forward. Because then the company, the entrepreneurs, the people who are building the algorithms, the AI, are working with the regulator early on. And there's a clearer understanding of what the regulator expects and then also what they deliver. So I think it's a fascinating area. And I hope that you will enjoy learning about it in the rest of this program.

5.4.2 AI Regulation Around the Globe

AI Regulation Around the Globe

Globally, regulatory bodies have thus far shown relatively limited interest in regulating AI. This may soon change.

Currently, the diplomatic coordination and harmonisation that would incentivise moving beyond regional fragmentation to more global standards does not exist. Deloitte's Asia Pacific Financial Services Regulatory Outlook for 2020 reports, "Though regulatory progress to date has been relatively slow, AI is still very much an emerging technology, and it is unsurprising there has been a lack of a coordinated push towards regulation" (Deloitte, 2020).

Until more stringent global standards emerge, using data from one jurisdiction to train a model that is applied in another jurisdiction will have risks. Organisations might discriminate unintentionally against parts of the population that the jurisdiction protects. So organisations who employ AI must ensure the data that they use to train their models has similar characteristics to the locations in which they apply the AI.

As yet, companies must operate within regional jurisdictions, as follows:

European Union

In September 2020, the EU released a new digital finance package that contains legislative proposals and strategies that include AI (European Commission, 2020). The package includes a Digital Finance Strategy, wherein as part of the strategy, language seems to actively encourage,

rather than restrict, the use of AI; meanwhile, section 4.2 invites participants to “explore the possibility of developing regulatory and supervisory guidance”, indicating only that organisations should use AI tools in compliance with GDPR and other existing customer and data regulations.

United Kingdom

The FCA has built regulatory sandboxes where firms can test their products and services in a controlled environment, within existing regulations and with actual consumers. No new regulations seem to be in development currently, as regulators and the government appear to be interested in the effects of those already in place.

United States

The US government has shown little interest in strongly regulating AI thus far. A 2018 report from the US Department of the Treasury recommends that regulators “should not impose unnecessary burdens or obstacles to the use of AI and machine learning and should provide greater regulatory clarity that would enable further testing and responsible deployment of these technologies by regulated financial services companies as the technologies develop” (Mnuchin & Phillips, 2018). Whether that stance will change under the Biden administration remains uncertain as yet.

Asia

From a policy perspective, China is leading the way. A 2019 report by the China Finance 40 Forum called for increased regulation, pointing out that AI “could go wrong just like any other technology” (Reuters, 2019). The former Head of the China Securities Regulatory Commission, a senior researcher on the report, remarked, “The point is how we make sure it is safe for use and include it with proper supervision” (Faridi, 2019).

Regarding AI more widely across Asia, glimmerings of ethical frameworks may be appearing on the horizon, but as in the US, the move towards AI regulation in Asia outside of China is slow and reluctant so far. In the meantime, global organisations like the United Nations Educational, Scientific and Cultural Organization (UNESCO) have developed and published guidelines on responsible development and “how to build the rule of law in the digital world” (UNESCO, 2020).

5.4.3 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Policymakers walk a very narrow line between writing effective legislation to lower risk and protect customers, and trying not to stifle entrepreneurial creativity and transformative disruption.
2. In terms of widespread industrial use cases, machine learning and AI are still so new, and present such difficult complexities, that regulation of AI is justifiably evolving.
3. Industry providers can help by working hand-in-hand with regulators on a local and regional basis. Often, with close communication, both sides work together to build regulatory “sandboxes” that enable real-world experimentation in a controlled, supervised environment, and that further hone new processes into a solution to benefit both parties.
4. Currently, the diplomatic coordination and harmonisation that would incentivise moving beyond regional fragmentation to more global standards does not exist.
5. Until more stringent global standards emerge, using data from one jurisdiction to train a model that is applied in another jurisdiction will have risks.
6. Organisations who employ AI must ensure the data that they use to train their models has similar characteristics to the locations in which they apply the AI.

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Optional Resources

[2020 Asia Pacific Financial Services Regulatory Outlook](#)

5.5 Considering Competition

5.5.1 Introduction to Competition Law

Quick Fact

“The Big Five tech companies [Google, Amazon, Meta, Apple, and Microsoft] generate almost US \$900 billion in revenues combined—an amount that rivals the GDP of countries like Saudi Arabia and the Netherlands” (Wallach, 2020).

Section Objectives

In Module 4, we looked at how Big Tech platforms are poised to enter the financial sector. In this section, we will look at the competition laws that may thwart their plans.

Introduction to Competition Law

Competition law (or antitrust law in the United States, Canada, and the European Union) is a framework of legislation to promote healthy competition for businesses and ensure markets are run fairly for consumers. The law helps prevent monopolies of commodities and services, agreements between companies to carve up markets or fix prices, and the abuse of dominant market positions through written or verbally arranged mergers.

The UK government’s antitrust agreement, the Competition Act 1998, prohibits (Office of Fair Trading, 2007):

- Agreeing to fix prices or terms of trade: for example, agreeing to raise prices in collusion with competitors.
- Agreeing to limit production to reduce competition.
- Carving up markets or customers: for example, agreeing with a competitor that you will bid for one contract whilst it takes another.
- Discriminating between customers: for example, charging different prices or imposing different terms, where there is no difference in the circumstances of supply.



Businesses found in breach of antitrust laws face penalty fines of up to 10% of their global turnover, whilst individuals involved in anti-competitive behaviour could face disqualifications and criminal charges (Pinsent Masons, 2020).

No matter its size or rank, every business needs to become familiar with antitrust laws to avoid charges—and, importantly, understand its marketplace rights.

5.5.2 Antitrust Laws, Competition, and Ethics

Antitrust Legislation

Governments enact antitrust laws to protect consumers from predatory business practices—market allocation schemes, monopolies, and price fixing, amongst others—which can easily occur as a result of pooling data and controlling broad business platforms, as the AI-based Big Tech multinationals have done. Such anti-competitive practices effectively force small and mid-sized companies to vigorously compete over niche markets, as they often cannot even attempt to play on the same field as the pan-market goliaths. These antitrust measures attempt to ensure fair competition not only in each business sector individually, but across sectors as well.

However, recent attempts in the US to justify antitrust legislation aimed at Big Tech have fallen flat. In an article pessimistically headlined “Congress made a lousy case for breaking up Big Tech”, Alec Stapp writes that even though such efforts may ostensibly attempt to counteract some of the “real social problems caused by broad platform technology [such as Facebook], like misinformation and election interference”, antitrust laws will have no effect because “these problems aren’t related to competition” in the first place (2020).

Moreover, opponents say, Big Tech companies aren’t technically monopolies, defined as a firm that “has maintained a market share in excess of two-thirds for a significant period” when “market conditions are such that the firm’s market share is unlikely to be eroded in the near future” (US Department of Justice, 2008), and their influence has not prevented new companies—including Shopify, TikTok, and Zoom—from entering and succeeding in the US market (Stapp, 2020).

Guest Video: Data Sharing and Regulation

In this video, Christina Caffarra, Senior Consultant, European Competition at Charles River Associates, discusses the present state of antitrust legislation. Dr. Caffarra explains that its conservative nature makes antitrust regulation slow to combat the growing usage of unregulated AI technology in businesses, as legislative bodies are reluctant to enforce regulation without precedent.



Many of the concerns that we have about data have to do with exploitation of the data position that one has. You think about many of the tech giants, they have enormous data advantages, and they're exploiting it. However, the antitrust laws are behind. We haven't done much in the realm of exploitation, which isn't some excess pricing case. And so the tools that should be used to really address these kind of problems are not tools that authorities are comfortable with. They're worried about using them. They're worried that if they proceed against companies on this basis, they will be, of course, appealed, and they will lose the appeal in Luxembourg, where the judges are very conservative.

I think that what you see is, at the moment, very tentative steps on the part of the authorities to address the data advantages, the data exploitation. Germany has been ahead of others. Of course, we know that Germany, with the Facebook case, has taken a particularly, I think, ambitious approach there, which I share. But other authorities are slowly trying to use kind of categories of analysis that are a bit outdated, and not yet embracing and getting their arms around the question of abuse around data.

Separately, we have merger control, which is a different tool. And of course, you are in that space, if you are enforcing against the merger. And here, I think the story is just as troubling and disappointing relative to where we should be. You mentioned Google Fitbit as a recent example. As you know well, I've animated a big group of people that included economists. You were also involved, and there were privacy experts, and there were civil liberties people.

There was a huge groundswell of interest in that deal, people with, certainly, privacy concerns, data protection experts. Because there, we all saw the potential for Google, which, of course, controls this enormous amount of data on all of us in various dimensions, being able to add to that enormous data fire hose, also very specific, useful information about health, signals, the stuff that can be collected through a wearable, and the potential for that data to be used in applications that are particularly concerning, from a citizen point of view.

So the potential there, curiously-- in fact, not so curiously-- but disappointingly, the discussion in the case was mostly about Google using that data to further its targeted advertising. That wasn't so much what worried us. I mean, targeted advertising is a worry, and it is something we don't like. But the potential here was the ability to combine the data that Google has, locational, search data that Google has on us with additional signals on the kind of things that, of course, go on in our body, which opens up, potentially, the possibility for application use cases that are incredibly attractive at this point.

Health tech application is a huge and growing market, insurance, potentially employment, and in ways that can be really detrimental to privacy and, ultimately, in ways that consumers cannot see. The big concern was really that the data was going to be combined in this way, and this was going to lead to outcomes that effectively were further discrimination. So I'm going to get an insurance offer which is not quite what I would get otherwise on

the basis of certain information which is being gleaned, including from the wearable, and without, really, my understanding or consent, fundamentally.

And that, we worked hard to explain to and to argue with the European Commission that that was a concern, because the harm was going to be directly exploitation of consumers. The harm to us as consumers was that we were going to face a reduction in quality and a discrimination in the offers that we were going to receive. But as I mentioned before, and I conclude, there is great reluctance on the part of the Commission to actually embrace these theories, because they are relatively novel. They are novel. They prefer to do the kind of things they've always done, of course.

I think your summary was spot-on. I think that the concern is not so much about my individual information being used because of the way in which machine learning makes inferences from data. What matters is the aggregate data that then can be used to draw inferences and then draw parallels with my characteristics. So this is really, this is really the concern. That imposes an externality to me, and even though it is not that they use, necessarily, my data to make me an offer. But so that is the point.

As a final comment, I think that antitrust really needs updating. And it is really a cusp now. There is a beginning of an awareness that antitrust, as a discipline, if it doesn't really interface effectively with data protection and privacy, and continues to kind of leave those issues aside, is obsolete, and it is incapable of really dealing with the kind of issues that we have today. So I hope that this move will come.

It is unfortunate that antitrust takes a long time to update because it takes laws and law changes. And we see the regulation, now, is beginning to take form that is seeking to come alongside antitrust. Because just an antitrust bag of tools is probably not sufficient. We need regulation to support it and to move the dial in a serious way.

The Market Power of Data

As Christina Caffarra discussed in the previous video, regulatory bodies are beginning to understand the immense market power data holds. Successful AI-based business models are circular and self-feeding in nature, as they both consume and generate (even more valuable) data—making it difficult for rival organisations to catch up once they have fallen behind. This makes the task of encouraging competition a difficult one, as success breeds success, and the tech giants get bigger.

Compounding the problem, AI, with ravenous models to train and leverage, further increases the value of personal data—so that companies already overflowing with human data have even more incentives to continue collecting as much data as possible. These organisations' dominance then enables them to impose conditions that exploit their consumers' data and violate freedoms. Effective competition, and the competition laws that protect it, have thus become fundamental to privacy (Privacy International, 2020).



These large organisations can also drastically increase the value of the data that they already control by combining data sets across companies—or, as Meta did with both WhatsApp and Instagram, by gobbling up data-heavy players in markets tangential to their own. In combining their data sets, these organisations may gain such a formidable competitive advantage that they use their dominance unfairly or abusively—highlighting the need for legislation to enable more control over the mergers and acquisitions of data-heavy companies.

To survive until legislation catches up, organisations must understand “the dynamics of scope expansion”—or they will eventually find their operating models at risk (Iansiti & Lakhani, 2020). Those who do not “leverage customers and data across markets are likely to be at a disadvantage,” as “firms find themselves competing with companies from different sectors, using different business models, and integrating bundling, and cross-subsidized products and services”.

5.5.3 Competition Regulation

Competition Regulation

In the last few years, tech giants have found themselves under increasing pressure from competition law regulators in the EU and the US. Germany was one of the first countries to reform competition laws in aid of countering the dominant market power of large digital platforms (van Dorpe, 2021). However, as the pressure has mounted to break up the power of companies such as Meta, Mark Zuckerberg has warned, “There are plenty of companies out there that are willing and able to take the place of the work we’re doing. . . . And they do not share the values that we have” (Bram & Schmalz, 2019).

As Oxford Associate Professor of Finance Martin Schmalz points out in *The Business of Big Data*, “Both sides of this argument nicely illustrate the powerful (and unavoidable) intersection between business, law and ethics. Businesses don’t exist in a vacuum: legal and regulatory regimes always determine which business models are viable, and which are impossible” (2019).

In China, the historically minimal constraints in competition law allowed companies such as Alibaba and Tencent to use the aggregated data collected from their apps and platforms (such as data from chat history, calendars, and social platforms) to inform credit decisions. However, more recently, Alibaba—which has a 33% stake in Ant Financial (Bary, 2020)—has hit numerous roadblocks with industry limitations on consumer information and price adjustments. Additionally, China has developed some legal constraints as these companies have grown. In February 2021 the government implemented a comprehensive anti-competition framework, called the Anti-Monopoly Law, to regulate how data is used and which kinds of price adjustments are allowed (Cadell, 2021).

For their part, regulators worldwide have taken a keen interest in AI, but practical, productive, responsive regulation takes time. Instead of blunt instruments, policymakers must use legal scalpels and an innate understanding of the issues to create and maintain healthy competition. Healthy competition ensures that companies have an incentive to invest, keep up with their rivals, and come up with new and better products for consumers. It also invites constant product innovation and better

customer service. A lack of competition, on the other hand, tends to drive down product quality and diversity—so that, despite a more personalised platform experience (thanks to all of that data and AI power), consumers are offered an abundance of mediocre products.

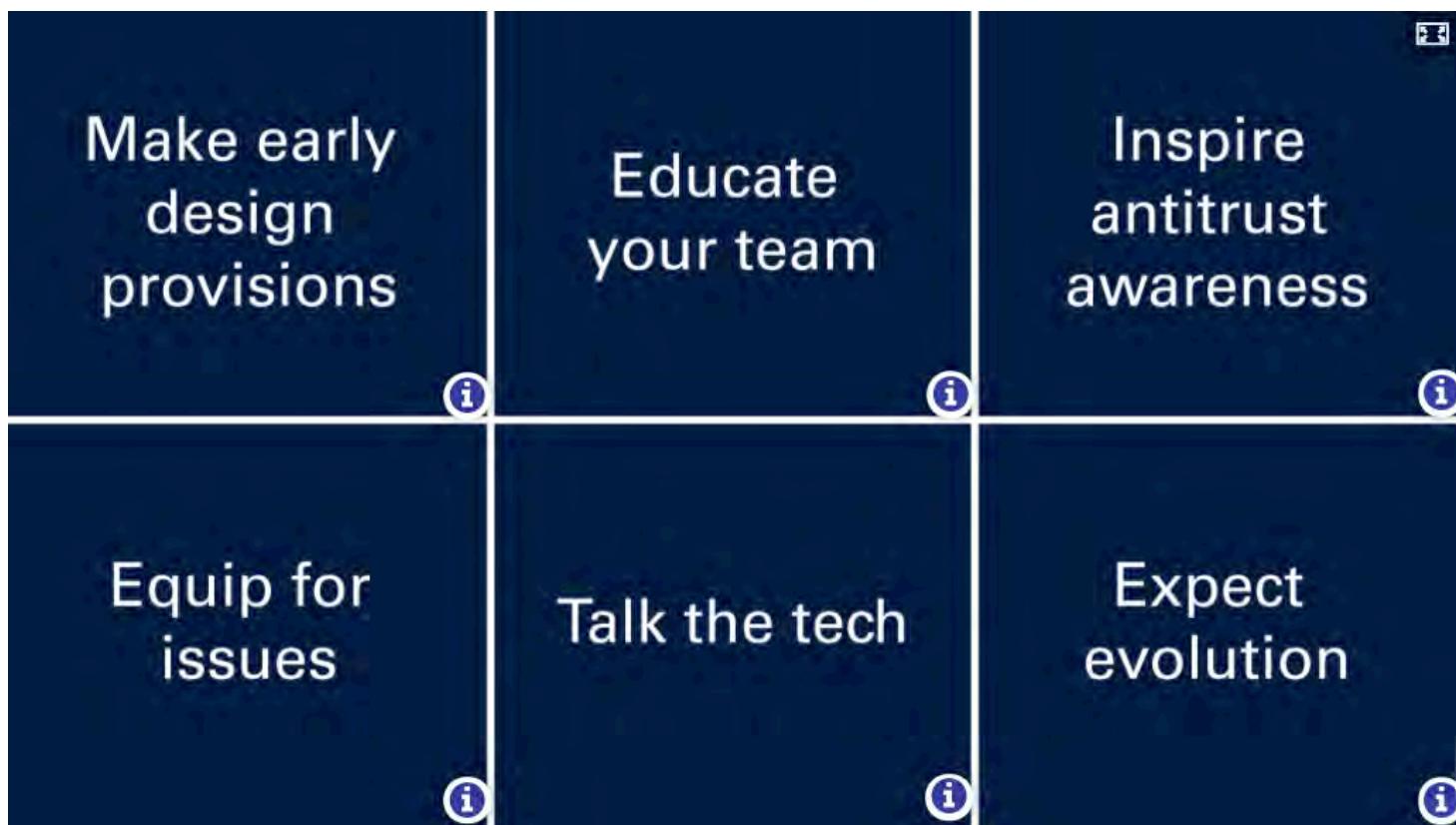
5.5.4 Addressing Competition Laws

Addressing Competition Laws

Regulators are placing increased focus on how artificial intelligence will shape antitrust laws for digital markets in the future. While antitrust issues of the past—such as collusion and price discrimination—were primarily created by human involvement, AI and complex algorithms have the power to amplify issues at scale if not closely monitored and regulated.

While there are still few use case precedents to learn from, and concrete legislation on AI-driven antitrust is in its infancy, businesses considering implementing AI into their project must take early precautions to avoid antitrust-related repercussions.

In 2019, several antitrust legal experts outlined proactive steps for data-driven businesses to address antitrust issues from the point of AI development (Snyder et al., 2019):



Make early design provisions

Already at the design stage, organisations must make sure to consider the technology's potential effects on antitrust areas including customers, pricing, and competitors. Costs, reduced efficiency, and legal risk may accumulate if potentially problematic AI systems aren't addressed early.

Educate your team

Rather than targeting only executives, marketing, and sales teams, as in the pre-AI world, an effective compliance program now also provides antitrust education to the personnel closest to the technology: the AI engineers and developers designing the product.

Inspire antitrust awareness

All parties involved in creating the product, from developers to users, need to be aware that legal liability can extend even to technical decisions. Organisations must also make sure that employees recognize the serious and expensive consequences of antitrust violations.

Equip for issues

Even motivated teams may be completely new to antitrust issues. Implementing antitrust training and compliance programs can help these teams learn to recognise issues before they become significant problems. One strategy for triaging antitrust risk is continuously asking: Will any group of people feel disadvantaged by the product?

Talk the tech

Whilst it is important to teach developers, engineers, and implementers to understand antitrust issues, it is equally important for the teams monitoring antitrust to build familiarity with the technology produced. Whilst it may not be possible to understand all technological facets, teams should ask these essential questions frequently: What is it for? What are the inputs? What does it do? Where does it come from?

Expect evolution

As AI evolves and becomes more prevalent, legal and economic experts are likely to publish additional theories and empirical studies of the impact of AI on competition. Companies who develop AI products must make sure to stay abreast of legal developments surrounding antitrust issues.

5.5.5 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Competition law (or antitrust law in the United States, Canada, and the European Union) is a framework of legislation to promote healthy competition for businesses and ensure markets are run fairly for consumers.
2. No matter its size or rank, every business needs to become familiar with antitrust laws to avoid charges—and, importantly, understand its marketplace rights.
3. Governments enact antitrust laws to protect consumers from predatory business practices—market allocation schemes, monopolies, and price fixing, amongst others—which can easily occur as a result of pooling data and controlling broad business platforms, as the AI-based Big Tech multinationals have done.
4. Successful AI-based business models are circular and self-feeding in nature, as they both consume and generate (even more valuable) data—making it difficult for rival organisations to catch up once they have fallen behind. This makes the task of encouraging competition a difficult one, as success breeds success, and the tech giants get bigger.
5. To survive until legislation catches up, organisations must understand the dynamics of scope expansion—or they will eventually find their operating models at risk.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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5.5.4 Addressing Competition Laws

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Optional Resources

[A quick guide to competition and consumer protection laws that affect your business](#)

[Antitrust Intelligence: six steps for talking to developers about antitrust](#)



Module 6: Open Data, AI Strategy, and The Future

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford Artificial Intelligence in Fintech and Open Banking

Module 6: Open Data, AI Strategy, and The Future



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6.1 About Module 6

6.1.1 Module 6 Overview

Overview

Welcome to Module 6 of the AI in Fintech and Open Banking Programme!

This week, we explore the future of open banking and the future of AI in finance. We look at the challenges that remain with open banking, and how they will need to be solved. We discuss the benefits of open data, and how the open ethos that started in the financial services could one day spread to other industries. We examine the opportunities and challenges the evolving AI landscape presents for those in financial services, and hear some predictions on what the future of AI will be in financial services.

In addition, we provide a framework that pulls together what you learnt in this programme along with some additional guidance into a step-by-step recipe that you can use to continue the AI projects you've started in this programme, or to start something new.

Faculty Video: Introduction to Module 6

In the following video, Professor Martin Schmalz shares what to expect this week.



Welcome to Module 6, and congratulations on all the hard work you've done already in the first five modules. This week, we're going to look ahead to the future of open banking. Where is the finance industry heading? And what new challenges and opportunities will open banking create? We will also look to the future of AI in the finance industry by examining the factors that are accelerating the rise of AI and exploring some predictions of future trends.

We conclude this module by providing a framework that brings together the ideas discussed in this program into a step-by-step recipe that you can use to guide the implementation of AI in your business. Beyond the module content, you and your team will also be working together to synthesise everything you've learned and create your final presentation and video pitch for your capstone project. We really look forward to watching your video presentations and hearing about the solutions you've come up with. Good luck with Module 6.

Objectives

By the end of this module you will be able to:

- Hypothesise about the future of open banking in both market-driven regions and Europe.

- Describe the challenges that surround the secure sharing of consumer data.
- Identify opportunities that the concept of open data creates for the financial industry.
- Discuss the future role of AI in finance, as well as the concerns of businesses and potential tradeoffs.
- Recommend an AI solution to a challenge in the finance industry.

Graded Assignments

You will complete individual and group assignments, which count towards your completion of the programme. This week, you will:

- Meet with your group to complete the Capstone project: a slide presentation and a 90-second video about your AI solution.
- Reflect on what you have learnt in this course and plan how you will apply this knowledge in the future.

You must submit all graded assignments in Module 6 by **26 July, 2022, 23:59 UTC**. (Try the [Time Zone Converter](#) to get your local time.)

Vocabulary Check

The terms below are industry specific terms that appear in this module. Before beginning the module, check your knowledge of these words, and, if you need to, review the definitions in the programme glossary.

[Application Programming Interface \(API\)](#)

[Competition & Markets Authority \(CMA\)](#)

[open data](#)

Time Commitment

Plan to spend seven to ten hours on Module 6 this week. As there is a lot of reading material, and many videos, you might want to divide up your work into several sessions. The module is broken up into sections by theme, giving you potential break points.

Make sure you plan time to meet with your group, and to complete the assignments.

6.2 The Future of Open Banking

6.2.1 The Future of Open Banking

Section Objectives

In this section, we will explore the future opportunities in open banking. We will compare the differences in the development of open banking regulations between market-driven regions such as the US and China versus Europe. We will also discuss the importance of secure sharing of consumer data in light of the growth of open data and the world of possibilities that it will bring to the finance sector.

The Future of Open Banking

When European and British regulators first conceived of open banking in the early 2010s, the world was a very different place. Confidence in the financial services sector had been badly damaged by the great financial crisis (GFC) of 2008, in which the excessive risk-taking of banks was blamed for the near-collapse of the world economy and the global recession that followed. Technology companies had not yet ascended to the powerful positions they hold today, and fintechs had only begun to enter the market.

Open banking, and the adoption of the EU's second Payment Services Directive (PSD2) and the UK's Open Banking Directive in 2016, grew out of the regulators' desire to level the playing field in the powerful financial services sector by fostering competition and allowing new players to enter the market. However, following years of low to negative interest rates, banks have seen their preeminence slip, while the tech giants Google, Apple, Meta, Amazon, and Microsoft (collectively called GAFAM) have surpassed them to become the world's most valuable companies. Fintechs have matured and continue to grow as a threat, especially around payments. AI as a technology continues to make deep inroads, dramatically propelling the companies that have harnessed it, and especially GAFAM, to new levels of profit and dominance.



Today, as Covid-19's fallout continues to upend the world, open banking is at an "inflection point," according to CB Insights, the research firm that tracks the technology industry (2021). In the last couple of years, the open banking industry has seen a record level of funding pouring in, sending valuations of early open banking fintechs like Plaid and Klarna soaring. Financial incumbents know they must embrace the trend, while policymakers across the world continue to consider, fine-tune,

and adopt regulations to mandate open banking rules. Even in regions where governments have not explicitly adopted regulations, the market is rapidly moving toward an API (Application Programming Interface) economy, in which data feeds play a central role in the development of new financial services.

Market-Driven Regions (US and China)

Market-driven regions, including the US and China, have seen the technical side of open banking (that is, the sharing of data through a standardised API) run ahead of the secure consumer consent side of open banking. Whilst this has led to a number of innovative services and the rise of fintechs in both regions, consumer data rights are woefully behind. Screen scraping remains prevalent in the US, where a behind-the-scenes battle for the scraped financial data of consumers is playing out between US banks and data aggregators like Plaid and Yodlee (Popper, 2017).

Moreover, in the US, despite the 2010 Dodd-Frank Act empowering the country's Consumer Financial Protection Bureau (CFPB) to ensure that Americans would have a "uniform right" to access and use their financial data "however they see fit," it has taken ten years for the CFPB to officially even call for industry comment on how consumers' access to their financial data should be regulated (rebecca, 2020).

Europe

Meanwhile, in Europe, where open banking was born, services have not quite taken off as regulators had hoped. Industry observers blame this on the initial decision by regulators to not insist on a standardised protocol for the delivery of data. This has led to a number of different APIs, authentication methods, and what some see as an intentional ploy by the banking industry to keep the payments market fragmented (Döderlein, 2020). In the UK, where the Competition and Markets Authority (CMA) mandated technical protocols, open banking services continue to grow. Indeed, European regulators are gearing up for a PSD3 regulation, one in which the rules will explicitly set forth standards.

Secure Sharing of Consumer Data

Increasingly, both of these approaches—market-driven and regulatory—are faced with the ongoing, complex challenge of the secure sharing of consumer data. As consumer data gets scrubbed and combined with other data, the question arises: whom does this "new" data belong to? The bank? The data aggregator who scraped the data and combined it into a new feed? Or the consumer? Consumers find cold comfort in knowing that while their data is anonymised, it is being sold to others for profit (Popper, 2017). In China, where the fintechs have the upper hand, debate rages about whether fintechs should open up their data to banks, and also about the value of consumer data and who ultimately owns this collective data. Is it the fintechs who created a service that generated the data? Is it society itself, which would benefit more widely if this data were not locked up in fintech?

This brings us back to the very early days of open banking, to the years following the 2008 GFC, when the financial sector was still seen as one of the most powerful industries in the world and GAFAM were not yet the titans they are now. Acting under the assumption that banks would continue to be the dominant industry, European regulators passed open banking rules that gave Big Tech access to the banks' customer data, should a consumer authorise it, as a fintech competitor. However, Big Tech companies now have their own collected data on consumers, giving them an advantage.



6.2.2 Beyond Open Banking and Open Finance to Open Data

Beyond Open Banking and Open Finance to Open Data

In Module 2 we were introduced to the next step in the open banking movement, open finance, and to the grand vision of “open data”: a world in which consumers own all their data (including financial data, health data, and behavioural or attitudinal data) and make the decisions about where their data can be shared. Let’s wrap up our discussion on open banking by looking at what opportunities are created for the finance industry in a world where all data is owned by the customer and can be used to build AI models.

Faculty Video: Opportunities in AI for an Open Development

In this video, Professor Pinar Ozcan describes some of the opportunities open data regulations provide for AI services in finance.



As we conclude the course, let's look forward to see what opportunities there might be for AI-based services in finance and beyond in a world where we have open data regulations. As you know by now, open data regulations will be cross-industry regulations, taking advantage of data being merged across industries, in order for us to take advantage of that data for different services.

This will mean that a competitor in finance will be able to access health data if we, as consumers, allow them to. Transportation data can be combined with insurance data. All sorts of data will be fair game in order for us to consider what services we'd like to get and what better deals we want to get with the analysis of that data.

What this also means, however, is that those players that already are advanced in data analysis and that already have large databases will be at an advantage in that future world. This means, however, that we need

to pay special attention to Big Tech players and other players that are already in possession of large amounts of data across industry data, if you will, and that these players will now have access to even larger amounts of data. They already have advanced skills in AI. And so this means that they have the power to dominate even more industries in the world and across the world.

Part of the difficulty is that regulators need to work together in order to curb the monopoly of these players. And that is a very difficult task when different regulators not only have different priorities but are also at different stages of their thought process in terms of looking at data sharing and the power of data analysis.

So what will the future bring us? More data, cross-industry data, and opportunities, lots of opportunities for AI, but at the same time, a constant battle between Big Tech and regulators.

6.2.3 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Following years of low to negative interest rates, banks have seen their preeminence slip, while the tech giants Google, Apple, Meta, and Amazon (collectively called GAFA) have surpassed them to become the world's most valuable companies. Fintechs have matured and continue to grow as a threat, especially around payments.
2. AI as a technology continues to make deep inroads, dramatically propelling the companies that have harnessed it, and especially GAFA, to new levels of profit and dominance.
3. Market-driven regions, including the US and China, have seen the technical side of open banking (that is, the sharing of data through a standardised API) run ahead of the secure consumer consent side of open banking.
4. Meanwhile, in Europe, where open banking was born, services have not quite taken off as regulators had hoped. European regulators are gearing up for a PSD3 regulation, one in which standards will be explicitly set forth by the rules.
5. Increasingly, both of these approaches—market-driven and regulatory—are faced with the ongoing, complex challenge of the secure sharing of consumer data. As consumer data gets scrubbed and combined with other data, the question arises: whom does this “new” data belong to?
6. There will be numerous opportunities created for the finance industry in a world where all data is owned by the customer and can be used to build AI models, with the advent of open banking and open data.

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To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[Mr. Open Banking Podcast](#): Listen to “Season 2, Episode 5: Open Banking in Europe”

6.3 The Evolving Landscape of AI

6.3.1 The Continued Rise of AI

Section Objectives

This section explores the future of AI in the financial services industry. We examine the factors accelerating the rise of AI, and we hear some predictions on the future trends of AI in finance. We also take a look at some of the challenges and risks businesses face as they bring AI into the organisation.

The Continued Rise of AI

At the same time that regulators are reshaping the financial industries of their regions through open banking rules, banking is being upended by the technology juggernaut that is AI. In the financial services industry, machine learning (ML) has made and continues to make deep inroads across the industry as institutions race to implement it. Covid-19 has brought even more pressure to adopt AI. According to a recent KPMG survey, *Thriving in an AI World*, the rate of AI adoption in the financial services sector has “skyrocketed”, with 84% of respondents reporting that “AI is at least moderately or fully functional” in their organisation (Krishna et al., 2021). This is a 37 percentage point jump from the last survey in January 2020. Looking ahead to the next two years, industry executives expect AI to have its greatest impact on fraud detection, risk management, and process automation.

Faculty Video: Open Data AI Strategy and the Future

In this video, Professor Martin Schmalz recaps key takeaways from the programme around AI in finance, and discusses his future predictions.



We've seen that the opportunities of using AI in financial services are unprecedented. It's not an exaggeration to call it the fourth Industrial Revolution. The ability to run the same processes and deliver the same products at a faster speed, at a higher quality, and much cheaper than ever before imply profit opportunities that are unfathomable.

At the same time, the same factors imply the competitive threat to incumbents. If your competitors-- and I don't mean the traditional banks and financial services companies, but perhaps tech companies, companies outside the traditional industry-- if those companies start to deliver your products faster, cheaper, and better than you are able to do it, obviously this is a lethal-- potentially lethal and competitive threat to the incumbent players.

And one factor you have to understand is that developing this technology takes time. In particular, machine learning algorithms work a lot better if they have a lot of data to work on. This is more true for some algorithms than others, but a lot of AI technologies need a lot of data and it takes time to collect that.

To just illustrate. Suppose an car insurance company now decided to collect data on driver behaviour by putting sensors into cars or contracting with car companies to share data about driver behaviour with them. It would take them years and years to try and catch up with Tesla, which is another way of saying, they probably won't catch up because Tesla, of course, doesn't stop with the data collection either.

So another takeaway is that what is feasible with AI changes constantly. The frontier of what machines are able to do and how machines are able to substitute and complement human intelligence changes at a speed that has not been seen before. The reason for that is simply that we are over a tipping point. The tipping point at which it has become so cheap for companies to collect data, store data, and process it, and make automated decisions with AI that now more and more are doing it. And the more companies are doing it, the more data gets generated, which can be reused elsewhere as well, either inside or outside the same company.

And, of course, this would be turbocharged if regulation forced companies to share their data about certain processes or individuals with competitors. The technology is such that having more data makes it more attractive to use machine learning algorithms and make automated decisions because humans are not particularly good at processing large quantities of data in a high quality fashion. So it is therefore incumbent upon all businesses to spend a lot of their time thinking about which processes can be automated with AI, which areas of their business they make predictions, and which decisions rely on such predictions, and which of these predictions and decisions can be automated with machine learning algorithms for the prediction part and AI systems when it comes to the automated decisions.

And, in fact, there's nothing conceptually new about that. Of course, businesses have always tried to make the processes cheaper to automate certain processes. I grew up in Germany. The car industry is obviously an example of that. So what has changed is the speed of change, the speed at which the AI frontier is moving, and which processes are economical to replace or complement with artificial intelligence is now moving faster than it ever has. And that speed is only going to pick up from here.

So what about some future predictions? Well, as a benchmark, I would say let's assume that the past trends continue. In terms of technology, it will probably not become more expensive again to store data because for technological reasons, the cost of storing and processing data is on a downward trend. What it implies is it becomes more and more attractive to use machines to analyse these troves of data and use it for automated decision-making. A second prediction is that legal constraints are going to pop up, keep popping up right and left that constrain these businesses in various dimensions, and that the speed and intensity at which these legal constraints start to emerge differs across jurisdictions, countries, or even states within countries.

Open data in some ways is, of course, just an extreme version of the data becoming cheaper to collect. If you get it for free by decree from competitors or get access to it at a cheaper way, that just accelerates the trends. But at the same time, it means that processing certain pieces of data are no longer a competitive advantage in case you're forced to share it with competitors. Now, the devil here is in the detail to find out to which extent particular pieces of data have to be shared with competitors and which parts remain proprietary.

Regulators have to likewise be up to speed on the technological trends and how the technology is used in practice. We've heard from Christina that competition laws are hopelessly out of date to deal with the challenges of a data economy. At the same time, we've heard that competition regulators in China have come up with a comprehensive new toolbox or have proposed that. That puts new restrictions in how tech companies can use data and employ it for predictions and automated decision-making.

6.3.2 Trepidation from Businesses

Trepidation from Businesses

The same KPMG survey made clear that financial executives, despite the rapid pace of AI adoption, also believed their organisations were not moving fast enough. The survey reported that 85% of the executives surveyed wanted their businesses to more aggressively adopt AI (Krishna et al., 2021). Yet this is just half the story. On the flip side, 75% of the same respondents also admitted to feeling that business uses for AI might be more hype than reality.

What accounts for this divided view? According to KPMG, in the evolving landscape of AI, there is trepidation amongst businesses that they are falling behind in the increasing race to integrate into their companies a complex technology that they struggle to keep up with. Cliff Justice, the US Leader of Enterprise Innovation at KPMG, said in a recent MIT Technology Review podcast that it is not just the “exponential” changes in AI that make executives uneasy, but that introducing AI into an organisation is more than simply integrating a new technology tool (MIT Technology Review Insights, 2021). Justice continued:



Even if one could fully wrap their head around the progress of artificial intelligence and the potential of artificial intelligence, changing an organization and changing the mindset and the culture in a way to adopt and benefit from the opportunities that artificial intelligence poses and also protect against the threats take some time. So, it creates a level of anxiety and caution which is, in my view, well justified.

Faculty Video: The Impact of AI in Financial Services—Short Term, Long Term

In this video, Thomas Hellman, Professor of Entrepreneurship and Innovation at Saïd Business School, University of Oxford, discusses how AI-driven businesses are changing and transforming different industries, and in particular how they will change the finance industry.



I think it's very easy to sort of overestimate the impact of AI in the short run and underestimate the impact of AI in the long run. I think we're in for a deep transformation in many industries. AI is going to play an enormous role over a 10 to 20-year horizon. Although, over the very short-term horizon, often, I think the impact of AI can be exaggerated.

Now, if you look at the finance industry specifically, finance has always been about data and about trust. And I think AI is going to fundamentally change or challenge some of the existing methods, some of the existing institutions that we see in the finance industry. But that's going to take time.

I think for the moment, we've seen a fintech revolution. That's been about for about six, seven, maybe 10 years, depending on how you count. And it's been largely about the digitization of finance. I think the next wave will be bigger, deeper. And it's about bringing aspects of machine learning, artificial intelligence to the sector.

6.3.3 Considering Tradeoffs

Considering Tradeoffs

Recently, HSBC unveiled a new wealth management product in Hong Kong: an AI-powered equity index structured product, part of the company's AiPEX family of indices. In short, AI was in charge of picking the shares with the most promise. The HSBC announcement seemed like any other of the hundreds of corporate press releases heralding a new product. And yet, on closer reading, it strikes at the very heart of both the obvious benefits and enormous challenges of AI in financial services.

According to HSBC's announcement, the AI "objectively evaluates each of the 1,000 largest U.S. publicly traded companies" and identifies those whose share prices are "poised for growth" (HSBC, 2021). It does this by "ingesting and learning from" such data points as company announcements, tweets, satellite images, and "even the tone of language a CEO uses during an earnings presentation". Justin Chan, Head of Greater China, Global Markets, Asia-Pacific, HSBC, noted that the AI "simulates a team of thousands of analysts and traders working around the clock to analyse millions of information pieces".



The announcement was both awe-inspiring and anxiety-inducing: here was an AI product that was essentially doing the work of thousands of analysts and traders, faster, deeper, cheaper, and without pause. What will this department within HSBC look like in the future as its AI models continue to evolve? What will the impact be on the business strategy of the bank? Should these products perform better and prove more popular with customers? How many analysts and traders might eventually lose their roles?

As we learned in earlier modules, implementing an AI strategy comes with tradeoffs. Business leaders will need to understand not just what AI will bring to the business in terms of savings and revenues, but also the impact on the company's entire strategy and the risks that can emerge.

Guest Video: Using AI in a Safe and Secure Way

In this video, David Heike, Managing Director, Head of Risk Modeling—Consumer & Community Banking at JPMorgan Chase & Co., speaks about how banks can remain trusted institutions in the future, and how banks should use AI in a safe, secure way.



I think that we're on the cusp of a massive transformation of the financial services industry through AI and machine learning techniques. It's critical for business leaders to embrace this new technology, because I really think it's going to transform the way we manage risk, we generate revenue, and we service our customers. At the same time, it's important to think about risk controls around this emerging technology.

There are a number of risks that have always been there around models, about making sure that you're using data in a careful way, and you have good controls around data quality. That you manage the operational risks around technology. That you manage issues around bias. If you have bias in the data, you're going to have bias in the models. And you have to find ways to mitigate that.

In order to manage all of these risks, you need to have a good set of controls-- model risk controls, fair lending controls, data controls. And you need to stay on top of that. Testing on an ongoing basis is incredibly important. Because at the end of the day, we want to service our customers. We want to treat them fairly. We want to give them the best products. We also want to be a safe and sound institution that will be here for centuries to come. In order to do that, you need to make sure that you're using AI in a safe and sound way.

6.3.4 Reskilling for the Age of AI

New Job Responsibilities

As banks increasingly use artificial intelligence (AI) and machine learning (ML) to automate predictive and repetitive tasks, up to 37% of UK jobs, 47% of US jobs, and 77% of Chinese jobs may be displaced (D'Ercole et al., 2020). However, as some skills become automated, others will grow more relevant—such as bias mitigation, machine learning testing and training, and data analysis.

To obtain these newly relevant skills, finance professionals will be expected to upskill throughout their careers. The World Economic Forum, for example, predicts that active learning will be one of the top ten skills of 2025 (Zahidi et al., 2020). Already, several large banks have started to invest in strategic reskilling of their workers; in 2019, JPMorgan launched a US \$350 million upskilling initiative, and in 2020, the Bank of America announced that part of its US \$1 billion commitment to racial equity included skills development (Ward, 2020).

“As jobs are transformed by the technologies of the Fourth Industrial Revolution, we need to reskill more than 1 billion people by 2030.”

— Saadia Zahidi, Managing Director, World Economic Forum

Strategic Upskilling

Even if an employer does not offer a formal upskilling programme, finance professionals can—and should—chart their own roadmap, adapting Deloitte's suggestions for how to reskill workers (D'Ercole et al., 2020):

- Assess your current and future state:
 - Conduct a skills assessment and map your strengths.
 - Chart the trajectory of your current role.
 - Research and identify critical skills to develop.
- Invest in effective training:
 - Determine what type of learning fits into your life and schedule.
 - Find a modality—video, text, or audio—that works for your learning style.
 - Incorporate experiential learning: practice what you've learned in the real world.
 - Reflect on what worked well and what didn't post-course.
- Sustain change and make learning stick:
 - Share new skills and knowledge with your work teams.
 - Ask for targeted feedback.
 - Take on opportunities and projects that use your new skillset.

6.3.5 The Banking Future

The Banking Future

In May 2021, *The Economist* posed the question: will banks disappear? As *The Economist* notes, the stakes are high when it comes to banks disappearing or playing a diminished role, no matter how hated or feared they have been, given that they are the interface between the state and the economy. Banks are under attack from several fronts: tech companies both big and small, the capital markets, and even the public sector, as digital central bank currencies gain ground. Tech disruption is well underway in the retail banking sector, as more consumers choose banking products from tech players. Is it conceivable that countries, including the UK and the US, evolve into a China-style market, where super apps are the main way that consumers bank and banks are the ones begging tech firms to open their data? This remains to be seen, but the threat of Big Tech dominating retail financial services is not an idle one.

Open banking and the rise of AI can be used to the incumbents' advantage. As the host of Mr. Open Banking, Eyal Sivan, notes in his podcast, the future of banking is in the same platform model that Big Tech has employed to such dominant effect. Digital banking will increasingly need to be where consumers want it: embedded into the flow of the apps and services they use to conduct their lives. "If open banking is the 'how,' then embedded finance is the 'why,'" said Sivan. "By standardising the APIs, open banking allows network effects to take hold, dramatically accelerating the platformification of banking and bringing us ever closer to embedded finance, a world where banking services are ambient and invisible, there when you need them and gone when you don't." (Sivan, 2021).

Guest Video: The Next Evolution of AI

In this video, Ajay Bhalla, President of Cyber and Intelligence Solutions at Mastercard, speaks about the future of AI, including 5G and Quantum, and what it means for the future of the financial services industry and the world.



AI is incredibly powerful, as we just discussed. It is the new electricity powering our society and will drive progress in our society in the future. But as we all know, for AI to work, it really needs a lot of data. It needs the world to be connected digitally well. And this is where, I think, future technologies like 5G and quantum will play a major role in potentially transforming how we use AI in future.

If you look at 5G, which is now been introduced in many countries already, it's a game changer. It's a game changer because of the speed. It's a game changer because of the kind of connectivity you can get. And with the advent of internet of things, which can rely heavily on 5G technologies and make it work, it's going to create a lot of data, which can be very quickly accessed. So if you look at technologies like driver-less cars, they can be immensely successful by the use of these technologies. And it will enable a completely new generation of applications and services, which I think we can't even envisage today.

And if you look at quantum, that's, again, an incredible prospect. As you know, there is a lot of progress happening in the quantum space. It's still some time away. But, you know, as you know, companies are investing billions of dollars in the development of technology in this space. And you know, when so much investment goes in any technology, something comes out of it.

And I'm very hopeful that quantum, one day, will become a reality in this world. And again, that will again be a big step change. The kind of processing power that can enable is mind-boggling. And just visualize, when you combine these two technologies, what it can do to the future of the world.

And what applies to the future of the world will also apply to the financial services industry, the banking world, the payments world in a very, very big way. Because it's going to create new applications and services which consumers can use. So I would say you can expect a completely different world in the future. And I think AI will be the driving force behind this world.

6.3.6 Key Takeaways and References

Key Takeaways

Let's review the key points of this section:

1. At the same time that regulators are reshaping the financial industries of their regions through open banking rules, banking is being upended by the technology juggernaut that is AI.
2. Looking ahead to the next two years, industry executives expect AI to have its greatest impact on fraud detection, risk management, and process automation.
3. According to KPMG, in the evolving landscape of AI, there is trepidation amongst businesses that they are falling behind in the increasing race to integrate into their companies a complex technology that they struggle to keep up with.
4. Business leaders will need to understand not just what AI will bring to the business in terms of savings and revenues, but also the impact on the company's entire strategy and the risks that can emerge.
5. Tech disruption is well underway in the retail banking sector, as more consumers choose banking products from tech players.
6. Open banking and the rise of AI can be used to the incumbents' advantage. Digital banking will increasingly need to be where consumers want it: embedded into the flow of the apps and services they use to conduct their lives.

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6.4 Implementing AI in Your Business

6.4.1 A Framework for Identifying and Evaluating Your AI Project

Section Objectives

In this section, we will be delving into a framework for your AI project. You will be presented with seven key areas for consideration when thinking of implementing an AI project within your business. You will be guided through each step of the framework's process, and take away key points that you can apply when you propose an AI project within your organisation.

Faculty Video: Introduction to the Framework

Before we begin, take a look at this video where Professor Martin Schmalz introduces you to the AI framework that you will be delving into in this section.



By now you've learned a lot about what machine learning and artificial intelligence is, and how others have used it in their organisations to create a lot of value. But how do you implement it in your organisation?

The framework we're going to give you here is a step-by-step procedure. You could even call it an algorithm that allows you to convert the insights and the theoretical knowledge you've acquired in the programme so far into action and thereby lift potential also in your organisation.

Introduction to the Framework

In *Prediction Machines*, a book that focuses on the economics of AI, authors Ajay Agrawal, Joshua Gans, and Avi Goldfarb redefine AI as a “prediction tool,” or one that turns information you have—data—into information you don’t have—a prediction—to help you make an automated decision (2018). It’s a useful way to think about what you are trying to do by introducing AI.

Prediction tools use models to construct an “AI factory” that eliminates human bottlenecks and creates a “virtuous circle between user engagement, data collection, algorithm design, prediction and improvement” (Iansiti & Lakhani, 2020). The AI factory integrates input data to refine and train the algorithms. The algorithms use the data to make decisions and improve their own accuracy. The predictions then drive further action—either human or automated. The system is constantly refined through hypotheses as consumer behaviour patterns shift and as competitive responses, and process variations are tested.

Defining a Task

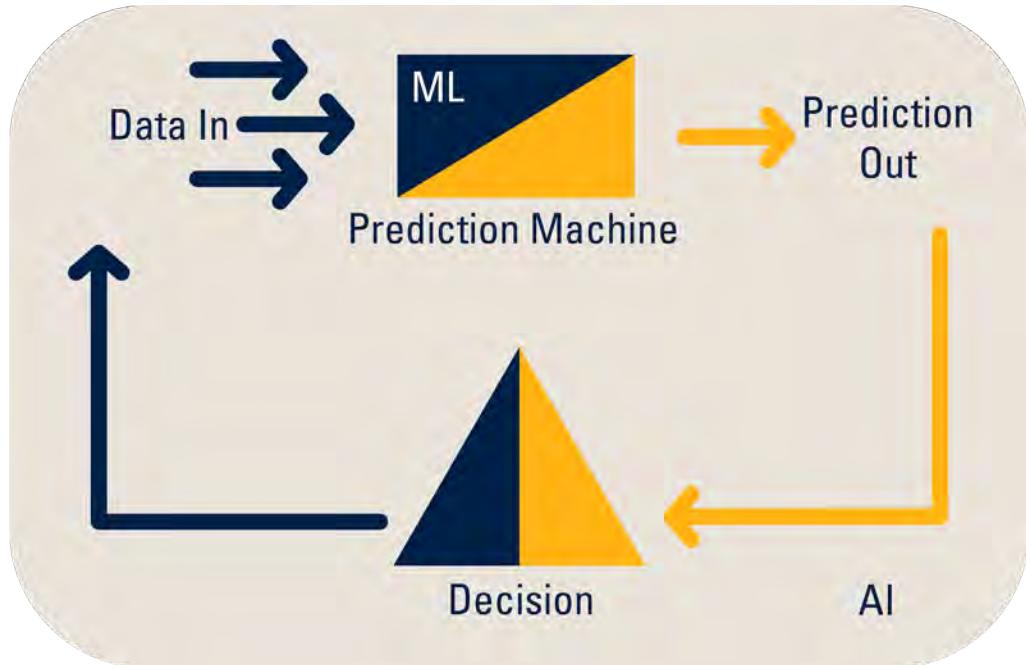
Because AI is better at automating particular tasks rather than entire jobs, you need to evaluate your use of AI within the context of a task. Start by identifying areas in your business in which humans make generic, predictive decisions based on past data. Note that you will need to thoroughly understand workflows to break them down to identify these tasks.

The Framework

When you have identified a task, you need a framework to evaluate AI's impact on that task. Implementing AI into a workflow leads to a number of questions about your business strategy, and you will need to parse through complex tradeoffs. You may discover, for example, that automating a particular task might prove too costly, or may alter your business strategy, or may open up an entirely new business model.

Agrawal et al. (2018) suggest a framework that identifies seven key areas to consider within every AI project:

1. **Prediction:** What are you trying to predict with your AI tool? (For example, is a transaction fraudulent? Is this applicant likely to repay the loan? What is the likelihood that this customer will become a repeat customer?)
2. **Input Data:** What data will you need to build your prediction tool and run the algorithm? Do you have enough of this data?
3. **Judgment:** Once your model begins to produce results, how will you value the decisions being made, and how will you prevent future errors? (For example, how will you determine and compare the value of preventing fraudulent transactions, the cost of a false negative, and the cost of missing a true positive?)
4. **Action:** What action or decision will you take based on the results of your model? (For example, will you reject more or fewer transactions or loan applicants?)
5. **Training Data:** As you refine your model, what additional data might you need beyond your input data? Is your data causing errors or unintended bias or discrimination?
6. **Outcome:** What are the results of your action? What key performance indicators (KPIs) should be put in place to measure the success of the task? (For example, should you aim for 30% more qualified loan applicants?)
7. **Feedback Data:** How can you refine the model further by feeding the outcome data back into the prediction tool?



6.4.2 Prediction and Input Data

Faculty Video: Considerations with Using Data to Make Predictions

In this video, Professor Pinar Ozcan discusses the types of data needed to build AI, including input data, training data, and feedback data, as well as important considerations that need to be made in building algorithms.



How will AI transform businesses? Computers can still not think for us and they will not be able to for a long time. However, what AI will make cheaper is prediction. And as prediction gets cheaper, we will see it everywhere. Just like we see it in the case of getting better, more suited products and services for retail. We will see it in the financial sector.

AI can help us predict whether a consumer can make it to the end of the month, whether they'll be able to pay back a loan if they get it. AI can also look at the spending patterns of a consumer and can tell us what is the best way for that consumer to save. However, in order to do all of that, AI needs data. AI is a capability where data is a complementary and 100% necessary resource as you know by now.

What types of data do you need in order to build AI then? You need three types of data to start with. You need input data, which is going to be the data that you use in order for the algorithm to be built. You will need training data in order to improve that algorithm. And finally, you will need feedback data in order for that algorithm to get better and better as it operates in the real world.

Sometimes these different sets of data that you need can be the same. So often, input and training data cannot be differentiated from one another, or sometimes it is difficult for you to get training data because training the algorithm in the real world can actually cost lives. Imagine Tesla trying to get training data for its autonomous driving algorithm by letting cars loose on the streets. This would not be possible.

And so a lot of times, you may need to build your algorithm based on limited data. Typically, a certain amount of input data will get you to a level of prediction that can be either 90% or 95%. And you may need a lot more data in order to get it up to 99%. A critical question to ask then is, how much value does this extra predictability add to my product or service? And based on the answer to that question, you may want to stay at that level of data access and therefore, predictability, or you may want to increase it further.

Imagine a money management app that has certain levels of prediction. This money management app can actually live with that level of prediction if it is not trying to give financial advice, which is an entirely different category. If the algorithm for the money management app can show to the consumer what their spending habits are and, therefore, what the prediction is for their savings at the end of the month, then that is already very valuable to the consumer. And the consumer can make their own decisions in terms of how to save better. You don't need the extra predictability in that case.

Another important consideration when you're building an algorithm based on existing data is to interpret the data correctly. In their book *Prediction Machines*, Professor Agrawal and his colleagues actually look into a very interesting case of World War II bomber planes and how they improved their strength. Examining those planes that came back from their missions, engineers and mathematicians were looking into what bullet holes they had on the plane and therefore, how they should strengthen these planes for their next mission. In this particular case, the data is the bullet holes on the plane, which shows you where the plane was hit.

Looking at this data, your first intuition might be to make the plane stronger where the bullet holes are. However, this is actually exactly the reverse of what you should do. Keep in mind that the data that you have is about the planes that are coming back from their mission, whereas a bunch of other planes have not come back from their mission. So the data that you have actually shows you that the bomber planes that get hit in these particular parts of their body can make it back to their base. However, those that get hit in other parts of their body did not make it. So therefore, you should strengthen the parts that don't have bullet holes rather than those that do.

Another important consideration when you're building an algorithm is to try to decide whether you need what we call a human in the loop. This means that a human is part of the system in order to look at the prediction and to make a judgment. As you can imagine, having a human in the loop greatly increases the cost of your entire production. However, this may be necessary if it's a life-saving situation or having a human in the loop greatly increases the predictability. However, in a situation where the speed of judgment is more important than the accuracy of the judgment, then having a human in the loop can be a liability. .

Prediction: What Are You Trying to Predict?

Before you embark on an AI project, it is critical to pinpoint and understand:

- What in your business process you are trying to “predict”. What outcome do you want to more accurately infer based on past data?

- How you will use AI in the context of the chosen task. When you apply machine learning to the task, a number of new questions may arise: Is this new outcome part of our wider business strategy? Is automating the task possible, but prohibitively expensive?
- Your current process. How quick and cost-effective has this process been in gathering, compiling, and analysing the data that will be used to make decisions based on human prediction? If your results or earnings are not as effective as you would like, what factors are involved, and can AI mitigate these factors? For example, regression models have been useful, but they are also very sensitive to poor data (Gallo, 2015). Machine learning, on the other hand, has improved in performance as computing power has increased and data sets have gotten larger.

Based on Your Answers, Could Machines Reasonably Be:

- 1. Faster?** As we have learned in the programme, companies that have successfully deployed machine learning can speed up the prediction process by automating it, which could in turn help the decision-making process.
- 2. Cheaper?** Has your data set become so large that human analysis is no longer cost-effective? Weigh the value of AI-analysed data versus human-analysed data.
- 3. Better?** Could machines more accurately make these predictions?

Input Data: What Data Do You Need?

Machine prediction needs substantial amounts of data to perform well. Input data is used to train the algorithm for prediction and initial validation.

Use the following questions to evaluate your data, including whether you have enough of it. Consider your sources of internal and external input data (from open banking feeds, platforms, partners, public, customer devices, and so on).

Do you have a plan to obtain the data to train the algorithm?

If no:

- Consider how you can obtain the data you need, both from internal sources and external sources.
- Be aware that data can be expensive to acquire—thus you must evaluate if the benefit of the data is worth the cost of obtaining it.

If yes, is the data:

- Readily available?

- If not, but the data exists, where does it reside?
- If not, because the data doesn't currently exist, what are ways to collect it—and what can you offer consumers in return for their data? For example, Vitality, a UK health insurance company, gives away free Apple watches to get access to some of the health data the watches collect (Vitality, 2020).
- If so, and the data is with an external party, how can you access it—and what would you have to give up in return? (For example, a startup might give up freedom to develop any product on the big bank data.)
- The quality you need? As with all types of algorithms, “rubbish in” produces “rubbish out”.
- The type that you need? You need three main data types: input, training, and feedback data. In addition, you eventually need your data to be:
 - Clean (for example, without duplications)
 - Structured
 - Properly formatted
- The quantity you need? Ensure that your data can scale with successful project implementation.
 - How much data is enough at what stage? (How effective does your algorithm need to be in terms of predictive success? How critical is accuracy?)
 - If your input data is limited but just enough, how can you get training data for later (for example, through industry partnerships or data sandboxes)?
- Unique?
 - Differentiated data can help you gain a competitive advantage in and of itself.
 - If your data is not unique, you must either get your AI model in the marketplace faster than others, or build a model that is more effective than others.
- Siloed?
 - Ensure that your data is not siloed between different programs and/or business divisions.

After you have trained and run the algorithm, consider: Could or should you expand your existing data set?

Guest Video: The Importance of Clear Goals and Considerations About Data

In this video, Karen Smith, Partner at IBM responsible for data sales and delivery across financial services sector, and Paul Lucas, Distinguished Engineer at IBM specialising in Core Banking and Payments Transformation and large-scale systems integration, discuss why it is important to have a clear goal of what you are trying to achieve with your AI project, and some of the pitfalls to look out for when considering data to use in your AI project.



Karen Smith: I don't think it's an exaggeration to say that probably 70% to 80% of data science doesn't get productionalized. So we do see swathes of data science teams producing incredible work, absolutely incredible work, but it doesn't get productionalized. It doesn't get productionalized because it's interesting. And well, who would own this? Where would we take it? What good would it do? Oh, I'll just leave it there for a moment. And then go on to the next one.



Paul Lucas: What I'd add to that is the sheer amount of drag that the large amounts of data we're dealing with create on that process of making sure you have a clean known source. Banks have been around. Well, we know systems that are from the 60s. And some of them have data from the 60s. So there is an enormous amount of drag in trying to clean up your data, just because of the sheer volumes of it. So even though AI is very much a kind of a cutting edge activity at the moment, it's still dragging behind it that huge historical legacy of data. And it's very easy to get focused on the shiny new stuff and forget that you're going to be dragging this thing behind you and trying to clean it up to get to where you want to be with that data.

Karen Smith: Big banks, loads of disparate data. No necessarily consolidated enterprise single view of their customers. Some have, some haven't. Conforming that data in a way to produce it upwards is really, really key. You don't do that. Some of this stuff, it is not going to work. So getting organized in an appropriate way, getting all the data that you need in there is key. Those that do well at it, those banks that do well are the banks that set out right, we would like to do x. We want to get our aims here, we're going up the ladder. Our aims here and we want to get that rather than those that have the teams of data scientists sitting there, cranking handle if you like, rather than going through that ladder with an ultimate aim.

Let's take the screening example that I gave you. With an aim to improve screening of customers as they join the bank. There's another point as well on that I'll mention and that's bringing external data in as well. Now external data, there's a wealth of it on the internet that's free for anybody to take. It's really useful, and a lot of banks are using that data to add to the data they hold about their customers, to inform about local environments, particularly, now with the climate change, et cetera, with ESG, and with Brexit, to add to that data, to make it more real for the moment.

However, the banks need to be very careful how they use that data. Because if you're producing lots of information and you may find that one of your customers can't pay because people have made or done whatever it might be, whatever the situation will be. The regulator is now coming down a lot harder on things like this. And we see that change in the future. The regulations will change as a result of the growth of data, how much data is being produced? And what the banks are doing with it. So there are things to be wary of as well as all the great stuff.

6.4.3 Judgment and Action

Judgment: What Value Could AI Bring?

After your model generates results, you need to apply judgment to determine what value AI has brought to the business process. You need to:

- Work out the payoffs for different actions in different situations. (For example, your model determines that the likelihood of applicants defaulting on a loan is 3%. What are the implications for accepting up to 3.5% in terms of cost?) How aggressive should you be in your decision-making?
- Understand the consequences of acting on wrong decisions, as well as correct ones. (For example, what happens if you incorrectly judge a credit card transaction to be fraudulent on a high worth account?)

Action: What Action Will You Take, and Can the Action be Automated?

Once you have made your judgment, you need to take action. For example, if your judgment is that you will accept transactions that have a 3.5% likelihood of being fraudulent, your action would be to accept or reject these transactions.

- Determine if the judgment could be automated. For example, a self-driving car makes decisions autonomously—whereas a financial “robo-advising” model might simply present predicted outcomes to a human for further analysis and decision-making.
- Consider the “action-situation” combinations that result from making a decision. Are these combinations of a size, scope, and predictability that are better managed by a machine versus a human? In some cases, the action-situation combination may constitute a costly exercise for a machine, but a quick one for humans.
- Think about whether humans represent a bottleneck or judgment figure. Humans are necessary in the model training/testing/monitoring (and possibly retraining/retesting) loop. But do you also need them in the decision-making and production loop? Removing them could increase your organisation’s ability to scale your business. On the other hand, removing humans could also raise issues of liability, bias, explainability, and more.

6.4.4 Training Data and Outcome

Training Data: What Are the Legal and Ethical Implications of Your Algorithm?

As you refine your model, you need to consider what additional data you need to train the algorithm further. Training data is used to produce the actual prediction and to train the algorithm for improved results.

However, as you plan to collect additional data, you must also balance consumer privacy, accuracy, and fairness:

- **Privacy versus accuracy:** The more training data you use, the more accurate your model, but the more invasive the data you collect on your customers must be. How can you collect the type of data that will ensure your algorithm is accurate while maintaining consumers' privacy?
- **Accuracy versus fairness:** AI systems can lead to discriminatory outcomes—but the technical measures to reduce this risk can diminish output accuracy. What measures can you enact to produce fair outcomes that are also accurate? What level of accuracy can you sacrifice for fairness, and vice versa?
- **Privacy versus fairness:** Privacy can conflict not just with accuracy, but also with fairness. How can your company make sure your algorithm is fair without collecting data on protected characteristics, such as sex or age?

Faculty Video: Considering Crowd Behaviour and Consumer Privacy

In this video, Professor Pinar Ozcan discusses the dilemma of changing crowd behavior, and the tradeoff in terms of consumer privacy.



One of the dilemmas that we have to pay attention to when we're building an algorithm is what to do with the prediction itself changing crowd behavior. One of the dilemmas that the developers of Waze's algorithm for its driving app faced was what to do with drivers always wanting to take side roads, alternate routes, and avoiding traffic. Who is going to then find out whether the traffic is still there or not?

And so Waze had to pay attention and really make a trade off in terms of making some consumers less happy because they needed to stay on the main road and give data to Waze in order for Waze to know whether the traffic has cleared or whether it's still there. This can be a very important consideration when you're thinking about investment apps that are giving the same prediction to thousands, if not millions of investors for doing a certain thing.

And finally, as you're starting to think about how to access data and build more data on top of what you have, you also need to consider whether you're facing a trade off with consumer privacy. Clearly, giving less privacy to

consumers, collecting data more aggressively, will give you a better algorithm. However, it will also come at the cost of reputation in certain cases.

This is why we see Apple really emphasising how they will not build a profile on you, but they will just base their AI services on the data that you give through their hardware, which is iPhones and computers and tablets. Whereas Google has a much more aggressive profile building activity, where they make most of their revenue through advertising based on prediction.

How aggressive can you be in your data capture effort without turning off consumers? If you're building a loan app, then clearly the people who are going to use that app are people who need loans, and therefore they might be a bit more willing to share their data in order to get better rates and in order to generally be better off. However, in other circumstances where consumers don't expect you to capture data aggressively, you may really damage your brand if you do so openly.

Outcome: What Are the Results of Your Action?

After you have run your algorithm, you need to be able to measure the outcome and consider implications around behaviour, privacy, explainability, the speed at which you can bring the AI to market, and more. An effective plan will consider all of the following aspects of the outcome:

- **Key performance indicators (KPIs):** What are your metrics for success?
- **Initial error rate:** What sort of initial error rate will your AI product have? Is this rate acceptable in terms of:
 - **Brand reputation:** Will your use of your AI model damage your brand or even put your customers in danger? (For example, Tesla ran into the problem of gathering more training data, because to gather that data, it would have to put its autonomous vehicles in "live" situations.)
 - **Accuracy:** What is acceptable, in terms of prediction power? For example, an 85-90% accuracy rate would not be considered strong enough for most autonomous driving decisions, but those results are quite good with regard to wealth management.
- **Behaviour implications:** How might your algorithm change customer behaviour over time? For example, what might happen if all robo-advising models from an organisation with a large user base pushed the same stock buying or selling behaviour without accounting for live feedback data?
- **Ethical and legal implications:** Would the use of AI present any legal or ethical concerns in terms of data privacy, storage, transfer, and access; existing data bias; and the potential for algorithmic bias? If so, you must have a viable strategy to deal with each of these issues.
- **Privacy and aggressiveness in data collection:** If you must collect data from your users, how aggressive must you be in collecting it, and could this damage your brand reputation? How can you also mitigate privacy concerns?

- **Explainability/human language:** Can you fully explain how your algorithm works and its results to:
 - **Regulators?** In a regulated environment, you might choose an algorithm that has a lower level of prediction, but is more explainable.
 - **Customers?** If the algorithm denies a loan application, it is important to be able to explain why.
 - **Competition?** Explaining your algorithm could potentially expose trade secrets.
- **Speed to market:** How quickly can you ramp up your AI? The faster you bring an AI model to market, the better your chance to gain a head start on collecting data and training your algorithm, compared to competitors.

6.4.5 Feedback Data: Refining and Improving Your Algorithm

Feedback Data: Refining and Improving Your Algorithm

Models are built and tested in the “lab” based on input data and training data. The third type of data—feedback data—can be mined only after your model has been deployed in the real world, and is used to improve predictions over time and to refine the algorithm. Once you have enough feedback data, you can bring the model back into the lab for re-testing, re-training, and re-deployment.

When you prepare to feed your data back into the algorithm, consider these questions:

- Based on your results, how can you use the outcomes to improve the algorithm? Examine if your algorithm is:
 - Interpreting the *right* data?
 - Interpreting the data *correctly*?
- How might you need to change your algorithm over time?
- What can you do to maximise feedback data?
- Can you use your existing or future business model to generate data, which will eventually allow you to automate decision-making? (Think of Tesla and self-driving cars; then think of Tesla and car insurance underwriting.)
- Has your model experienced either of these forms of “model drift”, or the loss of predictive power?
 - Concept drift occurs when the values of hidden variables change over time (Sammut & Harries, 2011).
 - Data drift is caused by unexpected events that can change the value of the input data (De Dios Santos, 2020).

6.4.6 AI Framework Downloadables

Framework Downloadable Images

We've put together a couple of downloadable images that you can save and keep with you to remind you of the steps to take when embarking on an AI project. The first is an outline of the seven steps in our AI Framework. The second is some tips to remember before you begin your project.

Implementing AI in Your Business Framework

- [Download the PDF](#)

Before You Start Guide

- [Download the PDF](#)

6.4.7 Key Takeaways, References, and Optional Resources

Key Takeaways

Let's review the key points of this section:

1. Prediction tools use models to construct an “AI factory” that eliminates human bottlenecks and creates a “virtuous circle between user engagement, data collection, algorithm design, prediction and improvement”.
2. Start by identifying areas in your business in which humans make generic, predictive decisions based on past data. Note that you will need to thoroughly understand workflows to break them down to identify these tasks.
3. Implementing AI into a workflow leads to a number of questions about your business strategy, and you will need to parse through complex tradeoffs.
4. Before you embark on an AI project, it is critical to pinpoint and understand: What in your business process you are trying to “predict”. What outcome do you want to more accurately infer based on past data?
5. Machine prediction needs substantial amounts of data to perform well. Input data is used to train the algorithm for prediction and initial validation.

6. After your model generates results, you need to apply judgment to determine what value AI has brought to the business process.
7. As you refine your model, you need to consider what additional data you need to train the algorithm further. Training data is used to produce the actual prediction and to train the algorithm for improved results.
8. After you have run your algorithm, you need to be able to measure the outcome and consider implications around behaviour, privacy, explainability, the speed at which you can bring the AI to market, and more.

References

To deliver the highest quality content, we collate information from many leading sources. References are included to attribute works to their original authors. Some of the sources used are freely available, and some are not. Subsequently, the links found in module reference lists may require you to purchase access.

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Optional Resources

[Professor Martin Schmalz on planning your pilot stage](#)

[Pinar Ozcan on Change Management](#)

[A Primer on Data Drift](#)

[Big Data's Hidden Scourge: Data Drift](#)

6.5 Further Reading

6.5.1 Further Reading

Further Reading

If you are interested in further reading, check out these book recommendations from Professor Ozcan and Professor Schmalz:

Martin Schmalz and Uri Bram, *The Business Of Big Data: How to Create Lasting Value in the Age of AI*

Rather than competing against the growing technology, Schmalz and Bram argue for integrating AI into finance and business structures, technologies, and everyday life, and outline how to do this successfully.

Michael Wooldridge, *Artificial Intelligence: Everything You Need to Know About the Coming AI*

Computer scientist Michael Wooldridge recounts the history and evolution of intelligent machines and AI, from Alan Turing's vision of thinking machines to Siri in the 21st century.

Eric Schmidt and Jonathan Rosenberg, *How Google Works*

Former CEO Eric Schmidt and former SVP of Product Jonathan Rosenberg delineate insider guides and strategies at Google, explaining the shift in power balances from corporation to consumers. They detail the ever-growing need for "smart creatives" in technology, as well as the importance of corporate philosophies that allow for creativity and innovation.

Tim Wu, *The Attention Merchants: The Epic Scramble to Get Inside Our Heads*

In a world with limitless information at arm's reach, human attention has become the "ultimate commodity." Wu tells the story of technological companies' fight to hold consumers' focus in a digital age.

Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*

In this examination of the machines at the forefront of economic and societal transformations, the authors also frame arguments for the best strategies for prospering in the new world of machines in areas of life, politics, economy, and technology.

Karim R. Lakhani and Marco Lansiti, *Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World*

Lakhani and Lansiti show how traditional constraints of business growth are removed by restructuring the frameworks that surround AI in data analytics and operating models. This book serves as a guide to firm competition in the age of AI.

Ajay Agrawal, Avi Goldfarb, and Joshua Gans, *Prediction Machines: The Simple Economics of Artificial Intelligence*

Economists Agrawal, Goldfarb, and Gans explain how tools from economics provide powerful insight into AI's pivotal role in decreasing the cost of prediction, and what this means for entrepreneurs, policymakers, CEOs, and businesspeople.

Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order*

While the United States has long held the spot as the global leader in AI, Lee outlines the astonishing pace at which China has caught up, creating US-Sino competition. Lee argues that the cultural and societal transformations that accompany AI's rise may precipitate tumultuous upheavals sooner than expected.

Stuart Russell, *Human Compatible: Artificial Intelligence and the Problem of Control*

Russell explains the workings of AI and the technology's endless capacity for humans while laying down the crucial importance of maintaining control of intelligent machines. Russell argues for a reshaping of AI's foundations to avoid existential threats by the increasingly powerful technology.

Margherita Pagani and Renaud Champion (editors), *Artificial Intelligence for Sustainable Value Creation*

Offering insight into the possibilities and challenges that coexist with the spread of AI, the editors also take a look into the effects of AI on society and businesses.

Kate Crawford, *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*

As she focusses on AI's exploitative costs to the planet, low-wage workers, and more, Kate Crawford provides a "material and political perspective" on the rise of AI as the world shifts to a planetary network built increasingly on inequality.

Andrew McAfee and Erik Brynjolfsson, *Machine, Platform, Crowd: Harnessing Our Digital Future*

Experts McAfee and Brynjolfsson examine the different opportunities and challenges presented by the rapid, recent rise of various digital and scientific technologies in business.

Cade Metz, *Genius Makers: The Mavericks Who Brought AI to Google, Facebook, and the World*

In this in-depth presentation of the contemporary history of AI and deep learning, Cade Metz focusses on the stories of innovators who built this technology from its infancy.

6.8 Congratulations! Programme Wrap-Up

Faculty Video: Programme Wrap-Up

In this video, Professor Martin Schmalz and Professor Pinar Ozcan wrap up the programme by sharing their insights on the future of AI in finance and open banking.



Pinar Ozcan: Congratulations, you've reached the end of the programme. You've worked so hard and learned so much together with us as you went through the modules and understood what led to the rise of data-driven technologies in finance and how the financial sector is transforming through these technologies. Out of the many topics that we explored together, what is really closest to my heart, what excites me the most, is really how technology can be used in order to improve financial wellness.

As you have seen, AI can be used to improve financial wellness in many different ways. It can help reduce debt, it can help people save better. And all of this can have a huge impact on people's mental and physical health. This is a wonderful place to be, to watch these opportunities, and to participate in them. As you move forward after this programme, make sure that you keep in touch, not only with us in order to find out about the latest research related to these topics and also the new and exciting courses that we're offering, but also keep in touch with your network, with one another. Because as I said before, this network can really be a great resource when you are thinking about adopting new technologies in your organisation. Now over to Martin.



Martin Schmalz: Thank you very much, Pinar. I also want to congratulate you for completing the programme. Heartfelt congratulations. Well done. So you've now taken a pretty solid look at what makes AI applications in finance exciting and economically profitable, but you've also seen a few of the challenges that are likely to come up. And a few of these challenges come from inside your companies, in terms of culture, in terms of incentives to innovate, in terms of treading on other people's turfs and others that come from the outside, such as new rules and regulations that you will encounter in the next few years in this space.

And I hope we've given you a framework to navigate those challenges and a few good examples that help illustrate these frameworks and concepts. So please stay in touch with us at the school. And in due course, you will also be invited to join the alumni community. And I look forward to reconnecting with you there.



Wrapping Up: Important Logistics

Oxford Artificial Intelligence in Fintech and Open Banking Programme
2022

Oxford Artificial Intelligence in Fintech and Open Banking

Wrapping Up: Important Logistics



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W.2 Certificates, Badges, and Credits

W.2.1 Certificates and Badges Overview

Credentials

When this programme ends, if you have earned a score of 50% or higher for your work and have successfully completed ID verification, you will be eligible for three types of credentials:

1. A **digital badge** on the Credly platform. This credential is published to the blockchain, and is shareable, printable, and embeddable. You will receive an email from Credly on **14 September, 2022** with information about how to claim and share your badge. This is ideal for sharing on social media.
2. A **printed certificate** will be physically mailed to you 7–10 weeks after the programme end date (if you decide to opt-in). We will use the mailing address you entered during the Orientation ID verification survey UNLESS we hear from you in the next section that you need the certificate mailed to a different address.
3. A **digital certificate** available from your programme dashboard. This credential will be ready for you on **14 September, 2022**.

More information about each of these credentials follows.

W.2.2 Digital Badge via Credly

About Your Badge

Learning, employment, and advancement opportunities are intertwined, but a career path rarely follows a straight line. Saïd Business School, University of Oxford, wants to recognise your learning achievements and skills in a way that connects you with opportunities that can serve as milestones along your career path. That's why we issue digital credentials through the Credly platform. In addition, Credly offers **blockchain-backed credentials**. By issuing digital credentials on the blockchain, Credly is using the latest technology, supporting high-volume verification requests of future-proof and tamper-proof credentials. Upon acceptance of your badge, it will be published to the blockchain.

What Is a Digital Credential?

Digital credentials go beyond paper certificates. They are portable, verifiable, and uniquely linked to you. They also ensure that your hard-earned achievements are owned by you, not us — you can access and utilise your digital credential whenever and however you see fit. Digital credentials make you — and your achievements — more visible to employers and your professional network.

Share Your Achievements with Your Network

Your skills, competencies, and certifications are worth more than a static bullet point on a resume or a paper certificate hanging on the wall in your office. When your achievements are represented as a digital credential, you can share your achievements with your network in one click from Credly's Acclaim platform. Peers and employers can verify and learn more about what it is you can do, thanks to earning a digital credential from Saïd Business School, University of Oxford. And research shows that professionals who share their digital credentials to professional networking sites are discovered by employers, on average, six times more often than those who do not.

You will be able to connect your LinkedIn, Twitter, Facebook, and XING accounts to your Credly profile, which will allow you to:

- Post the unique badge URL on social media
- Embed the badge on a personal website
- Send the badge via email to a contact or employer
- Download the badge visual for a resume or email signature
- Download a printable version of your badge
- Send the badge through Facebook Messenger and WhatsApp on a mobile device

Find Your Next Career Opportunity

You've invested time and money into advancing your skills, and your Saïd Business School, University of Oxford digital credential can unlock career opportunities for you. Credly's labor market insights help you:

- Discover new skills that complement what you already know
- Connect with the next certification along your career path
- Search and apply for your next job opportunity

Claiming Your Badge

On **14 September, 2022**, you will receive an email notification from Credly with information on how to create a profile on the Credly platform.

Once you sign in, you will be able to claim your pending Oxford AI in Fintech and Open Banking Programme badge. There will be clear instructions for claiming and sharing your badge in the email.

Have questions? You can email oxfordsuccess@esmelearning.com.

Credly Badges

[Download the PDF](#)

W.2.3 Physical Certificate

Saïd Business School, University of Oxford is committed to sustainability. You will be receiving a digital certificate and a shareable digital badge. If you would like to receive a printed copy of the certificate, please opt-in online.

Keep your eye on the post for a beautiful Saïd Business School, University of Oxford printed Certificate of Achievement. Perfect for framing or placing in a scrap book, your certificate signals to the world that you've worked hard during this rigorous 6-week programme.

We will mail your physical certificate to the mailing address you gave us in your ID verification survey during Orientation. If you would like your certificate mailed elsewhere, or if someone other than you handled billing, please enter your current mailing address below no later than **2 August, 2022**.

Note that if we receive no response from you by then, we will send to the address we have on file.

Physical certificates will arrive in **7-10 weeks**.

W.2.4 Digital Certificate

This programme issues digital certificates. **Certificates will be awarded on 14 September, 2022.** When certificates become available, a link to your certificate will be visible on your [dashboard](#). You can view and print your certificate. Though there are options for sharing this certificate via social media, we recommend sharing your Credly badge instead.

View Your Certificate

To view your certificate, click the link on your [dashboard](#).

Print Your Certificate

To print your certificate, open the certificate in your browser, and then you may either take a screenshot to save as an image and share, or select **Print Certificate** in the certificate header. We recommend using the A4 paper setting for an optimal printing experience.

Share Your Certificate

We recommend that you share your Credly badge instead of your digital certificate on your LinkedIn and other social media sites. We've outlined some of the benefits of sharing your Credly badge in the Digital Badge via Credly section of this module, and you'll get more information on how to claim and share your Credly badge in an email on **14 September, 2022**.

If you'd still like to share your digital certificate, see [How can I add my certificate to my LinkedIn profile?](#) or [Share a Web Certificate](#).

W.3 Continuing Education Credit

W.3.1 IACET CEUs

International Accreditors for Continuing Education and Training (IACET)

We're happy to inform you that Esme Learning Solutions is also accredited by the International Accreditors for Continuing Education and Training (IACET) and offers IACET CEUs (Continuing Education Credits) for its learning events that comply with the ANSI/IACET Continuing Education and Training Standard.

IACET is recognised internationally as a standard development organisation and accrediting body that promotes quality of continuing education and training. Many companies, regulatory boards and organisations have been reported to accept the IACET CEU credit, and you can check the [list of organisations accepting IACET CEU credit here](#).

Successful completion of this programme with a score of 50% or higher earns you 6.0 CEUs.

W.3.2 CPD Credit Hours

Continuing Professional Development (CPD) Hours

We're pleased to inform you that the content of this programme has been independently certified by the CPD Certification Service as conforming to continuing professional development principles. You may declare up to **44** CPD hours for the Oxford AI in Finance and Open Banking Programme. You can learn more about CPDs and how to use them on the [CPD website](#).

Contact registrar@esmelearning.com to obtain a copy of the certificate verifying that this programme is CPD-certified if needed.

W.4 Access to Materials and New Offerings

W.4.1 Access to Online Materials Until 6 September, 2022

Access to Programme Materials and Riff

Access to your programme materials and to Riff will be available for six weeks after the programme ends, until **6 September, 2022**. During the six weeks, you can access programme materials from your [dashboard](#), and download the materials that you want to save.

You can [access Riff](#) by using your browser, or by using the links in the programme.

Once programme access has ended, we encourage you to stay in touch with your classmates. Check out the Staying in Touch lesson to learn more about how to join the Oxford International Online Community and stay connected.

Complete Your Downloads Before 6 September, 2022

You can find individual module, transcript, and Key Takeaways downloads in the [Downloadable Notes](#) section of the programme material.

If you'd like to download the entire packet of programme materials together, you can do so here:

[Oxford AI in Fintech and Open Banking Full Programme Download](#)

Note: This is a large download, at 8 MB.

W.4.2 Upcoming Oxford Programmes Start 14 September, 2022

Don't forget to tell your friends about this programme! Our next presentation starts on **14 September, 2022**. For more information, see the [Oxford AI in Fintech and Open Banking Programme](#) or contact Esme Learning at oxfordprogrammes@esmelearning.com.

We would be thrilled to have some familiar faces in our next six-week online programmes from Saïd Business School, University of Oxford.

And now that you've completed the Oxford Platforms and Digital Disruption Programme, you've joined the ranks of the Oxford e-lumni network, and you're eligible to receive £350 off any online Oxford Programme listed on [esmelearning.com](#) by entering code **OXFALUM2022** at checkout.

For more information, follow the links below:

- [Oxford Blockchain Strategy Programme](#) - next presentation starts **14 September, 2022**
- [Oxford Digital Disruption and Platforms Programme](#) - next presentation starts **21 September, 2022**
- [Oxford Fintech Programme](#) - next presentation starts **14 September, 2022**
- [Oxford Cyber Security for Business Leaders Programme](#) - next presentation starts **28 September, 2022**

W.5 Staying in Touch: Join the Oxford Saïd Community

W.5.1 Join the Oxford Saïd Community

You Are Invited to join the Oxford Saïd Community

The online offerings from Saïd Business School, University of Oxford, are designed to enhance your personal development and fast-track your career. These programmes furnish you with skills to unravel complex problems and engender success across businesses.

The completion of your programme puts you in league with a global network of e-lumni, and offers you extensive benefits exclusive to members of this Oxford Elumni Community. You'll be granted access to:

- A special Elumni reduced rate of 10% off of the fee on your next Oxford Saïd online programme to support your lifelong learning goals
- A dedicated group on LinkedIn—the [Oxford Executive Education Alumni group](#), an official Saïd Business school, University of Oxford alumni group for all Executive Education programmes, with over 7,000 members
- The Oxford Saïd Elumni newsletter, which will keep you updated on news, events and other opportunities at the Schools (be sure to opt-in below)
- Further opportunities to learn from Oxford faculty and thought leaders through a range of events

In addition, you'll have access to regular networking and informational events hosted throughout the year by some of the world's best University societies, such as the Oxford Guild - the most prominent university society in the world and among Europe's oldest.¹



Throughout its over hundred-year history, the Guild has been a source of inspiration, encouragement, and guidance to some of the best and brightest minds. The Guild's inimitable global reach provides its members singular opportunities to meet and network with experts from various industries and backgrounds.

¹ [The Oxford Guild](#) (Nd). Accessed 31 March 2021

W.6 Summary of Important End-of-Programme Dates

W.6.1 Important End-of-Programme Dates

A Recap of Important End-of-Programme Dates

10 August, 2022:

- An email will arrive with your final programme score and a prompt to view your digital credential on your programme dashboard.
- An email will arrive from credly.com with the subject “Saïd Business School, University of Oxford Issued You a New Badge” that will have instructions for claiming and sharing your Credly badge.

6 September, 2022: The last day you’ll have access to this learning platform and the Riff discussion and video meeting platform.

6 September 2022+: You will receive your printed Saïd Business School, University of Oxford Certificate of Completion in the post unless you have opted out of this service.

Anytime until 8 June, 2029: You may email registrar@esmelearning.com to verify your attendance and completion of the Oxford AI in Fintech and Open Banking Programme

Artificial Intelligence in Finance and Open Banking

Glossary

AI - See *artificial intelligence (AI)*.

AI ethics guidelines - Set up by the European Commission outlining, that a balance must be struck between what should and what can be done with AI, and that due care must be given to what should not be done with AI

algorithm - A programmed sequence of procedures, based on a set of chosen parameters, and meant to accomplish a given task.

algorithmic decision-making - Algorithmic decision-making is the process whereby an algorithm not only makes a prediction but makes a decision arising from that prediction, in contrast to human decision-making based on algorithmic predictions.

algorithmic lending - Computer-based lending, using a set of pre-programmed criteria (generally to approve or deny borrowers with regards to default risk, and so on). Lending based solely on algorithms can occur at a speed far quicker than human lending.

algorithmic trading - Computer-based trading, using a set of pre-programmed criteria (generally to buy or sell with regards to timing, price, quantity, and so on). Trading based solely on algorithms can occur at a speed far quicker than human trading, and without human subjectivity and emotion.

alternative data - Alternative data is data that has not typically been collected in the past, but could potentially provide information that could turn into a competitive advantage

AML - See *anti-money laundering (AML)*.

API - application programming interface (API) is software that enables two separate applications to communicate. For example, the Google Maps API enables businesses, such as restaurants, to embed maps on their websites so that customers can find the business easily, without having to access Google Maps as a separate application or website.

anti-money laundering (AML) - A set of regulations meant to prevent the crime of making illegally-obtained funds appear to be legitimate.

application programming interface (API) - Software that allows two separate applications to communicate. For example, the Google Maps API allows businesses, such as restaurants, to embed maps on their websites so that customers can find the business easily, without having to access Google Maps as a separate application or website.

artificial intelligence (AI) - Broadly, AI is the science of developing machines to emulate human behaviour. (See also *machine learning*.)

artificial neural network - See *neural network (NN)*.

augmented analytics - Using machine learning and other advanced computing techniques to augment and automate the otherwise manual process of data analysis.

authentication - The process of verifying the identity of a user or device, such as with a username and password, or a biometric.

B2B - See *Business-to-Business (B2B)*.

B2C - See *Business-to-Customer (B2C)*.

BaaS - See *Banking as a Service (BaaS)*.

Banking as a Service (BaaS) - Providing online financial services. Because these financial services can be provided by organisations that are not strictly speaking “banks,” regulations (like [PSD2](#)) are in place to govern BaaS on a regional or country-by-country basis. BaaS originated when institutions began to operate in areas previously underserved by the financial services community—essentially, banking the unbanked. One example of such a company is [BitPesa](#), which operates in Africa. For more information—and disambiguation among BaaS, Open Banking, and Platform Banking—see [What the hell is Banking as a Service? And what is it not?](#)

big data - Voluminous, often complex, data sets, and the business of capturing, managing, analysing, and extracting useful information from that data. Big data can, for example, be leveraged by [AI](#) and [machine learning](#) for the purposes of predictive analysis.

Big Tech - Refers to the largest technology companies, including Apple, Amazon, Google, and Facebook. See also [GAFA](#).

business-to-business (B2B) - A business whose product reaches the consumer only through another business. For example, [Rapyd](#) and [Soldo](#) are B2B fintechs.

business-to-consumer (B2C) - A business that sells directly to the consumer, like most [insurtech](#) or money transfer firms. For example, [WorldRemit](#) and [TransferWise](#) are B2C fintechs.

BNPL - A business which consumers use to spread the cost of purchases. BNPL providers such as Klarna and Clearpay pay retailers on behalf of consumers, who then pay back over a period of time.

challenger banks - Newer online-only banks that “challenge” traditional brick-and-mortar banks by improving the user experience with digital-only features.

CIAM - See *customer identity and access management (CIAM)*.

cognitive computing - Computing that leverages [deep learning](#) to learn from data and problem-solve in a way that simulates human thought.

Competition & Markets Authority (CMA) - This refers to the UK's competition regulator, with responsibility for promoting competition "for the benefit of consumers". The CMA's remit covers mergers, anti-competitive behaviour and unfair trading practices.

concept drift - A notable shift in results as statistically small changes in input and output data become amplified as a model learns over time.

customer identity and access management (CIAM) - A subset of identity access management (IAM), focused on enabling consumers themselves to manage their identity and profile data, with regard to accessing corporate or institutional platforms. Typically, an IAM utility will allow users to use a single sign-on point to access multiple instances of a site-wide software application (dependent on user permissions on that platform).

credentials - Information with which a user verifies their identity, such as a username and password.

data aggregator - An organisation that collects and compiles data from one or more sources and then shares or sells that data to other individuals or organisations for processing.

data discrimination - Data discrimination is bias that occurs when predefined data types or data sources are intentionally or unintentionally treated differently from others.

data ethics - Data Ethics is the system of moral principles that govern the responsible collection and use of data (Gartner, 2020), and the actions of the individuals, groups or machines that apply them.

deep learning - [Artificial intelligence](#) that learns through layers of computation, typically in a [neural network](#), which structurally resembles human cognition.

EBA - See *European Banking Authority (EBA)*.

EFT - See *electronic fund transfer (EFT)*.

electronic fund transfer (EFT) - The electronic transferral of money from one bank to another.

embedded finance - Embedded finance is the ability to offer a finance solution right inside a consumer experience.

ERMA - ERMA (Electronic Recording Machine, Accounting) was a pioneering technology that automated bank bookkeeping and check processing.

Equality Act of 2010 (UK) - The Equality Act of 2010 in the United Kingdom and federal law in the United States prohibit discrimination based on the personally identifiable characteristics companies may retrieve from personal data, including: Age, Disability, Gender reassignment, Marriage and civil partnership, Pregnancy and maternity, Race—including colour, nationality, and ethnic or national origin, Religion and beliefs, Sex and Sexual orientation.

European Banking Authority (EBA) - According to the EBA's website, "[As] part of the European System of Financial Supervision ... the main task of the EBA is to contribute, through the adoption of binding technical standards (BTS) and Guidelines, to the creation of the European Single Rulebook in banking."

fintech - Portmanteau (the combining of two words) of "financial" and "technology"; fintech generally refers to technological innovation designed to aid or enhance the financial solutions and services industry and its clients.

frictionless payment - A financial transaction that requires little or no effort for the consumer.

GDPR - See *General Data Protection Regulation (GDPR)*.

General Data Protection Regulation (GDPR) - A legal framework that sets guidelines for the collection and processing of personal information of individuals within the European Union (EU). The GDPR sets out the principles for data management and the rights of the individual, while also imposing fines that can be revenue-based. The General Data Protection Regulation covers all companies that deal with data of EU citizens, so it is a critical regulation for corporate compliance officers at banks, insurers, and other financial companies. GDPR came into effect across the EU on 25 May, 2018.

GAFAM - A collective term for the four Big Tech companies: Google, Amazon, Facebook and Apple.

IPO - See *initial public offering (IPO)*.

identification - Information on an entity used by computer systems to represent an external agent, such as a person or device.

incumbent - In the finance industry, these firms (incumbents) include long-established retail and investment banks (Barclays, HSBC, J.P. Morgan) and financial services institutions (Fidelity, Lloyd's).

initial public offering (IPO) - A company's first sale of stock to the public.

insurtech - Portmanteau (the combining of two words) of "insurance" and "technology"; insurtech generally refers to technological innovation designed to aid or enhance the insurance solutions and services industry and its clients.

know your customer|client (KYC) - A protocol meant to protect consumers (and financial institutions alike) by ensuring that businesses have, at the very least, verified the identity of their clients—and, if relevant, possibly also understand their clients' risk tolerance, investment knowledge, and financial position.

KYC - See *know your customer/client (KYC)*.

machine learning (ML) - A subset of artificial intelligence, in which the goal is for computers to learn directly from data, without having to be specifically programmed. (See also, *deep learning*.)

ML - See *machine learning (ML)*.

neural network (NN) - A system built on a dense group of highly-interconnected pre-programmed nodes. The architecture is meant to model the neurons in a human brain, with a goal towards pattern recognition, learning, and problem solving in a way that simulates human thought.

new entrants - new competitors to the current players of an industry.

NN - See *neural network (NN)*.

open API - A publicly available *application programming interface (API)* that enables developers to integrate proprietary software or web services with other software or services.

open data - Similar to open source software, “open” data would be freely available to all to use, without restrictions from copyright, patents, and so on. To increase transparency, many countries and municipalities have made data available to all. (For example, see <https://data.gov.uk/>.)

Open Banking - The requirement for banks to release data in a secure, standardised form so that authorised third-party organisations can share that data. Open Banking is part of the second European Payment Services Directive ([PSD2](#)).

OBIE (Open Banking Implementation Entity) - The company set up by the UK Competition & Markets Authority to deliver Open Banking by creating software standards and industry guidelines. The company trades as “Open Banking Limited”

Open Data Exchange (ODX) - A Canadian [partnership](#) hoping to “[become] Canada’s central and national marketplace to access data innovation for economic prosperity.”

open finance - A movement to open up all financial services to operate via DApps run over decentralised public blockchain networks.

Payment Services Directive (PSD2) - The revised [2015 standard](#) set forth by the [European Commission](#)—to supersede the original [2007 standard](#) (PSD1)—regulating EU payment services and providers to create a more competitive payments market.

personally identifiable information (PII) - Any data that could potentially identify a specific individual. Any information that can be used to distinguish one person from another and can be used for de-anonymising anonymous data can be considered PII. Non-sensitive PII can be easily gathered from public records, phone books, corporate directories, and websites. Sensitive PII is information which, when disclosed, could result in harm to the individual whose privacy has been breached. Sensitive PII should therefore be encrypted in transit and when data is at rest. Such information includes biometric information, medical information, personally identifiable financial information, and unique identifiers, such as passport or Social Security numbers.

PII - see *personally identifiable information (PII)*.

pitch deck - A presentation that tells a compelling story about a business. It is used to help potential investors learn more about the business.

Platform - A general service that can be applied to different contexts, typically used by developers and data scientists.

platform banking - Financial services organisations offering new or additional services on a “platform” basis (for example, robo-advisor service), from [third-party fintech providers](#). For more information, see [Platform banking as a new business model](#).

policymakers - Governments and governing bodies (the [FCA](#) [Financial Conduct Authority], the [EBA](#) [European Banking Authority], the [U.S. Federal Reserve](#), and so on.) who create policy to regulate areas of business within their jurisdiction.

PSD2 - See *Payment Services Directive (PSD2)*.

regulation - A form of supervision that subjects financial institutions to certain requirements, restrictions, and guidelines aiming to maintain the stability and integrity of the financial system.

regulators - Governments and governing bodies that implement and enforce policy.

robo-advisor - Software-based robo-advisors use complex algorithms to dispense financial investing advice, based on a customer’s particular portfolio and data.

SaaS - See *software as a service (SaaS)*.

screen scraping - A method of sharing customer financial transaction data between banks and third parties in which the third party creates a duplicate of the bank’s login page and customers enter login information on that page. The third party can then log in as the customer, and the third party’s software copies customer information into an external database. For more information, see [Open Banking vs. Screen Scraping: Looking Ahead in 2019](#).

software as a service (SaaS) - A delivery model where software is centrally hosted and licensed by subscription.

startup - Generally used to define a business that is not simply in its nascent stage of development, but rather a business with a novel idea or technology that will enable it to grow quickly.

third-party providers (TPP) - Non-bank businesses that use banking data via APIs to provide a specific service to fintech institutions or their customers (see [platform banking](#)).

TPP - See *third-party providers (TPP)*.

value density - With regards to big data, discrete data sets might not yield much value until analysed as part of a much larger set (with sufficient volume, variety, and velocity), at which point, information of very high value can be gleaned.