EVIDENT ΛI INDEX
BANKS

The global standard benchmark
of AI maturity

KEY FINDINGS REPORT

2023/01

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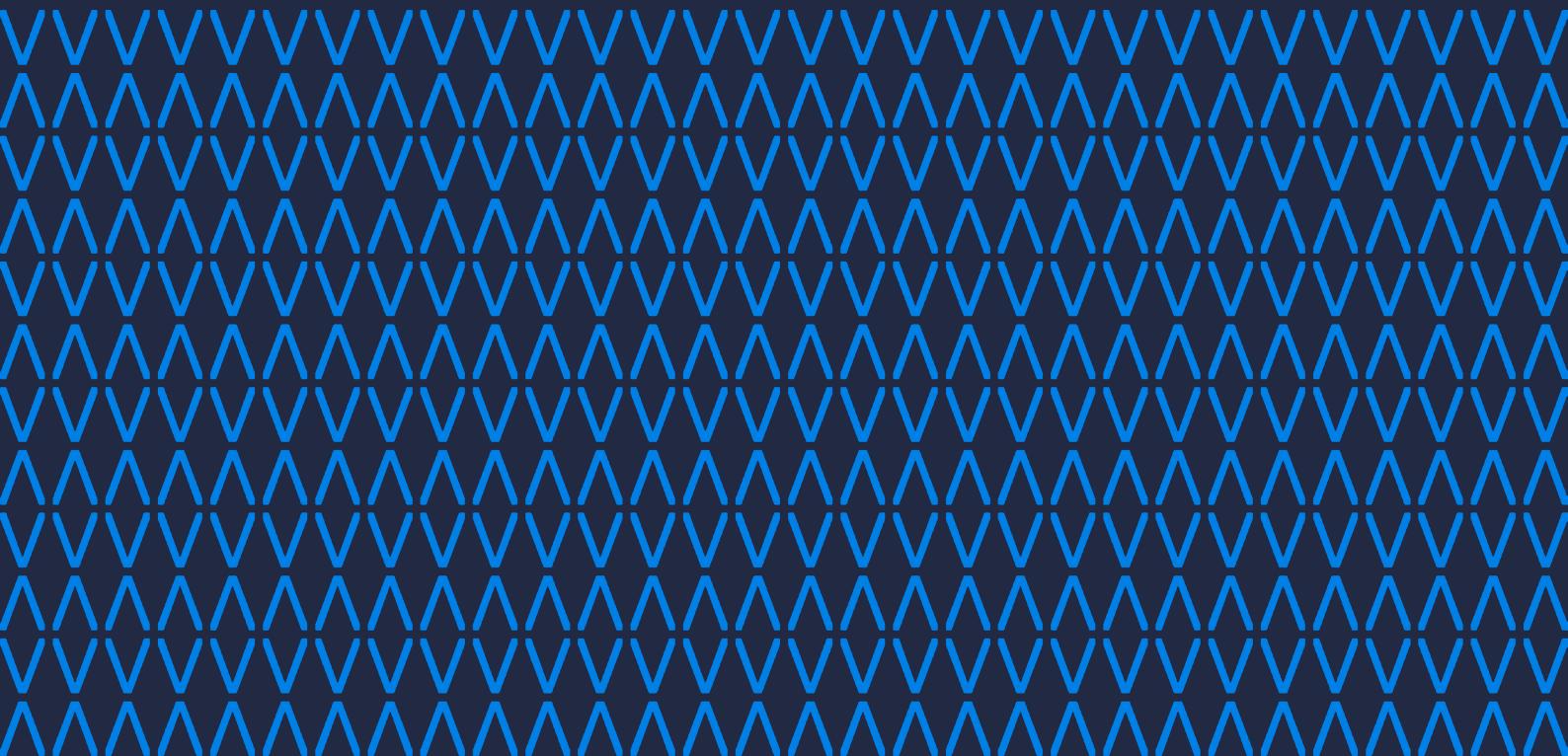
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EVIDENT
AI INDEX
BANKS

**KEY FINDINGS
REPORT
2023/01**

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Foreword

The current wave of AI breakthroughs is not yet a decade old, and the momentum appears to be, if anything, accelerating. AI is impacting all areas of society and business, transforming nations, creating new opportunities, and changing how we consume, learn and work.

It already feels like an existential issue for the largest and most powerful organisations. Businesses worldwide are ratcheting up AI investment. Those that win will surge ahead of their rivals on growth, productivity and financial performance, and there is a significant threat to those that fall behind.

And yet, visibility into the approaches different companies are taking to AI transformation is sorely lacking - with the hype often obscuring the reality.

We created Evident to increase transparency around the approaches different companies are taking to building and developing AI by creating a global standard benchmark: the Evident AI Index.

We believe transparency is critical to harness the value of AI for commercial - and societal - gain. By showcasing best practice, we aim to help companies transform faster and safely, minimising the harms of AI and maximising the commercial, economic and societal opportunities. We hope the Index will not only be a tool used by senior management, investors and suppliers to accelerate corporate AI adoption, but also for society as a whole.

At the heart of the Evident AI Index is independence: unlike existing surveys and benchmarks, the Index relies solely on publicly available data. This "outside-in" approach is important. The volume of data, and the range of sources available, enables us to build a more complete and rich assessment of corporate AI maturity than the narrow survey-based approaches that exist today. And, crucially, it enables us to offer an independent profile of a company's AI maturity, without resting on proprietary surveys that suffer from self-reported biases.

At launch, the Evident AI Index provides in-depth coverage of the 23 largest banks from North America and Europe (with more than $1 trillion in Total Assets). We've chosen not to focus on the many AI-first start-ups, tech companies and challengers, but instead focus on the incumbents that need to transform the most. The Index draws upon millions of data points to assess each company across 143 individual indicators that have been defined with input from more than 50 leading AI and banking experts, as well as more than half of the banks in the Index.

This report lays out the key findings from the first Evident AI Index for banks and sheds light on the different strategies banks are taking to AI transformation.

Over the coming months, we'll be refining and deepening the Index, expanding it to cover the value created by AI, whether through financial performance or improved products for customers. We'll be working with our members to discuss best practice and lay out roadmaps for accelerated AI transformation. Ultimately, we aim to cover 1,000+ companies across a range of sectors.

Our journey is just beginning. We hope that you will join us.

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We created Evident to increase transparency around how companies are building and developing AI by creating a global standard benchmark: the Evident AI Index.

Alexandra Mousavizadeh
CEO & Co-founder

Annabel Ayles
COO & Co-founder

EVIDENT AI INDEX
BANKS

About Evident

Seize the AI opportunity with market-leading intelligence on AI adoption in business.

Evident is a membership-based intelligence platform that helps banking executives, investors, equity researchers and vendors to seize the AI opportunity and brings transparency and openness to AI progress across the business world.

We synthesise data from the Evident AI Index into clear intelligence that helps our members to understand, compare, and monitor the latest industry-wide AI developments and, ultimately, to get the most out of AI.

→ Inform strategic decision making: explore how AI is being adopted across sectors, transforming nations and geopolitics, and the impact this could have on your business

→ Accelerate AI transformation: compare the roadmaps different banks are taking towards successful AI implementation, identify best practice and prioritise the "quick wins" to accelerate AI adoption

→ Preempt competitor strategies: see what your competitors are planning by identify and tracking their strategic priorities and latest AI-related decisions

→ Learn from peers and leading AI experts: keep on top of the technologies shaping the frontier by connecting with like-minded peers and leading experts

WHAT WE DO
Through our benchmarking, insights and events, we provide the most comprehensive assessment of AI progress across the banking sector and track emerging trends.

→ Evident AI Index dashboard: access indicator-level data to compare all the banks in the Index across the 143 metrics

→ Executive diagnostic: evaluate an individual company's AI strengths and weaknesses to identify quick wins and areas of opportunity

→ Real-time benchmarking: monitor AI activity across the banks with our Talent, Innovation, Leadership and Transparency trackers tailored to your competitor set

→ Bespoke research: commission data-driven research reports and thought leadership to dig deeper into the Index or explore cross-sectoral trends in AI and other emerging technologies

→ Leadership events: we bring together leading AI experts from industry, academia and government to discuss the latest AI breakthroughs and the practical application of AI in business

Join us
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Acknowledgements

Executive Summary
Headlines from the Evident AI Index for Banks

→ **JPMorgan Chase is the overall leader** across all four Index pillars, scoring 63% of points, with success based on strong leadership and sustained investment over half a decade.

→ **Royal Bank of Canada (RBC) ranks second in the Index**, with a particularly strong performance across Innovation and Transparency.

→ **North American banks are typically ahead of European peers**, occupying seven out of the top ten rankings.

→ **Canadian banks are the "dark horses" of the Index**, with Toronto-Dominion Bank (TD Bank) joining RBC in the top six.

→ **UBS Group is the clear European leader,** with ING Groep and BNP Paribas also breaking into the top ten from outside North America.

→ **The competition for Talent is on,** with banks pursuing hiring, training and reskilling initiatives. Wells Fargo, ING and JPMorgan Chase appear to be creating leading talent development programmes.

→ **North American banks lead in the Innovation pillar**, demonstrating a high level of investment into research and patents.

→ **Banks are taking different approaches when it comes to demonstrating AI Leadership.** While some banks may be cautious of building a public narrative, a willingness to articulate strategy and provide clarity for stakeholders will create the support required for change and help to attract the best talent.

→ **Transparency of responsible AI activities is a nascent area for most banks in the Index,** with JPMorgan Chase, TD Bank and RBC leading in this area.

JANUARY 2023 RESULTS

COMPANY	RANK	TALENT Capability & development	INNOVATION Research, patents, ventures, ecosystem	LEADERSHIP in public comms and strategy	TRANSPARENCY of responsible AI activities
JPMorgan Chase	1	1	1	1	1
Royal Bank of Canada	2	7	3	7	3
Citigroup	3	6	2	13	9
UBS Group	4	4	9	5	15
Wells Fargo	5	5	8	14	5
Toronto-Dominion Bank	6	10	16	2	2
ING Groep	7	3	10	8	6
Bank of America	8	2	7	15	16
BNP Paribas	9	12	13	3	7
Morgan Stanley	10	11	4	11	19
Goldman Sachs	11	15	5	10	20
Deutsche Bank	12	16	12	9	8
HSBC	13	17	11	20	4
Banco Santander	14	18	6	17	18
Société Générale	15	14	18	6	14
Barclays	16	8	14	23	13
NatWest Group	17	9	20	18	11
Lloyds Banking Group	18	13	17	22	12
Intesa Sanpaolo	19	21	21	4	10
UniCredit Group	20	19	22	12	22
Crédit Agricole	21	20	19	21	21
Crédit Mutuel	22	23	15	16	23
Groupe BPCE	23	22	23	19	17

AI offers the biggest commercial opportunity going today. An eye-watering $433 billion was spent globally on AI solutions in 2022 alone, and the planet's GDP could grow by an additional $15.7 trillion by 2030 thanks to AI.

The highest-valued companies on the planet are already doubling down on AI investment and prioritisation. They understand that AI offers a game-changing opportunity for individual companies and poses a significant threat to those that fall behind.

This is particularly true in traditional industries such as banking. Banks have a treasure trove of valuable customer data, which, thanks to their digital transformation efforts over the past decade, means they are ideally placed to take full advantage of the AI revolution. McKinsey estimates that AI technologies could deliver up to $1 trillion of additional value to global banking annually.

Yet on the flip side, banks face significant competitive challenges - from Big Tech, fintech, and the neobanks. Legacy banks may cease to exist altogether if they fail to meet the challenge of AI-driven digital transformation. This would put 100,000s of people out of work and destabilise the global economy, with these institutions likely displaced by under-regulated Big Tech monopolies operating to a 'move fast and break things' mentality.

Further, AI transformation is complex, expensive and risky. Major business transformation is required – around technology, talent, culture, and more – with significant ethical and reputational risks for those who get it wrong. And there's increasing pressure, internally and from investors, to demonstrate ROI.

The banks and the leadership teams that can make the jump, and mitigate the risks, will win the next business cycle. Those that do not may struggle to survive.

HOW IS AI TRANSFORMING BANKING?
AI holds two promises for banks:

Firstly, to take on the aspects of the major information-processing centres - administration, routine decision-making, scoring and responding to customers, and transactions - through automation and optimisation. Existing structured data can be managed at a different level and scale with AI, speeding up document processing or providing new tools to optimise process trade-offs and market opportunities.

The second stage lies in AI's potential to solve problems that have eluded even the finest human minds. As an example, AI offers the potential to apply software to unstructured data. What CEOs say at company results can be analysed for sentiment clues, satellite photos of oil tankers can be assessed to predict market supply, and consumer behaviour can be more deeply analysed to predict appropriate credit scores.

AI tools offer the opportunity to reach human-level decision-making at blindingly fast speeds and at a near-infinite scale. However, as we shall see, the complexity of these new decision-making processes poses both huge opportunities and new risks for the banks.

Ten potential use cases for AI in the banking industry
1. **Fraud detection and prevention**: analysing large amounts of data to identify patterns and anomalies that may indicate fraudulent activity.

2. **Customer service**: AI chatbots can provide personalised and efficient customer service, such as answering frequently asked questions and helping customers with account management tasks.

3. **Personalised product recommendations**: analysing customer data to make personalised product recommendations, such as credit card offers or investment opportunities. Cross-selling of new products to existing customers is a key value driver in banking.

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"For traditional banks, getting AI right is an existential issue, which is why investment - in talent and R&D, as well as real-world commercial AI deployment - is soaring. But as the pace of AI adoption accelerates, greater transparency around how major banking institutions are using AI is necessary to ensure that the result is a race to the top. Critically, we must ensure that the application of AI does not lead to unforeseen negative consequences in an industry that touches all of our lives."
Kay Firth-Butterfield, Head of AI and Machine Learning, World Economic Forum

4. **Risk assessment**: analysing data to make more accurate risk assessments, which can help banks make better-informed operational, lending and market decisions.

5. **Credit underwriting**: analysing data to make more accurate credit underwriting decisions, which can help banks assess the risk of lending to a particular borrower.

6. **Portfolio management**: helping banks manage and optimise their investment portfolios.

7. **Cybersecurity**: detecting and preventing cybersecurity threats, such as by analysing network traffic for signs of malicious activity.

8. **Trade finance**: automating and streamlining the trade finance process, such as by analysing and verifying trade documents.

9. **Market analysis**: analysing market trends to make more accurate market predictions, which can help banks make better-informed investment decisions.

10. **Recruitment**: video interviewing tools can be used to identify and prioritise promising candidates for human interviewing.

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AI offers the opportunity to break many of the industry's historic trade-offs.

THE AI IMPACT ON BANK FINANCIAL PERFORMANCE

Most businesses have to make trade-offs between scale, scope and speed. In banking, retail banks focus on scale, offering mass customer service of a limited product set as cheaply as possible. Investment banks deliver a bespoke concierge-like service offering that is tailored for their selected clientele. Trading desks aspire for speed.

AI offers the opportunity to break many of the industry's historic trade-offs. Imagine personalised retail banking that delivers human-like service support at internet speed, or investment bank services rolled out to small and medium-sized businesses. Capturing higher revenues, reducing fraud or market risk, trading at higher speed and margin, or scaling businesses with minimal variable cost increases are all on the table.

Similar trade-offs once existed in retail. Amazon now offers scale (reflected in vast choice and low prices), scope (personalised shopping suggestions against a near-infinite product mix) and speed (next-day delivery) in a way that no traditional retailer could.

Banking is inherently more complex than retail, and far more heavily regulated, but AI will enable significant changes in business models and market delivery. Managing top-line growth whilst keeping cost-to-income ratios under control is precisely what shareholders will reward. Standing still will not be an option.

All of this is easy to say. Achieving it will be somewhat harder.

THE DELIVERY CHALLENGES FOR BANKS ARE BOTH OLD AND NEW

1. **Digital transformation just got more complicated**
Changing organisations with hundreds of thousands of employees, strong regulatory supervision and incredibly complex information and data infrastructure - the legacy of multiple acquisitions and mergers - is never easy. Done well, digital transformation can yield significant cost savings and provide competitive advantage. Done badly, it can lead to broken morale, poor customer service, and even service outages, with poor PR and regulatory intervention. Furthermore, the pain and costs of digital investment are at the front end, with the benefits often several years away. This is not always an attractive proposition for executives potentially rewarded on annual or even quarterly performance.

2. Inherent risk from rapid advancements in AI
If digital transformation is hard when the functionality and benefits of the software deployed are relatively easy to quantify, then AI adds a new level of challenge. As a cutting-edge technology undergoing rapid development and requiring deep data access before results can be confirmed, AI is, by its very nature, inherently riskier. Whereas a traditional software solution will deliver a known result, there is no guarantee that a given machine learning project will deliver exactly what is expected. Indeed, outcome inscrutability is part of the power of the AI - it may potentially deliver more than expected. There is no confirmed playbook for AI transformation, and new fields, such as responsible AI, are only now emerging to meet these questions. This will likely be a generational process.

3. The war for talent makes delivery harder
Talent market challenges are rapidly increasing. Banks could once rely on their financial proposition to recruit many of the most ambitious and talented staff. However, the rise of the technology sector, combining financial potential and interesting problems to solve, means that banks have become a less attractive relative destination for talent. Approaches such as at DeepMind, the Google subsidiary, whereby data scientists are able to publish public academic research whilst earning bank-level salaries, have attracted many former academics.

4. New business risks range from "data bias" to "black box" uncertainty
Risk management at banks is a complex beast – dealing as it does with a wide range of business, technical, operational and regulatory risks. Banks, simply put, have relatively little leeway for mistakes. A sophisticated and heavily reviewed compliance playbook covers most of these. At the heart of managing risk is internal transparency around the decision-making process and oversight of portfolio risk management.

The very nature of AI described above means that knowing that rules have been followed is no longer good enough, because those rules may well be buried deep inside a "black box" algorithm. One of the management challenges of operating with AI is working out how much to trust the outputs, whether counter-intuitive or not. This obviously poses risks that will be new to a bank's existing risk infrastructure and personnel.

5. Stakeholder oversight is getting more serious
Stakeholder stance means that there is limited scope for mistakes. No one is willing to cut much slack for banks, especially in the aftermath of the great financial crash of 2008. Moreover, stakeholders are getting more sophisticated in their understanding of, and concerns around, AI development and impact, and are demanding clarity on the use of AI.

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There is no confirmed playbook for AI transformation, and new fields, such as responsible AI, are only now emerging to meet these questions.

The Evident AI Index methodology

The Evident AI Index for banks covers the 23 largest banks from North America and Europe based on a minimum eligibility criterion of $1 trillion in Total Assets as of January 2022.

The Evident AI Index is the only independent "outside-in" benchmark of AI maturity that assesses the various approaches banks are taking towards AI adoption.

We define AI as it relates to its adoption in businesses: as a process that computationally processes large amounts of data in order to provide human-level decision-making, recommendations and predictions that can be applied to specific business problems at scale.

We measure four areas: the strength of AI & data talent and recruitment efforts, the steps banks are taking to drive firm-wide innovation, the prioritisation of AI across company leadership, as well as the public communication of the bank's responsible AI agenda.
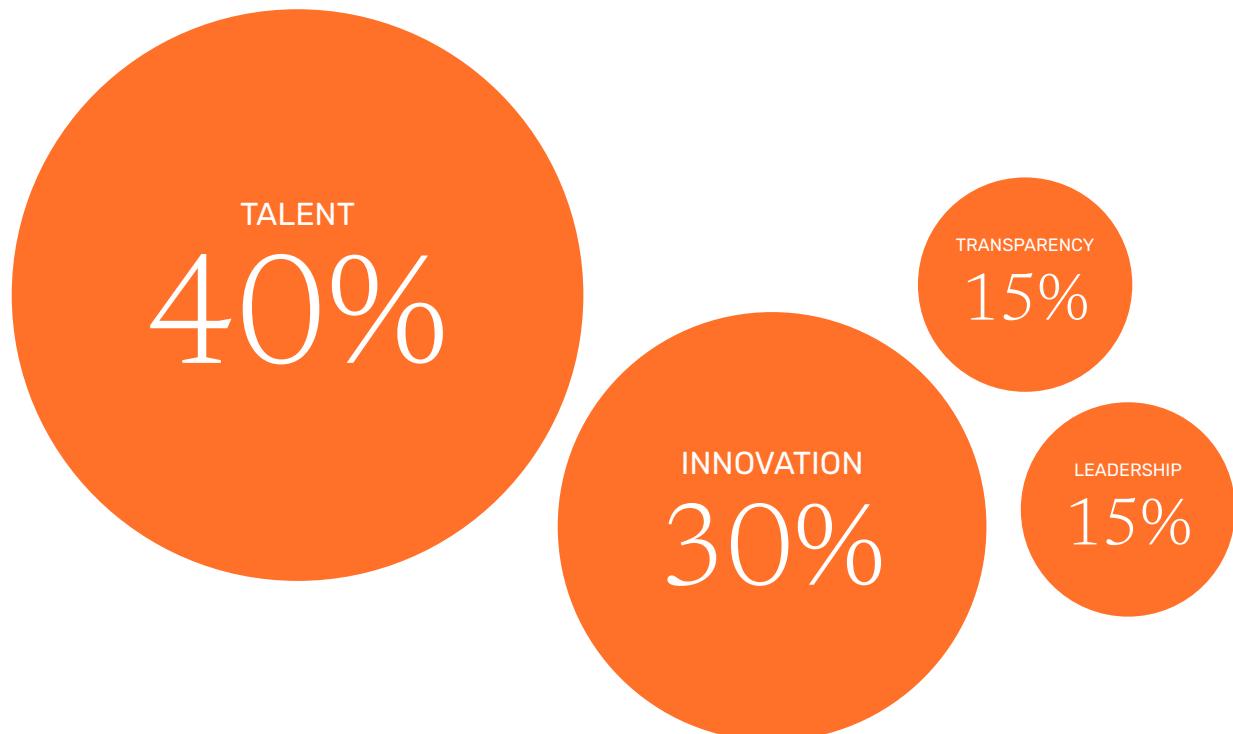
DATA SOURCES
The Index draws upon millions of data points from two sources:

→ **Company reporting, such as:** press releases, investor relations materials, group website pages, group social media accounts, and Executive interviews

→ **Independent 3rd party sources, such as:** LinkedIn, Glassdoor, Crunchbase, Google Patent, Google Scholar, arXiv, GitHub, Kaggle, academic conference websites, and general media

The Index was built through a combination of extensive manual research, programmatic data gathering, consultation across Evident's network of AI and banking experts, and ongoing dialogue with many major banks.

INDEX PILLARS

Each company is assessed on 143 individual indicators across four pillars:

TALENT
40%

INNOVATION
30%

TRANSPARENCY
15%

LEADERSHIP
15%

INDEX STRUCTURE

40 % OF INDEX WEIGHT

Talent | measures the number, career experience and tenure of AI and data employees stated as working at each bank, as well as the visible initiatives underway to hire, retain and develop leading AI talent.

→ **Talent Capability**: the volume, tenure and experience of employees working across the AI and data lifecycle. This includes analysis of all employees visibly working across 39 job titles, such as AI development, data engineering, model risk, quant, implementation and AI research.

→ **Talent Development:** the breadth of visible initiatives banks are deploying to attract, retain and develop leading AI talent. This includes gender diversity; AI culture; the breadth of entry-level opportunities; visible retraining and upskilling initiatives.

30 % OF INDEX WEIGHT

Innovation | measures the steps banks are taking to drive innovation across the bank, covering academic research and patents, investments in technology and AI-first companies, as well as broader engagement in the open source ecosystem.

→ **Research & Patents**: the volume and calibre of original academic research papers; ownership of AI patents; participation at leading academic conferences through paper submissions, or as speakers or reviewers.

→ **Ventures & Partnerships**: the volume of investments and acquisitions of tech and AI-first companies, as well as the range of partnerships the bank has employed to accelerate its AI and digital initiatives

→ **Ecosystem**: the bank's overall engagement with the broader innovation ecosystem. This includes contributions to the open source development community, as well as publicly stated academic partnerships related to the research, funding or teaching of AI.

15 % OF INDEX WEIGHT

Leadership | measures the public communications of company and group-level leadership, including the existence of a public AI narrative across group-level investor materials, press releases and media.

→ **AI Narrative**: the bank's external narrative on AI at a group level; how clearly it communicates key AI initiatives and priority areas in group-level investor relations materials, press releases, across the company website and group-level social media.

→ **Executive Positioning**: the extent to which the CEO and members of the executive leadership team prioritise AI in their external facing communication, as well as visibility of how AI is managed at a group level, for example, the stated existence of an AI Centre of Excellence.

15 % OF INDEX WEIGHT

Transparency | measures the extent to which banks are publicly communicating a wide range of responsible AI activities and making visible their efforts to create specific AI controls
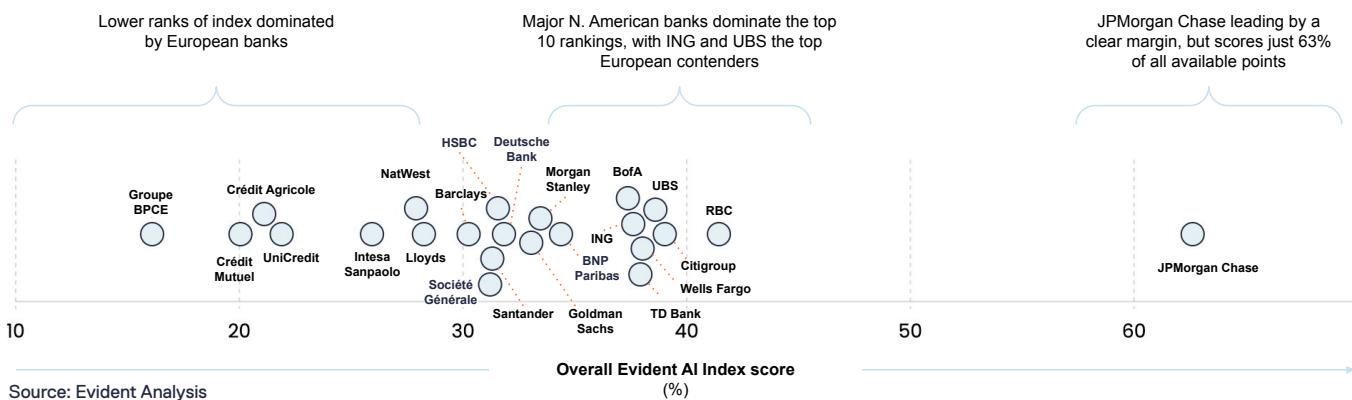
→ **Responsible AI**: the extent to which banks are publicly communicating a wide range of responsible AI activities, such as through the publication of a set of ethical principles, announcements of collaboration with other institutions to facilitate understanding of the topic, or publicly announcing dedicated responsible AI roles.

→ **AI Controls**: the extent to which the banks are making visible the specific AI controls that are in place across the bank, such as communications about the adaptation of existing risk management structures to mitigate AI risks and the publication of AI-specific roles to oversee AI risk.

SUMMARY

There are two sets of winners emerging. Individual banks - most notably JPMorgan Chase - and, more broadly, North American banks. UBS, ING and BNP Paribas are the leaders in Europe, with the remaining European banks dominating the latter half of the Index. In a global industry where many European banks are already at risk of falling behind major American banks, the evidence from the Evident AI Index is that AI might compound this situation.

FIG 1. EVIDENT AI INDEX RANKING BY SCORE

Lower ranks of index dominated by European banks

Major N. American banks dominate the top 10 rankings, with ING and UBS the top European contenders

JPMorgan Chase leading by a clear margin, but scores just 63% of all available points

Overall Evident AI Index score (%)

Source: Evident Analysis

JPMorgan Chase's dominance - for it is a strikingly strong performance compared to the rest in the Index - has been based on a long-term commitment at the most senior levels, backed up by significant and sustained investment in talent and research. The bank has adopted the approach taken by tech firms - enabling industry-leading talent to combine ongoing publication of academic research with the opportunities of working at a bank, such as rich data sets, attractive remuneration packages, and the opportunity to address real-world challenges. How replicable this model will be, especially as attention turns to business delivery, is one of the core issues that Evident will be tracking closely in the years ahead. However, it is important to note that we are still at an early stage in the race.

Whilst JPMorgan Chase has had a strong start, there is no guarantee that it will continue to dominate - or that it can turn its structural advantage into sustainable financial success.

There are two reasons for this. The Index is divided into companies worried about competition from the Index's leaders, and the leaders who worry about competition from outside the Index. The former may catch up; the latter may have their fears realised. Competition from outside the Index may come in the form of new market entrants, established technology players with deep customer loyalty and installed bases (such as Apple or Amazon) or banks that are still on the rise. Asian banks and Capital One are the most frequently cited examples - and we will cover them in due course.

There are three obvious sets of hypotheses to apply to banks' relative success in the Index:

Size: Bigger bank doesn't mean better AI maturity
Returns to scale is an obvious hypothesis to test in an index of this nature. The logic goes that the bigger banks would be able to deploy their fixed-cost AI investment over a larger business, driving better returns on the inputs.

There is no strong correlation between Index scores and size as defined by Total Assets (although JPMorgan Chase's leadership on both counts is a stand-out feature). We suspect that this may change over time (i) as the banks progress on their AI transformation and (ii) potentially as we build out better insight on both business impact and structural differences within the banks.

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"We have to make this an AI-first firm." David Hudson,
David Hudson, JPMorgan Chase, Risk.net (Feb 2022)

**Type: No strong correlation between Index rank and type of bank**
Secondly, we were interested as to whether bank type - defined broadly as retail, investment or universal - would suggest different rates of AI maturity. Would different customer types, use cases or competitor sets power different outcomes in the Index?
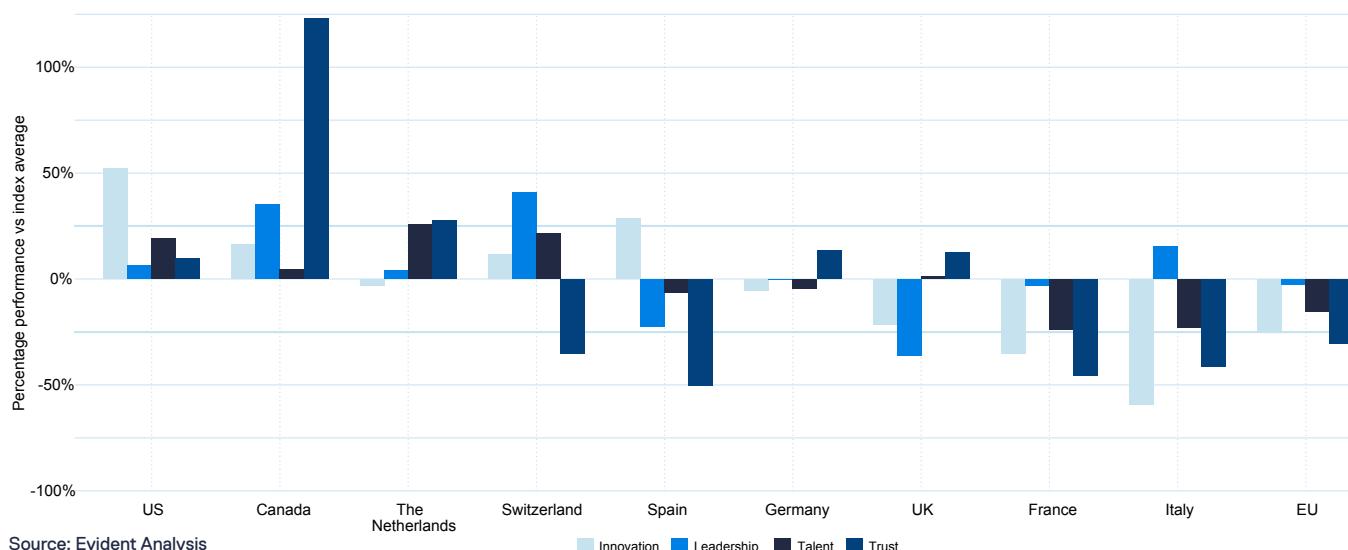
In fact, there is limited correlation between Index scores and type of bank. The leading banks tend to be universal, combining multiple business lines. We do not yet have the divisional breakdown to determine whether this masks a more differentiated picture. As we expand our Index coverage to a wider variety of financial institutions, we might well expect to revisit this question. Over time Evident will cover multiple industries, at which point this will be an interesting factor for analysis.

Geography: The number one driver
By contrast, it is clear that there are different stories to tell based on geography. Given the uneven diffusion of AI technology, differentiated talent pools, emerging government policies and regulatory frameworks, this may not come as a surprise. We would also surmise that this reflects different banking markets and competitor sets (both for customers and more widely - for talent, for example). How much this differentiation is set in stone and how much it simply reflects different timelines of overall technological diffusion is unclear, as is the potential competitive opportunity either scenario creates.

FIG 2. ANALYSIS OF REGIONAL PERFORMANCE COMPARED TO THE INDEX AVERAGE BY PILLAR

Source: Evident Analysis

Innovation   Leadership   Talent   Trust

KEY FINDINGS BY GEOGRAPHY
North American Banks are pulling ahead of their European counterparts
Given the global pre-eminence of the US banking powerhouses, it is perhaps not surprising that they also dominate the Evident AI Index. What is interesting is that they share the top slots with Canadian banks.

On a European basis, the UK players show similar characteristics to their EU counterparts. Both appear to be struggling in the race with the North Americans. In many ways, this is a particularly interesting race as many of the competitive battles (in retail banking, for example) remain local, and beating a domestic competitor is more realistic than catching a major US bank like JPMorgan Chase.

That North American banks should be ahead reflects the national positions revealed in the Tortoise Global AI Index. In the most recent iteration of that index, the US was clearly well ahead of all nations - with China, the UK and Canada racing to catch up and the rest of the Europeans building momentum but further back. Whilst we do not cover Chinese banks in our inaugural Index,

US banks own 85% of the nearly 6,000 AI patents owned by the banks in the Evident AI Index.

we look forward to seeing how their newly-built infrastructure, strength in key domains such as identity recognition, online payments and scaled offerings will position them relative to their Western counterparts. Ant Financial, for example, most closely resembles a data platform offering financial services - as opposed to a financial service player aspiring to be a data platform.

US: strength begets strength

The US's national strength sets a tone that banks will reflect - access to talent, to thinking, to role models. When banks realise that their status as the leading graduate recruiter has been surpassed by the AI-first tech platforms from Silicon Valley it can act as a wake-up call. Ambitious bank leaders, who instinctively understand that recruiting is the cornerstone of their future, are forced to question what their strategic direction might best be. Meanwhile, the scale of the US market forces faster responses to competitor innovation in - for example - quantitative trading or market analysis. In other words, national scale advantage is playing out in the US's most strategic companies as well.

US banks, for example, are the top five banks for AI patent ownership. Between them, they own 85% of the nearly 6,000 AI patents owned by the banks in the Evident AI Index - with Bank of America owning 36% and JPMorgan Chase owning 30%, respectively. This reflects deep investment in research and development and may well provide a future layer of competitive advantage.

One interesting area is the US banks' approach to public-facing information - a key driver of the Leadership scores. While European banks tend to be relatively strong on this pillar, driven by an overall more open approach to communicating their AI ambitions, major banks in the US appear to be less public about their AI ambitions, perhaps taking a more strategic approach to sharing what might be competitively sensitive information. For reasons that we cover later in this report, we believe that this approach might change - should it do so, the immediate impact will be to further consolidate the US lock on Index leadership.

Canadian banks are the "dark horses" of the race

RBC ranks 2nd in the Index and TD Bank ranks 6th. This relative success is driven by strong performances on Transparency and Leadership, and may come as a surprise to an industry not used to looking at Canada for banking innovation, and has attracted limited attention to date. This may be an indicator of their part in the wider Canadian AI success story, and the broader efforts of the Canadian Government to build the depth and scale of the country's AI industry. Their strong relationships with Canada's world-class universities are especially interesting. Notably, RBC also performs strongly on Talent and Innovation, rivalling the major US banks that tend to dominate this part of the Index.

European markets have deep pools of talent, and can offer significant strengths in AI, but they have not publicly demonstrated the ambition and sustained investment of the largest North American banks

Many European banks appear to be behind in their efforts to drive AI transformation. While they appear to do well versus the North Americans when it comes to Leadership - with particular mentions to BNP Paribas, Intesa Sanpaolo and UBS - they notably lag behind on Transparency and Innovation.

UBS, ranked 4th overall, appears to be rivalling the US banks. The question is which other banks might pick up this gauntlet - or will they risk falling even further behind the US leaders whilst new AI-powered players pick away at their revenue lines one by one?

Behind UBS, ING is the 2nd ranked European bank, coming in at 7th place. Leadership of the two banks has much in common - ING's CEO left in June 2020, before starting as CEO at UBS in November of the same year. ING's position at the centre of a network of Dutch AI players across academia and business will both strengthen its brand but also provide access to wider talent and social buy-in.

BNP Paribas is the only other European bank to make it into the top ten, driven by particular strengths on Leadership and Transparency. Deutsche Bank, ranked 12th, also performs strongly on these pillars, and shows evidence of a growing AI ambition with the recent announcement of a major partnership with NVIDIA.

THE LATTER HALF OF THE INDEX IS DOMINATED BY BANKS FROM THE UK, FRANCE, ITALY AND SPAIN
The UK's DeepMind, whose victory in the game of Go kicked off much of the recent excitement about the applications of machine learning, is an oft-quoted example of where London can show strength in AI. However, the UK banks rank in the lower half of the Index, and lag on Leadership and Innovation pillars. One notable performance is HSBC's showing on the Transparency pillar, which pulls the national average up. One of the unknowns is whether the bankers of London, astride markets as sophisticated and deep as those of New York and with historic access to the deep European talent market, have perhaps been impacted by issues such as Brexit and changing regulations at the very moment that they might have been more profitably focusing on the long term issue of AI?

Despite historic strengths in mathematical studies and, therefore, quant recruitment, on the whole the French banks rank lower on Talent and there is limited Transparency around their responsible AI activities. Italian banks also rank lower in the Index but there are some notable areas of strength, such as Intesa Sanpaolo's Leadership focus.

The heavy caveat is that these are but early days. European markets are fragmented and may lack the scale of the US, but localised competitive advantage will be both achievable and valuable.

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UK banks rank in the lower half of the Index, and lag on Leadership and Innovation pillars.

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Sourcing talent - to either develop groundbreaking AI or to simply keep up with current standards - is a challenge. Banks face huge competition for talent, not just from other banks but from all the other sectors engaged in the AI race

Whilst there is obviously an interest in understanding how different banks compare to each other across different regions, we believe that the real value of the Index is in the depth of data and context that each pillar provides. In what follows, we unpack what drives AI performance and provide guidance for the road ahead.

There are some interesting themes emerging here, many of which we will continue to explore in the year ahead, both publicly and with our members.

Talent

The pace of AI advancement is faster than the global workforce can keep up with. Education and real-world experience takes years, by which time the technology will have evolved further, requiring further education and training.

As a result, sourcing talent - to either develop groundbreaking AI or to simply keep up with current standards - is a challenge. Banks face huge competition for talent, not just from other banks but from all the other sectors engaged in the AI race, as well as the Big Tech companies.

Moreover, the mix of skills required for successful AI adoption has expanded, demanding increased numbers of employees in teams like ML ops and data engineers, as well as new skill sets from software developers and business analysts.

From data engineers to ML researchers, it's crucial for banks to understand the mix of talent required right now and further down the line in order to develop, implement and maintain AI effectively.

HOW WE MEASURE TALENT
This pillar assesses the overall capability level (number and calibre) of AI employees within the bank, as well as the bank's capacity to hire, retain and develop leading AI talent.

Talent Capability
Using LinkedIn, we analysed 120,000 individuals who work across 39 AI-related roles at the banks to build a picture of the number, tenure and quality of AI-related employees in each bank. We've analysed five categories of AI talent, with each playing a different role in the AI development lifecycle. This includes:

AI DEVELOPMENT	DATA	IMPLEMENTATION	MODEL RISK	QUANT
Data scientists; AI/ML engineers; AI/ML architects	Data engineers; Data architects; Database Administrators	Software engineering; AI/ML product managers; Operational risk	Model risk; Model governance; Model validation	Quant analyst, developer, strategist, engineer or researcher

In addition, we analysed the number of employees working in AI research using data collected from Google Scholar and arXiv, identifying authors who included a bank (or a bank's sub-entity, such as TD's Layer 6) in their affiliation. Where individual authors were identified who did not reference a bank in their affiliation, their affiliated bank was added manually.

Talent Development
We've measured the ability of each bank to attract, retain and develop leading AI talent. This includes the breadth and availability of entry-level roles, hiring initiatives, training and upskilling, gender diversity and culture. We used a variety of data sources to assess each bank's talent development capability - including group websites, press releases, job descriptions, Glassdoor and other public reports.

Data limitations
The "outside in" assessment of Talent has many valuable advantages, such as enabling comparability across banks, revealing to each bank how it appears

from the outside, and showcasing differences in role titles across banks. However, we are aware there are limitations to this data. For example, both LinkedIn and Glassdoor bias towards banks whose employees (or ex-employees) actively use these sites and update their job titles. This might impact the results for different geographies. For example, French banks tend to have a smaller proportion of their employee population on LinkedIn.

**THE RESULTS OF THE TALENT PILLAR**
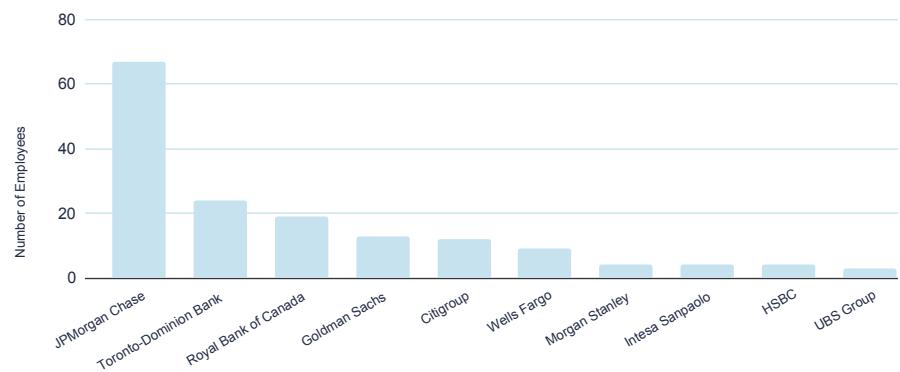
	Talent Capability							Talent Development					Pillar Rank
	AI Development Talent	Data Engineering Talent	Implementation Talent	Model Risk Talent	Quant Talent	Research Talent	Sub-Total	Culture	Gender Diversity	Hiring Initiatives	Training and Career Development	Sub-Total	
JPMorgan Chase	2	3	2	19	14	1	1	8	4	1	3	1	1
Bank of America	4	1	4	7	1	13	2	5	15	19	2	5	2
ING Groep	1	5	3	5	13	12	4	17	16	10	1	3	3
UBS Group	3	6	6	1	2	16	3	4	11	11	14	15	4
Wells Fargo	6	2	1	11	19	6	6	18	5	2	10	2	5
Citigroup	13	8	5	2	7	5	5	10	9	4	15	9	6
Royal Bank of Canada	5	15	16	4	17	2	7	6	8	5	20	13	7
Barclays	9	4	10	13	5	9	8	9	17	6	12	11	8
NatWest Group	8	7	13	9	2	20	11	13	13	15	6	7	9
Toronto-Dominion Bank	7	9	17	10	18	3	9	2	10	23	9	16	10
Morgan Stanley	14	13	7	17	4	7	10	3	22	6	22	20	11
BNP Paribas	12	10	9	16	10	15	13	14	14	11	11	14	12
Lloyds Banking Group	11	14	14	8	11	18	14	12	1	6	21	12	13
Société Générale	15	12	8	6	21	22	15	21	19	6	7	8	14
Goldman Sachs	17	18	11	18	3	4	12	7	7	11	18	17	15
Deutsche Bank	16	16	15	15	9	17	17	1	23	11	4	6	16
HSBC	18	11	12	12	15	8	16	11	20	19	5	10	17
Banco Santander	21	19	20	3	8	19	18	15	2	3	8	4	18
UniCredit Group	19	17	18	20	6	14	19	19	3	19	16	19	19
Crédit Agricole	22	22	19	14	16	10	20	20	18	15	17	22	20
Intesa Sanpaolo	10	21	21	23	20	11	21	22	6	19	19	21	21
Groupe BPCE	23	23	22	21	23	23	23	16	21	15	13	18	22
Crédit Mutuel	20	20	23	22	22	21	22	23	12	18	23	23	23

Scale and quality of talent

JPMorgan Chase leads by a significant margin in terms of absolute volume of AI developers and the calibre of its research teams. This is not unexpected given the scale of investment behind the bank's clear "build in-house" strategy. Out of the 23 banks in the Evident AI Index, JPMorgan Chase has a clear lead in its number of AI developers, and has invested significantly in the calibre of research staff compared to every other bank.

JPMorgan Chase also has a strong lead on the number of staff who have published a recent AI paper, though the two Canadian banks are hot on its heels.

FIG 3. TOTAL NUMBER OF EMPLOYEES THAT HAVE PUBLISHED AN AI RESEARCH PAPER WITH >10 CITATIONS SINCE 2017 (TOP 10)

Source: Google Scholar; arXiv; evident analysis.

Note: Employee affiliations are based on multiple sources, including contact details on papers, company website or their Google Scholar profile.

AI talent often continues publishing papers that drive the field forward, even while working in industry - this has been a consistent trend in the AI space to date. Moreover, tech firms looking to recruit AI talent have chosen to override

traditional expectations of secrecy, or obsessive patenting, to enable the best talent to be recruited. Indeed, this has been a core cultural proposition at market-leading organisations such as DeepMind, the Google-owned AI research lab. The relatively limited number of papers at most banks suggests that they are not currently winning the talent war - although whether there is a causation will need further investigation. In addition to building in-house, disseminating AI throughout every department is an objective of many AI-leading organisations. On a proportional basis, ING leads by a strong margin in terms of the number of AI developers in relation to the total number of employees.
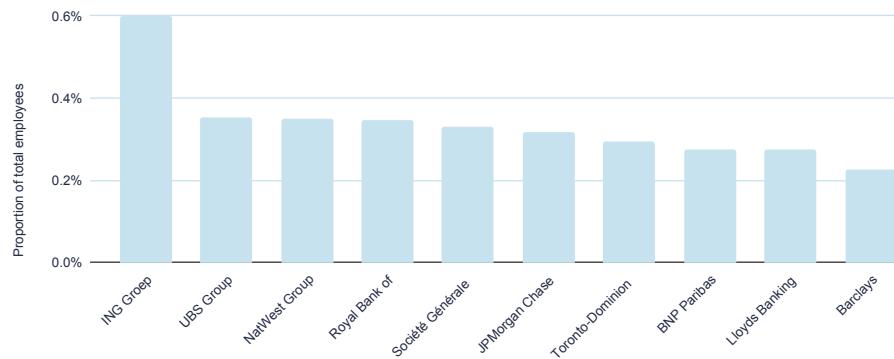
Some banks may take a buy versus build approach to developing technology - in which case they might be expected to perform more poorly in terms of the number of AI development employees. The Index's Innovation pillar captures some of this impact, such as in the Partnerships sub-pillar.

In addition to having a high number and calibre of AI development talent, banks need to have strong data and model risk capabilities to effectively put models into production.

As with AI developers, high calibre data engineers are likely to want complex challenges within their day-to-day working lives. The reality is that legacy systems and banks' perceived lack of technical agility can make them a far less attractive prospect for these professionals than employers that are technologically native, agile and truly innovation-minded. Yet without top data talent, data scientists will find themselves spending the majority of their time doing data engineering tasks, such as preparing data for modelling, or cleaning data for better results.

AI models also bring a new level of challenge to model risk and will take longer to validate, challenge and gain approval from senior management. The number and calibre of talent within the model risk function is also key to enable the deployment of safe AI models at a pace.

FIG 4. AI DEVELOPMENT EMPLOYEES AS A % OF TOTAL EMPLOYEES, BY BANK (TOP 10)

Source: LinkedIn (October 2022)

Note: AI development employees includes all employees visibly stated on LinkedIn working as data scientists, AI/ML engineers, developers and architects.

It is clear from the Index that banks have varying proportions of data and model risk staff relative to AI development and quant talent - our data shows large differences between the banks, with Data Engineering talent varying from just over 25% to just under 75% of the proportion of all AI & Data talent. But what is optimal balance? And how should this vary by type of bank? These are questions we are keen to explore in the coming months.
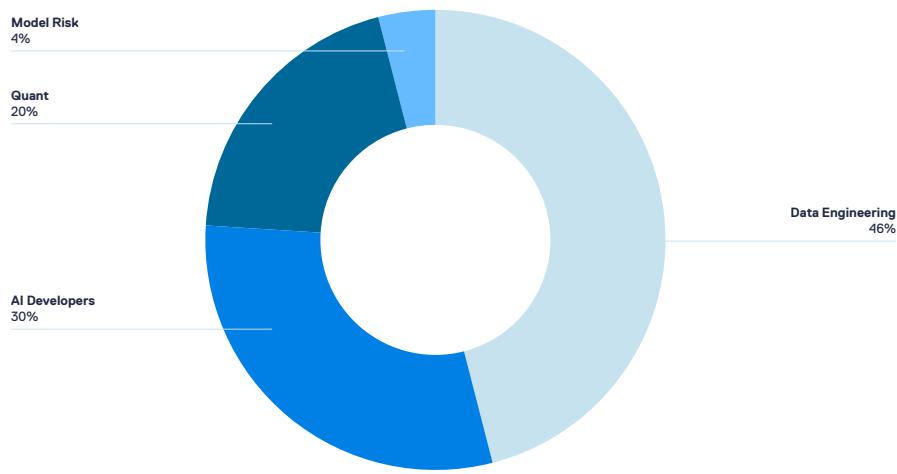
The competition for talent
Banks face huge competition to attract the best talent, not just from other banks but also from the Big Tech companies, and companies across all sectors that are rapidly investing in their AI capability. This means banks have to compete with large organisations able to offer competitive salaries, often coupled with flexible working hours and desirable benefits packages. As a result, recruiting data scientists and AI professionals - already a field that is

Key Findings by Pillar: Talent

FIG 5. EVIDENT AI INDEX BANK AVERAGE % OF AI & DATA TALENT BY JOB ROLE

Note: AI & Data Employees includes all employees visibly stated on LinkedIn working in the areas of AI development, quants, data and model risk

Source: LinkedIn (October 2022)

- Model Risk 4%
- Quant 20%
- AI Developers 30%
- Data Engineering 46%
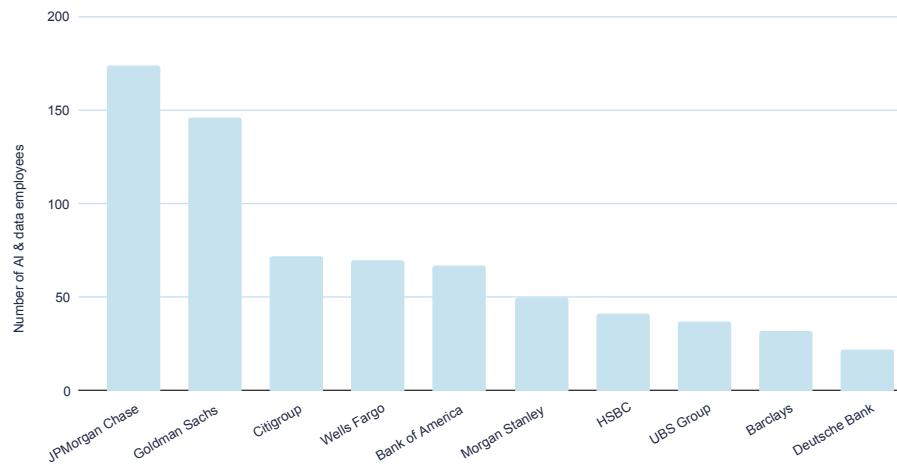
short on supply and long on demand - is a difficult, expensive endeavour, resulting in a multi-industry talent war.

We've analysed the current AI & data banking employees in our Index to explore how the banks are attracting talent from the rest of the financial sector, as well as major technology companies.

There is a clear gap between JPMorgan Chase and Goldman Sachs and the rest of the industry in terms of the number of current employees within our sample that they have recruited from Big Tech companies (Alphabet, Amazon, Meta or Microsoft) - this excludes any employees in other divisions, such as sales. Whether recent staff reductions in Big Tech firms will accelerate this dynamic remains to be seen.

FIG 6. NUMBER OF SAMPLED AI & DATA EMPLOYEES WHO HAVE PREVIOUSLY WORKED AT A MAJOR BIG TECH COMPANY (TOP 10)

Source: LinkedIn (as of October 2022)

Note: "Big Tech" companies include Alphabet, Google, Amazon, Meta (incl. Facebook) or Microsoft

Meanwhile, focusing on competition between the banks in the Index, the majority of talent is attracted from banks in the same domestic market, or banks that share a common non-English language.
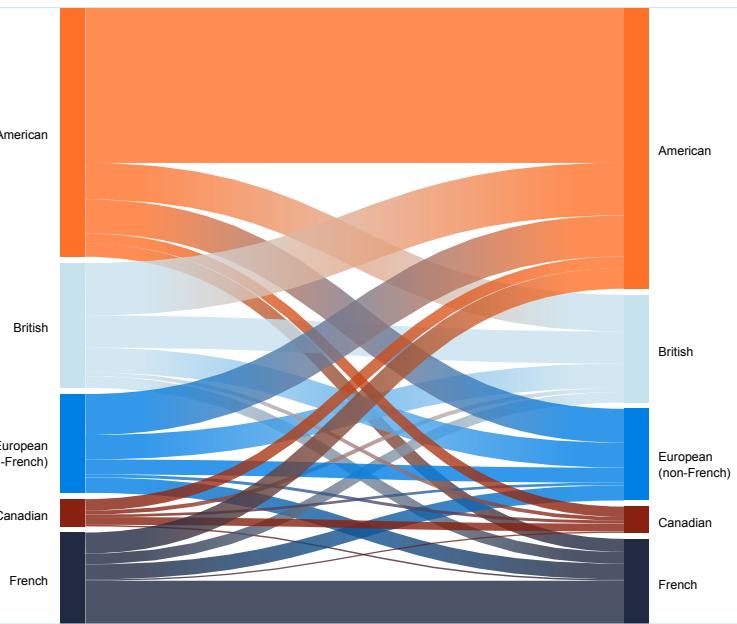
American banks predominantly attract talent from other American banks, and provide a significant source of talent for banks in all other regions. French banks predominantly attract talent from other French banks. Yet BNP Paribas has a significantly higher global talent pull than its counterparts, and Societe Generale also attracts a small talent pool from US banks (interestingly, these two banks also have a high volume of movement between them). UK-based banks tend to attract talent more evenly from peers across the UK, US and non-French European banks, presumably reflecting the depth and breadth of the international talent pool in London.

FIG 7. FLOW OF AI & DATA TALENT BETWEEN BANKS IN THE EVIDENT AI INDEX BASED ON COUNTRY OF BANK HEADQUARTERS

Note: This chart shows the proportion of talent attraction flow from bank HQ countries and only includes employees who have worked at multiple banks in the Evident AI Index

Source: LinkedIn (as of October 2022)
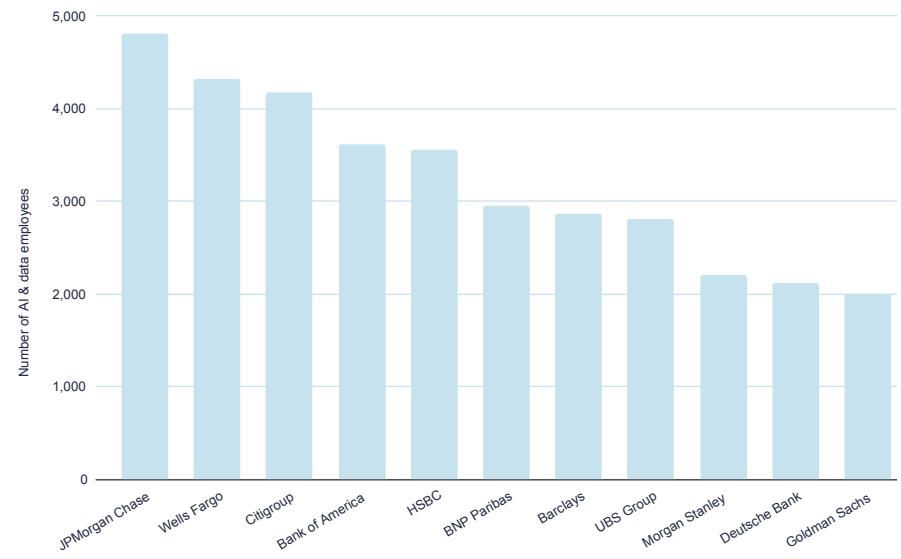
In addition, when looking at individual banks (see below), American banks also lead in terms of the total number of employees attracted from other banks within the Index, with JPMorgan Chase at the top.

While this is unsurprising given the relative size of the major US banks, it does indicate a deep talent pool in the US, with a high level of turnover, which must be beneficial for spreading best practice and increasing competition, and reinforces the strong need for strong hiring, retention and development initiatives. However, with the recent decline in the fortunes of many tech companies, and the rising cost of living in US tech hubs, we'll be keenly tracking whether the US will continue to attract the same volume of leading tech talent over the years ahead.

FIG 8. NUMBER OF CURRENT AI & DATA EMPLOYEES AT EACH BANK WHO HAVE MOVED FROM ANOTHER BANK IN THE EVIDENT AI INDEX

Note: AI & Data Employees includes all employees visibly stated on LinkedIn working in the areas of AI development, quants, data and model risk

Source: LinkedIn (October 2022)

Looking at individual talent flows between banks in the US, there is a clear competition for talent. For example, Wells Fargo has attracted a high number of AI-related employees from Bank of America.

However, when comparing the talent flows in the Index with their overall "AI culture" based on Glassdoor reviews, there doesn't appear to be a correlation. Further interrogation of the data is needed to provide insight into what can appear counterintuitive findings.

FIG 9. FLOW OF AI & DATA TALENT BETWEEN TOP US BANKS

AI-specific talent hiring and development initiatives are a priority for most banks

Given the highly competitive talent markets, it's no surprise that banks are investing heavily to attract, retain and develop their people. By analysing websites, press releases, job descriptions and other public reporting, we've assessed the hiring, training and development initiatives underway at each bank.
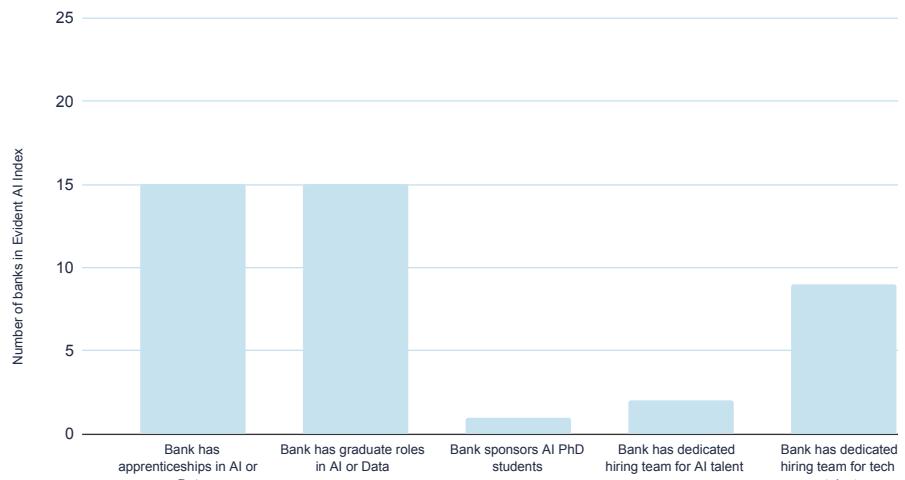
Leading banks, such as JPMorgan Chase and Wells Fargo, appear to be pursuing a wide range of initiatives that emulate Big Tech companies, with evidence of:
→ Apprenticeships in AI, data science, or data analytics
→ Graduate roles for AI, data science or data analytics
→ Scholarships, internships, or placements for AI, data science or analytics
→ Dedicated hiring teams for technology and AI
→ AI-related PhD scholarships or fellowships (JPMorgan Chase and Santander only)

FIG 10. EVIDENCE OF HIRING INITIATIVES ACROSS 23 BANKS IN THE EVIDENT AI INDEX

Note: AI & data includes AI developers, quants, data and model risk

It's important for banks to put in place dedicated hiring teams for technology and AI talent to ensure individuals in those teams have the deep understanding of the specific skills and expertise needed for each role - not just within an organisation, but on a departmental basis. We've found evidence of dedicated technology hiring teams at ten banks in the Index, with specialist AI hiring teams at just two banks, JPMorgan Chase and Wells Fargo.

In addition, many banks are focused on training, retraining and development initiatives, with some European banks such as ING, Deutsche Bank and HSBC performing well alongside JPMorgan Chase and Bank of America.

ING identified the need for AI training and retraining initiatives back in 2019, with the development of its own Analytics Academy, which is available to all ING employees. This involved partnering with training provider GoDataDriven, the outcome being:

→ A full 24-day Data & AI accelerator program for its Advanced Analytics Team
→ Over 5,000 employees being trained and certified in person on the use cases and application of data and analytics
→ The continuation of this internal initiative with the hiring of multiple dedicated roles including an Analytics Academy Lead, and a Learning Expert & Culture Lead

Evidence of Individual Contributor (IC) tracks is particularly interesting as it showcases some banks' commitment to follow Big Tech and offer opportunities for top AI development talent. A lack of IC tracks can make it difficult for a company to retain top talent, as highly technical staff may leave in search of opportunities that allow them to advance their careers without the expectation of management responsibilities. In the field of AI, there is a high demand for innovative and creative thinking, and IC tracks can give employees the freedom and autonomy to pursue their own ideas and research. Meta, for example, has a clear split between its Individual Contributor and People Management tracks.

FIG 11. "INDIVIDUAL CONTRIBUTOR" A PROMINENT FILTER ON META'S CAREERS PAGE

Source: Meta careers page

Diversity looks promising but issues remain
Ethical risks raised by AI require a strong focus on making sure that the decision-makers in the room reflect the society that they operate in. We have been able to track the proportion of female staff at banks in the Index - but not other types of diversity, such as ethnicity. This is something that we are keen to include going forwards.

On average female employees make up 34% of our sampled population of AI developers. Research suggests that AI-focused teams across multiple industries have, on average, around 27% of employees identifying as women, according to a 2022 McKinsey report. It's therefore promising to see these numbers from the banks, even if it's still well behind the 46% average of women who work in banking.
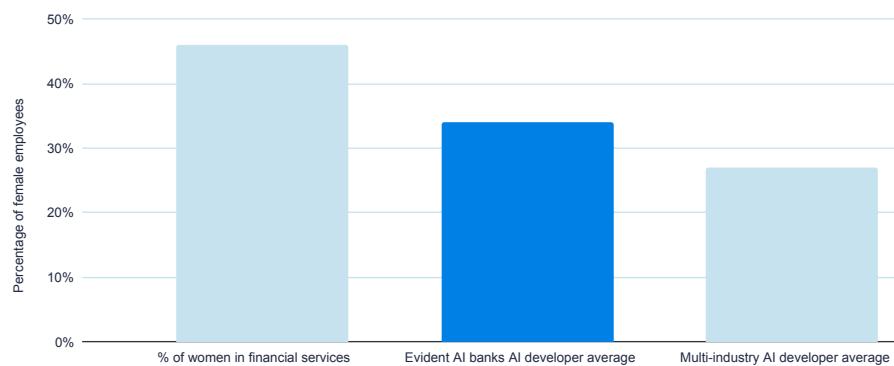
Talent remains the defining feature of this first phase of AI transformation. Banks are among the few employers outside of Big Tech that can afford to hire a high number and broad range of AI-related talent. A crucial next step for banks to address is how they mobilise this new workforce to support their AI mission.

Key Findings by Pillar: Talent

FIG 12. % OF FINANCIAL SERVICES EMPLOYEES COMPARED TO % OF FEMALE AI DEVELOPERS ACROSS INDUSTRIES

Source: % of women in financial services. Multi-industry AI developer % of women

Note: the Evident AI Index average is calculated from our sample of 120K LinkedIn profiles, and gender is assumed via the use of the gender_guesser python library.

Innovation

Innovation is about taking new ideas and turning them into tangible value for stakeholders, whether that be new and improved products or services, or for efficiency gain. This can be done by driving the creation of new technologies in-house and by leaning on external expertise.

Banks in our Index take different approaches to innovation, and we attempt to capture a combination of their ability to build and develop new technologies in-house, their willingness to partner with leading external vendors, and their focus on investing in, or acquiring, AI-first companies.

HOW WE MEASURE INNOVATION
The Evident AI Innovation pillar assesses the overall participation of banks in a number of areas that drive or otherwise indicate technological innovation. We capture a bank's ability to create novel AI research and participate in leading conferences, the ability to build a strong patent portfolio to protect competitive advantage, the volume of investment into AI and technology companies, and the engagement of the bank in the wider AI ecosystem.

RESEARCH & PATENTS	VENTURES & PARTNERSHIPS	ECOSYSTEM
The volume and calibre of original academic research papers; ownerships of AI patents; participation at leading academic conferences	The volume of investments into, and acquisitions of, tech or AI-first companies, as well as the range of partnerships the bank has employed to accelerate its AI and digital initiatives.	The bank's overall engagement with the broader innovation ecosystem. This includes contributions to the open source development community, as well as publicly stated academic partnerships
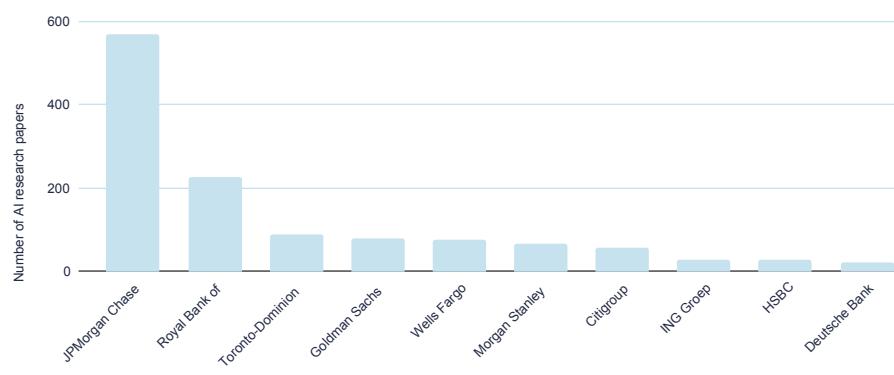
Research and patents are an increasingly important component of innovation strategy
To assess the intellectual output of a bank around AI, we gathered over 1,400 research papers and 5,800 patents about AI that were attributable to the banks in our Index. We analysed the volume of patents and research, the total and average number of citations, and the length of time that each bank has been actively producing research or patents.

FIG 13. NUMBER OF AI RESEARCH PAPERS PUBLISHED BY STAFF SINCE 2017 (TOP 10)

Source: Google Scholar, arXiV

Note: AI research papers are identified by using a large number of AI-related keywords across titles and abstracts.

Key Findings by Pillar: Innovation

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The Evident AI Innovation pillar assesses the overall participation of banks in a number of areas that drive or otherwise indicate technological innovation

Whilst almost all banks in the Index have produced some original AI research, the overwhelming standout across our Index is JPMorgan Chase, which has invested heavily in all areas of AI innovation. The bank's AI research team, has produced 580 research papers related to AI over the last five years - more than the next five best banks combined - with input from at least 112 employees.

There are also other strong performers in the research area of our Index, with both Canadian banks, RBC and TD Bank, coming second and third in terms of volume of research papers around AI. This is heavily driven by their respective AI research labs, Borealis AI and Layer 6. These two banks have also made a number of their academic paper submission codes easily available on their GitHub page, some of the only banks in the Index to do so.

However, it could be argued that the calibre of this research is not yet at the level of the technology companies the banks appear to be imitating. In our analysis of 20 leading AI and Machine learning conferences (such as Neurips and ICML) we found limited participation by the banks in our Index. Of the 23 banks in the Index, only six of them appeared to participate at these conferences in the last year, with three banks (Morgan Stanley, RBC and JPMorgan Chase) sponsoring conferences, two banks (TD Bank and Goldman Sachs) having a paper accepted, and two banks (JPMorgan Chase, Bank of America) with workshop or speaking responsibilities.
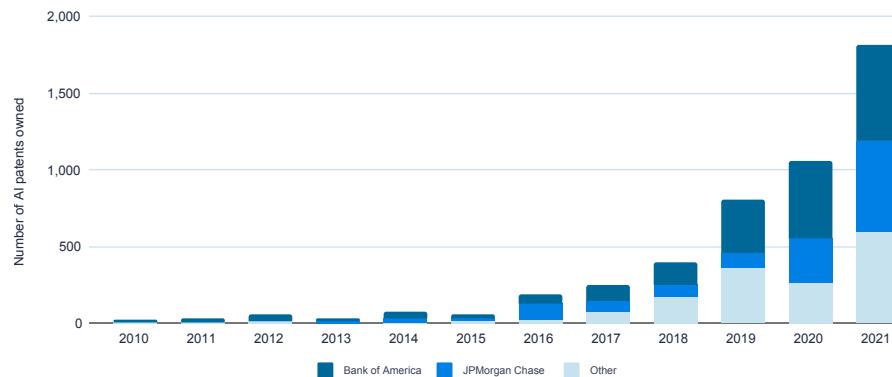
Of course, Innovation involves more than just pure research. Companies need to apply novel theories to practical applications - not always easy in the commercial world - and to protect their IP and any resulting competitive advantage once it is gained. One strategy to address this is to develop a strong patent portfolio.

Our data shows that two banks, Bank of America and JPMorgan Chase, are driving a strong patent agenda, with the former currently owning more than 2,000 patents related to AI. Bank of America has focused on patents for many years; it was one of the first banks in the Index to start owning AI-related patents, with evidence of technology patents before 2010.

However, many more banks in the Index have entered the AI patent race since 2017. Seven banks in the Index now own more than 200 AI patents, and AI patent ownership has increased by 72% from 2020 to 2021. We will be following how this evolves over the coming years.

Comparing the volume of patents and research, we see signs of the strategy that some banks are taking when it comes to innovation. JPMorgan Chase has clearly opted to invest heavily in both research and patents, while Bank of America has almost entirely focused on patents as a strategy. Interestingly, most of the other banks in the Index opt for a mix of both patents and research, and we can see a leading pack of six banks (Wells Fargo, Goldman Sachs, Citigroup, RBC, TD Bank, and Morgan Stanley) that have pushed beyond the experimentation stage and are beginning to pull away from the rest.

FIG 14. AI PATENTS OWNERSHIP OVER TIME BY BANKS IN THE EVIDENT AI INDEX
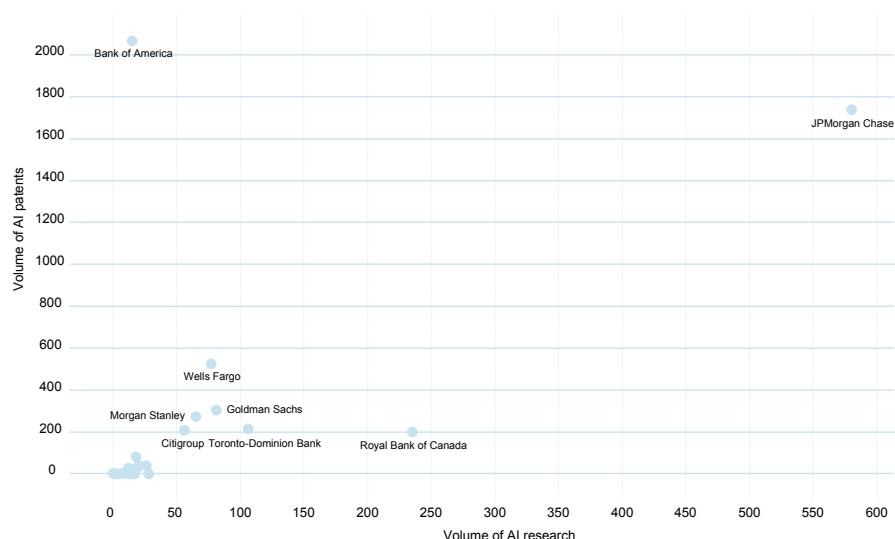
Source: Google Patents (October 2022)

Note: JPMorgan Chase & Bank of America are the two largest patent owners

FIG 15. NUMBER OF AI PATENTS CURRENTLY OWNED VS NUMBER OF AI RESEARCH PAPERS PUBLISHED SINCE 2017

Source: Google Patents
(October 2022)

Note: AI research papers are identified by using a large number of AI-related keywords across titles and abstracts.

Both research and patents are markers of a bank's ability to innovate, but the development of these areas into useful products and services will increasingly be the focus as the ROI of these large and expensive teams needs to be considered.

One key question is whether patents are still a useful measure of innovation. In a field such as AI, which is developing so rapidly, would that resource and investment be better spent elsewhere?

This is the change in behaviour reported by IBM's SVP and Director of IBM Research Darío Gil in a recent Fortune article. Gil discusses the company's motivation to move away from its historic focus on patents, to instead focus on new research areas and greater collaboration with other organisations.

The move to be more selective on patenting, Gil argues, must come with the practice of "open innovation", where companies look beyond their own organisation and collaborate openly with other companies and institutions. The argument here is that increased knowledge sharing accelerates the advancement of technologies like AI, in turn accelerating the benefits AI can deliver to the companies, such as product improvements and cost efficiencies.

A potential indicator of the willingness to move towards more open innovation is to look at a bank's engagement with the open-source community, as well as academic partnerships more broadly. Almost all the banks in the Index have a dedicated company GitHub profile.

Diving into the open codebases of the banks in our Index, we found that eight of the banks have at least one repository related to machine learning. Borealis AI (RBC) and Layer 6 (TD Bank) have a number of repositories across the Index sharing the code for their academic research papers, while we see a number of well-cited and maintained ML packages, including Borealis AI's Advertorch toolbox, and Societe Generale's Automated Machine learning package, aikit, and NLG library, CoreNLG.

Although these are indicators that we have measured in the Index and, we believe, form an important measure of AI development capability, this open innovation space of AI appears to be one in which banks have merely dabbled. Given the potential security concerns and the ongoing burden of transforming legacy technology stacks, it is perhaps not a current priority for banks. However, as the pace of AI development speeds up, it may be that failure to evolve new, open and collaborative cultures will prove strategically problematic for the banks.

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"Patents are only one measure of a company's true capacity for innovation. IBM will continue to patent new technology, but patents alone are a more incomplete barometer than ever before."
Darío Gil, IBM, Fortune (January 2023)

PARTNERSHIPS

Despite limited engagement in the open source ecosystem by most banks in the Index, many have built partnerships across a broader network of universities, companies and start-ups. This places them in a relatively strong position for innovation success and the attraction of great talent.

ING, a strong performer in our Index, has been forming partnerships with both businesses and academia to help drive AI adoption.

ING's involvement with universities, businesses and Kickstart AI puts the bank at the heart of a movement driving AI adoption in the Netherlands - a country that placed 8th in the most recent Tortoise Global AI Index. Similar integration can be found across multiple banks in our Index.

FIG 16. ING PARTNERSHIPS IN THE AI ECOSYSTEM

Academic research activity			AI Engagement		Investment Partnerships		
Has dedicated research team for AI; their ING Wholesale Banking Advanced Analytics team	AI Fintech Lab creation with TU Delft in 2019	New 5-year partnership with University of Twente on AI in finance	CAO sits on the board of Kickstart AI, and is vocal about AI initiatives in external media	Founding member of Kickstart AI - fostering the AI community in The Netherlands	Multiple investments into AI companies, like Axyon AI in partnership with UniCredit Group	Technology partnership with Black Swan on future-proofing KYC operations	Creation of ING Labs to partner with innovative scale ups, and the subsequent funding of AI companies like SeMi Technologies

Source: Evident Analysis

As AI use within banks is still in its development stage, having an integrated partnership with a large technology company can support digital and AI growth and capability. There are a number of examples of these partnerships in our Index, notably Deutsche Bank's recent announcement about its AI partnership with NVIDIA.

Crédit Mutuel's strategic partnership with IBM may have started over 50 years ago but has increasingly focused on driving AI adoption at the bank. This includes the announcement of a Technological Center of Excellence, AmbitionS and the creation of the Cognitive Factory, a blended team of Credit Mutuel and IBM AI professionals that has deployed IBM Watson across multiple business lines at the bank.

Partnering or "buying in" to provide specific services or use cases may make sense when this can speed up innovation and delivery. However, the sheer scale of change required to build AI services across banks of this scale, and the unique nature of the underlying data architectures that need aligning, ultimately will require a significant investment in internal resources. Time will tell if the strategy of relying heavily on partnerships and buying in the resources needed to implement AI solutions proves superior to developing the technology, knowledge and talent in-house.
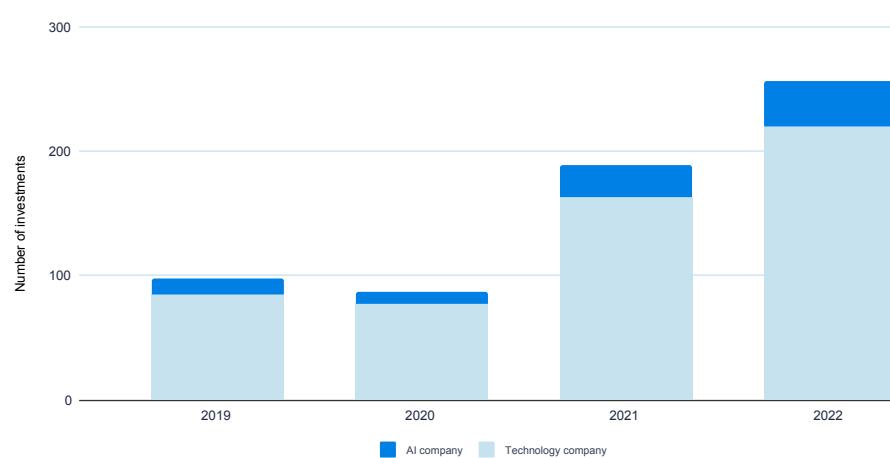
INVESTMENTS

In addition to partnering with leading providers, taking a stake in (or acquiring) a strategically important technology company can be another way to drive innovation, opening up opportunities for collaboration, learning and customisation of existing products or services to suit the bank.

Over the last four years, we have seen an increasing number of investments into technology companies from banks in the Evident AI Index, with an increasing share of these related to AI. In fact, our data shows that there was a 27% year-on-year growth from 2019 to 2022 in the number of investments into tech companies by the banks in our Index, with the percentage of those investments related to AI growing to 16% in 2022.

FIG 17. NUMBER OF INVESTMENTS IN AI & TECHNOLOGY COMPANIES BY BANKS IN THE EVIDENT AI INDEX SINCE 2019
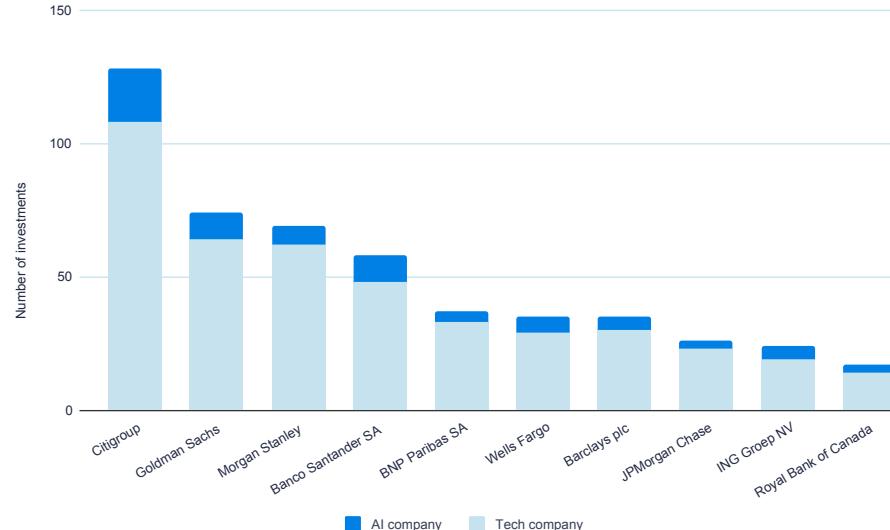
Source: Crunchbase
(Oct 2022)

Note: Company type identified by crunchbase labels and Evident analysis of company descriptions

Citigroup appears to be leading all other banks in this area of the Index, with Santander the only European bank rivalling the major US players. The Citi Ventures team has made nearly 120 investments in technology companies since 2019, of which 20 investments are in AI-driven companies. However, Citigroup is rarely a lead investor in these companies, with other banks - such as Goldman Sachs - investing less frequently but more often in a lead role.

FIG 18. NUMBER OF INVESTMENTS IN AI & TECHNOLOGY COMPANIES SINCE 2019, BY BANK (TOP 10)
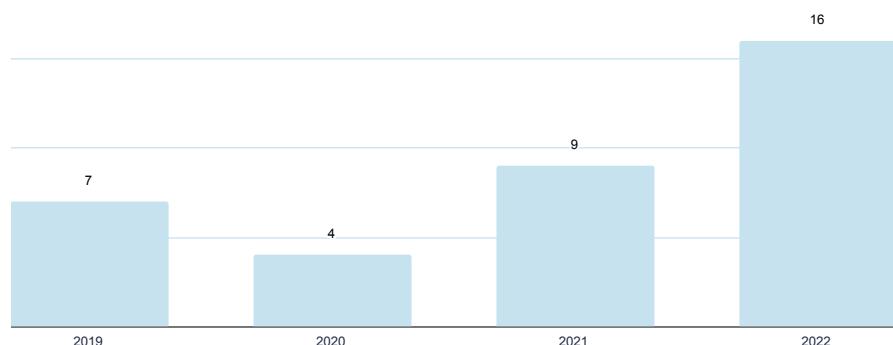
Source: Crunchbase
(Oct 2022)

Note: Company type identified by Crunchbase labels and Evident analysis of company descriptions

When it comes to AI investments specifically, it looks as though Citigroup will have greater competition in the future. While there were only seven banks investing in AI companies in 2019, there are now 16 banks in the Evident AI Index actively investing in this space.

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**FIG 19. NUMBER OF BANKS IN THE INDEX THAT HAVE INVESTED IN AI COMPANIES BY YEAR**

Source: Crunchbase
(Oct 2022)

Note: Company type identified by Crunchbase labels and Evident analysis of company descriptions

The question remains as to what extent these investments are VC-focused rather than strategic in nature. Whatever the case, activity in this space comes with opportunities for increased collaboration, partnership, or acquisition, the latter providing a valuable source of innovation and talent.

It is interesting to see a gap in our data when it comes to AI acquisitions, with no public evidence of any acquisitions of AI companies in recent years. This is surprising, as one of the top performing banks in our Index, TD Bank, made an early play in this area by acquiring the AI research company Layer 6 in early 2018, integrating one of the founders into the role of Chief AI Officer at the parent company. Layer 6 now forms an integral part of TD's work, deploying its AI expertise to a large number of business problems.

With the current decreasing market value of many technology companies, we will watch with interest to see if banks evolve new strategies to capture the skills that they need.

The data used in in the above charts related to AI and technology investments is sourced from Crunchbase (www.crunchbase.com).

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Effective leaders mobilise people to get behind an agenda. Communication is crucial to engaging stakeholders and driving the AI agenda internally and externally.

Leadership

AI transformation requires the mobilisation of a wide range of stakeholders - from employees, to investors, to customers. It requires individuals at the top of the organisation to understand the transformational power of AI, and be willing to invest in the long-term future of the company, possibly at the expense of the short-term results. It requires the setting of a clear ambition, goals and targets, as well as consistent and clear communication along the way.

The Leadership pillar measures to what extent the Executive leadership team appears to be prioritising their AI ambition, as well as how well the bank communicates AI initiatives and strategies to various stakeholders.

We focus on two areas:

→ **Executive Positioning**: the extent to which the CEO and members of the executive leadership team prioritise AI in their external facing communication, as well as visibility of how AI is managed at a group level, for example, the stated existence of an AI Centre of Excellence.
→ **AI Narrative**: the bank's external narrative on AI at a group level; how clearly it communicates key AI initiatives and priority areas in group-level investor relations materials, press releases, across the company website and group-level social media.

Good leadership starts from the top
Effective leaders mobilise people to get behind an agenda. Communication is crucial to engaging stakeholders and driving the AI agenda internally and externally. This demands buy-in from an organisation's leaders and typically needs to come from the top. Executive survey data from Accenture found that 83% of the most AI mature companies have C-suite sponsorship of AI, compared with 56% of those seen as less mature.
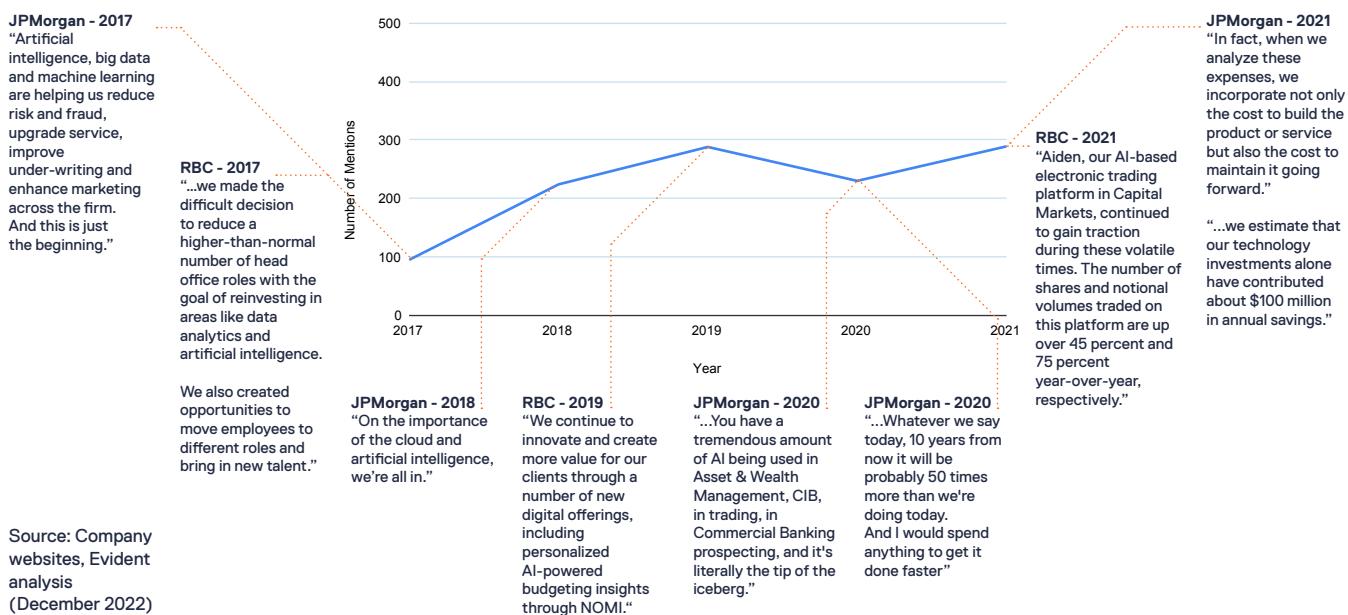
Key Findings by Pillar: Leadership

Our results support this finding. The two banks that lead the Index, JPMorgan Chase and RBC, both also rank top in terms of the AI Focus of the CEO. Strong CEO leadership leads to strong overall performance in AI.

The CEOs have not only made big bets on AI in fostering innovation and talent in their business, but they have also continually emphasised the important of to the bank for many years.

Noticeably, they have both evolved their communications from referencing AI as a "hyped" technology to explicitly referencing return on investments, efficiency gains and customer experience improvements, something we expect to increase in the coming years.

FIG 20. ANALYSIS OF CEO AI COMMUNICATION AT JPMORGAN CHASE AND RBC SINCE 2017

JPMorgan - 2017
"Artificial intelligence, big data and machine learning are helping us reduce risk and fraud, upgrade service, improve under-writing and enhance marketing across the firm. And this is just the beginning."

RBC - 2017
"...we made the difficult decision to reduce a higher-than-normal number of head office roles with the goal of reinvesting in areas like data analytics and artificial intelligence.

We also created opportunities to move employees to different roles and bring in new talent."

JPMorgan - 2018
"On the importance of the cloud and artificial intelligence, we're all in."

RBC - 2019
"We continue to innovate and create more value for our clients through a number of new digital offerings, including personalized AI-powered budgeting insights through NOMI."

JPMorgan - 2020
"...You have a tremendous amount of AI being used in Asset & Wealth Management, CIB, in trading, in Commercial Banking prospecting, and it's literally the tip of the iceberg."

JPMorgan - 2020
"...Whatever we say today, 10 years from now it will be probably 50 times more than we're doing today. And I would spend anything to get it done faster"

RBC - 2021
"Aiden, our AI-based electronic trading platform in Capital Markets, continued to gain traction during these volatile times. The number of shares and notional volumes traded on this platform are up over 45 percent and 75 percent year-over-year, respectively."

JPMorgan - 2021
"In fact, when we analyze these expenses, we incorporate not only the cost to build the product or service but also the cost to maintain it going forward."

"...we estimate that our technology investments alone have contributed about $100 million in annual savings."

Source: Company websites, Evident analysis (December 2022)

The AI narrative: Moving from talk to walk
Impactful AI leadership is not just about the CEO and their communications, but about consistent messaging and clarity across all company channels, such as press releases, investor relations materials and social media channels.

Looking at company reporting specifically, there was a sharp increase in references to AI from 2017 to 2019, before levelling off. This plateau comes alongside rises in mentions of other related, but more specific technologies, which include increased discussion around the use of cloud computing, automation and open source.
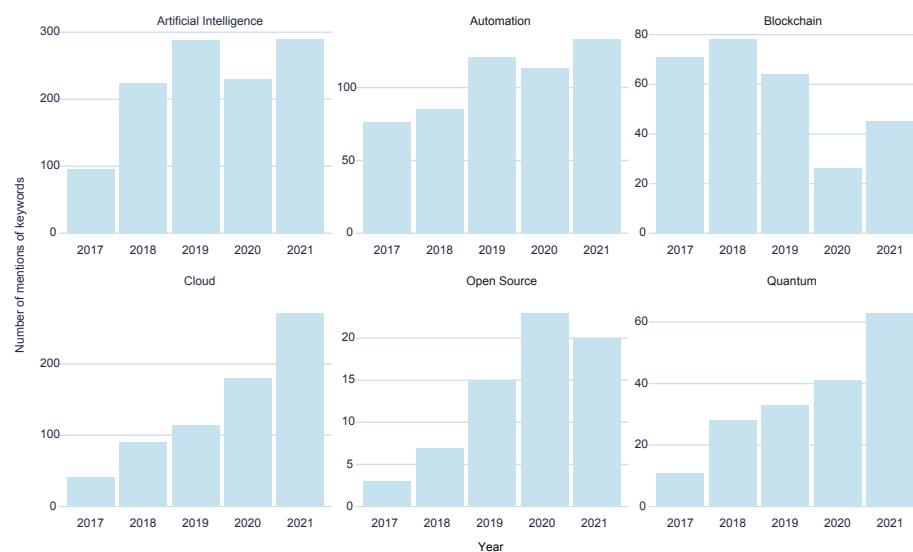
References to quantum computing, on the other hand, are steadily increasing. Could this indicate AI has shifted from being perceived as the latest "must-have" technology to being part of the greater digital transformation of the business?

Digging deeper into this data, we find surprisingly little evidence of clearly articulated AI strategies, goals or targets, undoubtedly an important part of any AI transformation effort.

We found no evidence that any banks in the Index have published a public AI strategy - this is in contrast to many clearly articulated cloud strategies, data strategies, and strategies around broader digital transformation efforts. Less than half the banks in our Index, predominantly the Europeans, even mentioned AI as part of their strategic objectives.

FIG 21 - MENTIONS OF EMERGING TECHNOLOGY WORDS IN INVESTOR RELATIONS DOCUMENTS BETWEEN 2017 - 2021

There appear to be lower levels of publicity when it comes to referencing AI as a strategic priority at many North American banks. There are a few possible reasons for this: strategies are highly sensitive; banks want to keep these close to their chests; banks may not differentiate AI from broader data and analytics efforts, or there may just be inherent cultural differences across the banks in the Index.

Whatever the cause, the result is that banks are providing little clarity to external stakeholders around their strategic objectives when it comes to AI. The pressure on the banks to communicate what they are doing will only increase as awareness of the power and risks associated with AI increases. We will be tracking this over the coming months and years.

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It is increasingly important that businesses explicitly communicate the steps they are taking, in order to build trust with a wide range of stakeholders

Transparency in the context of responsible AI

Banking is a highly regulated sector, with strict guardrails related to how banks operate and communicate. There are many layers of risk management and governance, as well as specialists within banks that are minimising risks for customers. This is something we cannot, and would not try to, assess with the outside-in approach.

However, as awareness over AI's potential societal impact accelerates, ensuring that AI development takes place transparently has become a matter of concern for key stakeholders. This includes regulators, who are pushing companies to explain how specific high-risk AI models make decisions, but also more conscious shareholders, consumers and employees, who are increasingly expecting that companies communicate how they develop and deploy AI responsibly and ethically.

While transparency is not the silver bullet to drive trust - and is not the only component that matters - it is a stepping stone to demonstrating an institution's trustworthiness to this wide range of stakeholders.

The Transparency pillar measures to what extent banks are publicly communicating their approaches to responsible AI, such as through the announcement of ethical principles, collaborations with other organisations, and publication of original research.

HOW DO WE MEASURE TRANSPARENCY WHEN IT COMES TO RESPONSIBLE AI IN BANKING?
Transparency in the context of responsible AI is still somewhat nascent, and as of yet there is no standard way for companies to report on it. However, we have honed in on explicit public statements that show how different banks communicate their approaches to the topic - drawing from sources such as company reporting, press releases, leadership hires, role titles, job descriptions and academic research.

We have found publicly available evidence of:
→ Published responsible or ethical AI principles
→ Collaborations with other institutions to facilitate understanding of key themes around responsible AI or ethics
→ Dedicated roles related to AI ethics,data ethics or responsible AI
→ Tools used and shared externally to improve explainability and fairness
→ Research related to specific areas of responsible AI, such as explainability & fairness
→ Descriptions of how risk management approaches have been adapted for AI
→ Dedicated roles to cover AI-specific governance challenges

Transparency as a driver of trust
Since the 2008 financial crisis, trust between banks and key stakeholders has been damaged, with confidence in banks now increasingly threatened by highly competitive, often seemingly bespoke services provided by neobanks and new Fintech players.

The AI space has gone through a more mild crisis of trust in recent years. Customers have become more aware of harmful algorithmic bias in high risk contexts. Big Tech companies are acutely aware of the reputational risks from harmful AI - with notorious recent examples including Microsoft's Tay chatbot and Google's facial recognition tool.

All of this puts pressure on the trustworthiness of the architects of AI systems. Public awareness of the latest generation of AI tools - such as ChatGPT - will only increase this sensitivity. With AI being adopted at scale by the banking sector, this all stands as a stark warning to the sector that trust simply cannot be ignored.

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"The most fundamental thing wrong with AI is that we make it a mystery," Cathy Bessant, Vice Chair, Global Strategy at Bank of America (2020)

A range of stakeholders are coming to expect transparent and accountable AI development that upholds high ethical standards and minimises risk by design. Both AI and banking can be complex and opaque, with the potential to accentuate ethical risks at scale. Whilst there has been progress from practitioners in the AI space to drive ethical standards internally, a crucial element for banks in developing trustworthy AI is communicating this to their stakeholders.

The link between transparency and trust reflects a wider societal trajectory that is not unique to AI. For example, reporting and disclosure on corporate sustainability practices - also known as ESG - has provided firms with an opportunity to communicate and build trust with their stakeholders. In fact, recent commentary from PwC has suggested that there is a clear thread between ESG and responsible AI.

FIG 22. TRUST MATTERS, BUT IS NOT LIMITED TO, THE FOLLOWING GROUPS:

CURRENT AND FUTURE EMPLOYEES

Movements in AI talent have the potential to be affected by trust. Companies that uphold trustworthy AI standards are likely to attract and retain top talent. Equally those who slip up on their ethical standards risk losing employees - as experience at Big Tech players shows. More broadly, all employees (whether working with AI or not) need to trust AI-driven tools such as those used to automate hiring workflows or monitor staff performance or compliance.

REGULATORS

Trust is front and centre for AI regulation. In Europe, upcoming legislation in the AI Act was informed by principles set out by the European Commission's Expert Working Group on Trustworthy AI. It is likely that this will set the tone globally and set tough requirements for "high-risk" applications - including systems that banks are already using. Whilst banks already deal with regulators for existing models, the complexity of many AI systems demands a sufficient level of explainability and fairness.

MEDIA AND GENERAL PUBLIC

Public perception of AI rests on a knife edge. Significant improvements to the power of AI applications has the effect of enthralling and startling consumers, as recent reaction to Generative AI tools such as ChatGPT shows. A WEF & IPSOS survey shows that this is also true about trust in the companies that use AI. Just 50% of adults across 28 countries reportedly trust companies that use artificial intelligence as much as other companies.

Both AI and banking can be complex and opaque. A crucial element for banks in developing trustworthy AI is to increase transparency around what they are doing and clearly communicate this to their stakeholders.

Few banks are publicly reporting on approaches to responsible AI
Despite the growing importance of trust, it appears that banks vary hugely in terms of how much they have prioritised the external communication of their responsible AI agenda.
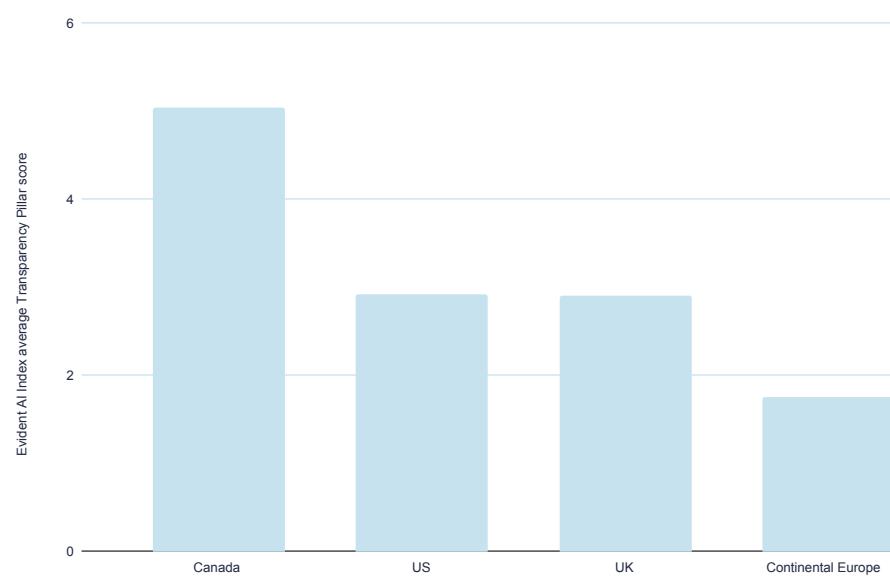
We tracked public statements, publications and collaborations related to responsible AI for each bank in the Index, and the data in the figure below (or lack of it) suggests most banks have made limited progress towards transparently reporting on their responsible AI programmes.

FIG 23. EVIDENCE OF RESPONSIBLE AI ACTIVITY ACROSS BANKS IN THE EVIDENT AI INDEX

Note: Responsible AI principles includes references to documents labelled as ethical principles, not all banks included here have made these public yet.

Source: Company Reporting, External Media, arXiv (December 2022)

FIG 23. Bar chart showing Evident AI Index average Transparency Pillar score by region: Canada (~5), US (~3), UK (~3), Continental Europe (~1.7)

Out of all the banks in the Index, three banks appear to be strategically focused on increasing the transparency of their responsible AI activity - they are doing this on multiple fronts.

FIG 24: THREE BANKS IN THE EVIDENT AI INDEX CLEARLY COMMUNICATE A WIDE RANGE OF RESPONSIBLE AI ACTIVITIES

|	JPMorgan Chase & Co.	RBC	TD
PEOPLE	Multiple responsible AI Leads, including recent hires from leading tech firms	Responsible AI Strategy Lead, driven through Borealis AI research arm	Head of Layer 6 ML Management also sits on board of Centre for Advancing Responsible and Ethical Artificial Intelligence
PRINCIPLES	Ethical principles are produced and implemented by responsible AI leads, but not published publicly	Ethical principles are clearly stated through Borealis AI, the bank's research arm	Shows evidence of having ethical principles, but not published publicly
PUBLICATIONS	Approach to responsible AI included in 2020 ESG materials	Approach to responsible AI is included in 2021 ESG documents	Published a report titled Responsible AI in Financial Services, based on expert round table and public survey
PARTNERSHIPS	Hosting ongoing events series focused on AI Ethics	Founding partner of university course on AI ethics	Partnered with Microsoft to showcase approaches to responsible AI

Source: Evident Analysis
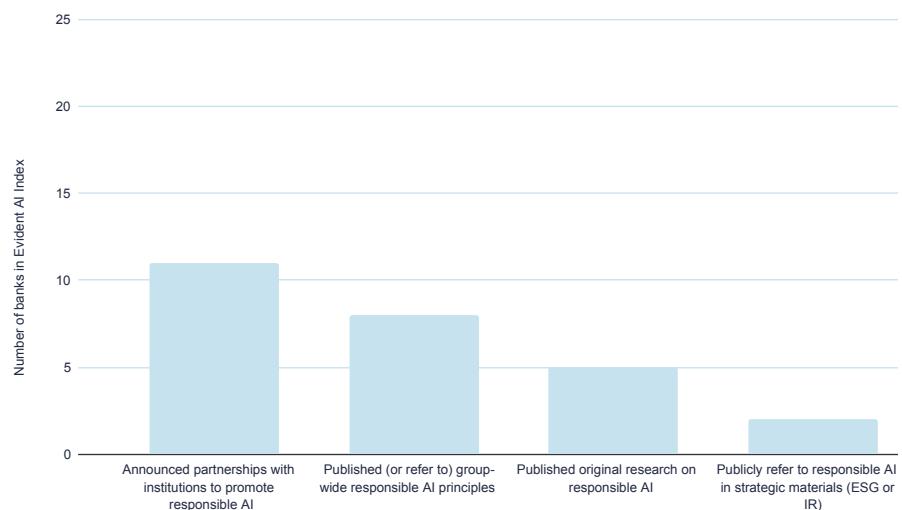
Addressing the technical challenges of implementing ethical standards into AI development often comes from strong research units that explore state-of-the-art thinking on these topics. So it is perhaps unsurprising that we see these three banks - each with strong research hubs - performing well here.

However, the question remains as to how these banks compare to other leading AI banks and Big Tech companies. For example, while only three banks in the Evident AI Index publicly report on their adaptation of risk management to address AI risks, this is somewhat limited compared to Capital One, a bank that we hope to include in the Index in the coming months.

Mind the gap: geographical differences on Transparency
Looking at Transparency scores by region, it is clear that the Canadian banks are the leaders in our Index. Despite strong performances from banks like ING, BNP Paribas, and Deutsche bank, continental European banks tend to be less transparent around their responsible AI activity.

FIG 25. EVIDENT AI INDEX AVERAGE TRANSPARENCY PILLAR SCORE BY REGION

Source: Evident Index Pillar scores (January 2023)

It's perhaps unsurprising that the two Canadian Banks - RBC and TD Bank - perform well, given the way that the country as a whole facilitates a lively AI ethics conversation.

The US and the UK clearly have a wide variety of performance within their mix - with strong performances from HSBC, Wells Fargo, Citigroup and JPMorgan Chase.

Leading banks on Transparency have created dedicated roles to drive responsible AI
Comprehensive responsible AI programmes need to be led by employees with clear accountability and specialist expertise in AI ethics and AI risk. We have found public evidence of nine banks who appear to have created dedicated roles related to responsible or ethical AI development. However, banks appear to structure these teams in different ways.

FIG 26: EVIDENCE OF DEDICATED RESPONSIBLE AI ROLES ACROSS BANKS IN THE EVIDENT AI INDEX

EUROPE AND UK	NORTH AMERICA
6	3
Evidence of six banks driving agenda for responsible AI through the lens of data ethics roles	**Evidence of three banks** driving the agenda for responsible AI through roles specifically dedicated to "responsible AI"

Source: LinkedIn, Company Materials, External Media (December 2022)

The UK and European banks appear to be managing responsible AI within the data ethics remit, perhaps in response to the dominating legislative force of GDPR. By contrast, the North American leaders are creating dedicated "responsible AI" roles as distinct from data and are attracting this talent from leading tech companies. It remains to be seen which approach becomes dominant.

In addition, banks are creating AI-specialist roles within existing risk management structures, and across all lines of defence. Although it is still early days, we expect these roles to grow in volume as the demand for accountability and ownership over AI risk increases.

In conclusion, while we know that many banks in the Index have adapted risk management to address AI risks, and established programmes to address responsible AI within the bank, there is generally very little public evidence of this across the banks in the Index. All banks will need to improve transparency around the work they are doing to stay apace with the growing public awareness of AI and its potential societal impacts. Ultimately, those that lead on Transparency will be able to redefine how they are perceived by society, create competitive advantage and better seize the opportunities AI presents.

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Join us

We hope you found this report valuable. We will be expanding and deepening the Evident AI Index for banks over the coming months and years, as well as tackling additional sectors. Evident is a membership-based intelligence platform for bankingexecutives, investors, equity researchers and vendors, aiming to bring transparency and openness to AI progress across the business world.

We offer the following services for our members:

→ Evident AI Index dashboard: access indicator-level data to compare all the banks in the Index across the 143 metrics

→ Executive diagnostic: evaluate an individual company's AI strengths and weaknesses to identify quick wins and areas of opportunity

→ Real-time benchmarking: monitor AI activity across the banks with our Talent, Innovation, Leadership and Transparency trackers tailored to your competitor set

→ Bespoke research: commission data-driven research reports and thought leadership to dig deeper into the Index or explore cross-sectoral trends in AI and other emerging technologies

→ Leadership events: we bring together leading AI experts from industry, academia and government to discuss the latest AI breakthroughs and the practical application of AI in business

If you are interested in exploring any of these areas, or understanding the Evident AI Index in more detail, please do get in touch.

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