# Technology and Innovation in Europe's Capital Markets

## A renewed imperative for the future of the industry

November 2020

Association for Financial Markets in Europe
www.afme.eu

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**November 2020**

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# Foreword

AFME and PwC are pleased to publish "*Technology and Innovation in Europe's Capital Markets: A renewed imperative for the future of the industry*".

In 2018 we published a report[1] that identified key trends in technology and innovation and a five-year vision for developing the investment banks of the future. This next report is an assessment of how investment banks and the industry are progressing on this journey and comes at a critical time.

The top two drivers of technological change today remain as they were in 2018 – reducing costs and enhancing client service. Investment banks have made progress over the last two years in areas such as the adoption of emerging technologies, Cloud Computing, increased resiliency, and new ways of working. However, the industry continues to face challenges, such as the immediate impact of the COVID-19 pandemic, along with new regulatory requirements – all coupled with persistent barriers to change that can limit their 'innovation-at-scale' and technology transformation goals.

The key technologies we identified in 2018 to underpin much of this change - Artificial Intelligence, Cloud Computing, Data & Analytics and Distributed Ledger Technology - are clearly driving changes across bank functions, the workforce, and engagement with third parties. Investment in these technologies is now more focused on core use cases looking to demonstrate value, but levels of adoption continue to vary. The ability to harness these technologies is likely to prove a critical driver of success.

Policymakers and regulators, through increased collaboration on policy frameworks and standards at the regional and global level, will continue to have a central role in supporting the adoption of new technologies – especially those with direct value to end users of the financial markets. This will help enable investment banks to execute their technology transformation plans and ensure that future, well-constructed, regulation maintains a balance between innovation, competition, and financial stability.

In producing this report, AFME, working with its members and supported by PwC, has examined the latest trends in technology and innovation across the capital markets industry and identified a number of calls to action for the industry over the next two-three years.

We hope that this report can support the industry - investment banks, investors, corporates, market infrastructures, policymakers, regulators, and third-party providers - in continuing to realise the future potential from new technologies in capital markets.

We wish to thank the subject matter experts from the AFME Technology and Operations Committee (TOC) for their efforts in contributing to this report.

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1 https://www.afme.eu/reports/publications/technology-and-innovation-in-europes-capital-markets

# Technology and Innovation in Europe's Capital Markets

## A renewed imperative for the future of the industry

# Executive Summary

**This report assesses the progress of key trends in capital markets technology and innovation and identifies new opportunities and challenges that have emerged over the last two years.**

The five-year vision and principles for the investment bank of the future, set out in our 2018 report[2], remain relevant today. However, the pace and adoption of new technologies at scale has been limited over the last two-years.

Our latest survey and in-person interviews with representative investment banks from AFME's Technology and Operations Committee (TOC), coupled with subject matter expertise from PwC, comes at an important time for the industry due to the impacts of COVID-19 and a new phase of regulatory scrutiny on non-financial risks (such as operational resilience).

We have identified the following trends in assessing our 2018 report:

- **Investment banks are more optimistic in their plans for technology transformation compared to 2018 and tangible benefits are now being realised.**
  - 50% of respondents to our survey felt that the current investment allocated to technology transformation was sufficient; up from only 28% in 2018.
  - Many investment banks are realising benefits from the key technologies we identified in 2018 (Artificial Intelligence/ Machine Learning, Cloud Computing, Data & Analytics and Distributed Ledger Technology). These are in areas such as process and text Analytics which are being used to improve client servicing, and Cloud Computing adoption to improve operational resilience.
  - The adoption of new ways of working (such as Agile methods) are also helping investment banks to be more collaborative, adaptive, and focused on innovation.
- **The recent COVID-19 pandemic has raised awareness of the value of new technologies and the resilience benefits they provide.**
  - From our interviews, respondents were unanimous in recognising the resilience of the industry, and the benefits of technology, in withstanding the recent disruption with minimal impact (such as adopting a rapid shift to remote working, and addressing significant market volatility and trading volumes).
  - The pandemic has highlighted the need for new technologies (such as Cloud-based collaboration tools) and for many investment banks has accelerated the pace of technology adoption above that seen over the last two years.
- **However, the benefits of investment bank technology transformation remain largely within specific areas of an organisation rather than at scale.**
  - Only 17% of respondents to our survey believed that the benefits of the new technologies identified in 2018 were now being realised across their organisation (although this was significantly higher for Data & Analytics at 33%).
  - Legacy IT complexity still ranked as the number one constraint on the adoption of new technologies in our survey, emphasising the consistent barrier this has been for the ability to transform at pace.
  - However, the limits on technology transformation were mainly coupled to the persistent and new challenges faced in the operating environment. These challenges include:
    - continued pressures on operating costs and returns that are impacting investment in new technologies;
    - a regulatory burden that has not diminished over the last two years with an increased focus and new requirement on technology and operational resilience;

2 https://www.afme.eu/reports/publications/technology-and-innovation-in-europes-capital-markets

  - shifting industry priorities, such as environmental, social and governance (ESG); and
  - the long-term implications and uncertainty of the COVID-19 pandemic.
- These challenges are exacerbating the divergence in investment banks' approaches to technology transformation and increasing the gap between those that can continue to invest long-term and those that remain constrained.

- **A shift to a longer-term transformation strategy and building a culture for change and innovation are now essential for investment banks.**
  - The persistent challenges in the operating environment, as previously outlined, are driving investment banks to focus on the near-term and exacerbating the challenge between competing priorities (such as reducing costs and/or increasing revenues).
  - A clear business strategy with executive sponsorship, and developing a culture focused on change and innovation, are key priorities for the next two-three years (rising to second and third in our survey on the barriers for change, compared to sixth and eight in 2018).
  - Investment banks now need to be more critical in their assessments of the benefits of technology change and investments made over the past two years, and the future potential value, and scale the 'success stories' across the organisation.
  - An increased level of scrutiny applied to investment portfolios and change delivery will help identify whether initiatives are delivering the expected benefits against business case projections.
- **Emerging regulatory frameworks on non-financial risks, such as technology and operational resilience, must not limit innovation during this critical period of change.**
  - Expectations that the number of regulatory initiatives would subside over the next five years have not materialised.
  - The significant focus on existing regulatory programmes continues across the industry (such as MiFID II), and a new wave of proposed legislation for non-financial risks has emerged (such as the EU September 2020 digital package[3] focused on crypto-assets, digital operational resilience, data and AI).
  - It is now vital that regulatory and industry collaboration is maintained to ensure that new frameworks are technology-agnostic, risk and principles based, globally consistent, and following the principle of "same activity, same risk, same regulation".
  - This will allow the industry to continue realising the benefits of new technologies whilst addressing the potential risks; maturing the high levels of resilience demonstrated during the previous two years.

**We have identified five calls for action for investment banks, and the wider industry, to support the delivery of our 2018 vision and principles for the investment bank of the future.**

Following our assessment in this latest report we have developed five calls to action which are specifically focused on the priority areas for the next two-three years. These are:

1. Prioritise investment in a long-term and clear change agenda (i.e. five years);
2. Accelerate the convergence of business and IT capabilities for increased flexibility;
3. Create an incentive structure for investment banks and third parties to collaborate;
4. Build an organisational culture for innovation; and
5. Ensure industry collaboration is maintained for developing a new fit for purpose regulatory framework.

3 https://ec.europa.eu/info/publications/200924-digital-finance-proposals_en

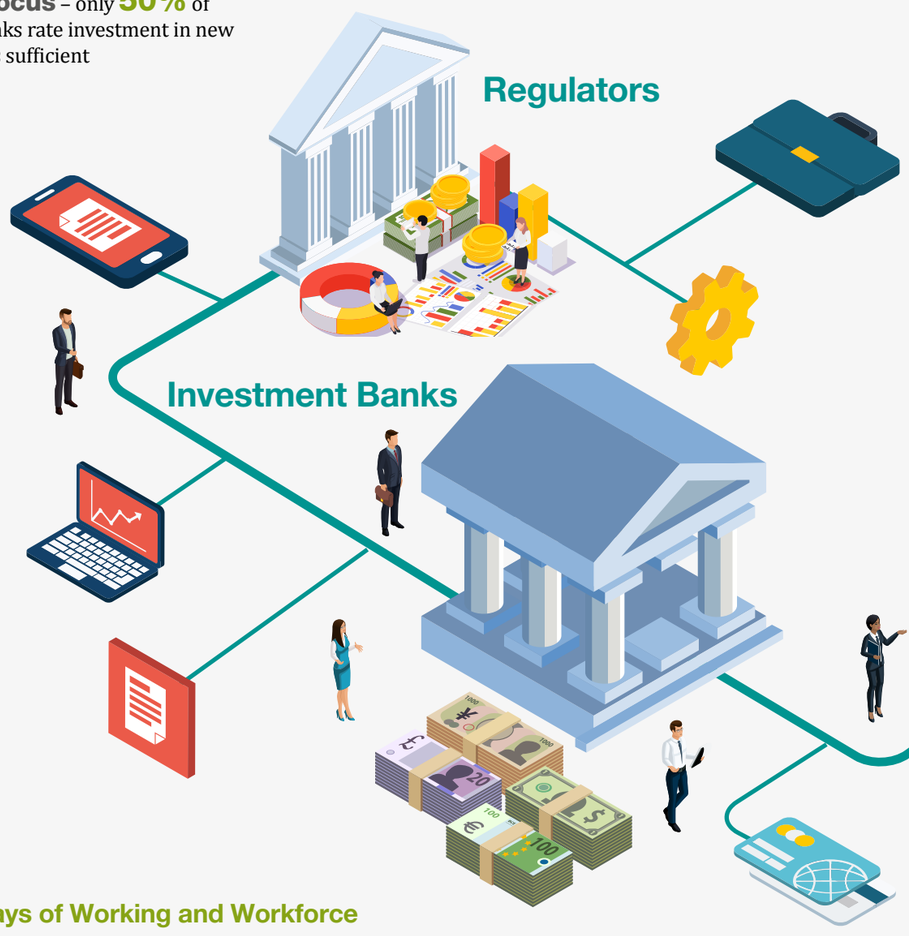
Technology and innovation in Europe's capital markets – a summary

# Technology and innovation in Europe's capital markets – a summary

The infographic below summarises some of the main changes identified since we published our 2018 report. Each of the areas below is assessed in this report by identifying why these changes have taken place and what this means for investment banks' continued technology transformation over the next two-three years.

## Operating Environment

Continued cost constraints driving **short-term ROI focus** – only **50%** of investment banks rate investment in new technologies as sufficient




## Culture, Ways of Working and Workforce

Investment Banks remain constrained by their approach to technology change; newer Agile methods are slowly becoming embedded and significant **upskilling** of the workforce is still required to enable more effective execution

**70%** of respondents rated existing culture and behaviour, and a lack of executive sponsorship, as two of the top three **barriers to change**

## Key Technologies

Significant growth in the implementation, and breadth of application, of **data and analytics**, AI/ML, e.g. process optimisation

Maturity of **Cloud adoption** has advanced significantly with **63%** of banks implementing in the Cloud (up from **33%** in 2018)

Increased optimism on the long-term use and viability of **crypto assets** and greater regulatory focus with global, regional, and national regimes now in place or developing

## Cybersecurity and Operational Resilience

**61%** of banks see **operational resilience** as one of the top priorities for their technology transformation

Remains a top **focus for regulators** as well as banks, amplified by the COVID-19 pandemic, however principle and risk based regulatory approaches, based on outcomes, are required


## Third Party Partnerships

Access and use of **third-party technology solutions** and services, as they have matured, has increased. However, an increased regulatory focus on third-party and concentration risk could create uncertainty on the approach to change.


## Policy Change and Regulatory Collaboration

Investment banks continue to have to balance the necessity of technology change within a fragmented and divergent set of **regulatory requirements** across the EU and globally

A new wave of **'non-financial' regulation** has emerged (e.g. operational resilience, security, technology and data focused policy)

# 1. Background

In 2018 AFME and PwC published a report identifying the key trends in technology and innovation for Europe's capital markets. The report set out a five-year vision and eight principles for the investment bank of the future.

The report identified that technology was one of the most important drivers for addressing the significant challenges that investment banks faced, such as pressure on returns, the cost of maintaining legacy technology, growing competition in the industry, and increasing regulatory requirements.

The five-year vision set out in 2018 outlined where new technologies were expected to have an increased positive impact across the investment bank value chain, where changes to the workforce and ways of working were anticipated, and how the industry, enabled by open technology, partnerships and collaboration, would become increasingly interconnected.

The eight principles developed in 2018 were to support investment banks in realising this vision. They focused on a bank's ability to prioritise long term investment, collaborate with the broader capital markets industry (such as investors, market infrastructures, policymakers, regulators, and third-party providers), and build a culture of innovation; all while managing the potential risks that could be introduced, particularly around operational resilience and cybersecurity.

Two years on, this latest report has been developed to assess the progress investment banks have made in realising the vision we set out in 2018.

The report has been developed through a survey of, and interviews with, representative investment banks of AFME's Technology and Operations Committee (TOC), coupled with subject matter expertise from PwC. The report is comprised of the following sections:

- An assessment of our 2018 report findings and five-year vision;
- The impact of the COVID-19 pandemic; and
- Calls for action to support the industry, and particularly investment banks, over the next two-three years.

**This latest report has been developed to assess the progress investment banks have made in realising the vision we set out in 2018**

# 2. Progress Against our 2018 Findings

This section of the report assesses the progress of our 2018 findings over the last two years and identifies the new challenges and opportunities that have emerged. The implications of this assessment for the next two-three years, and our 2018 vision for the investment bank of the future, are provided.

Most trends in our 2018 report have been realised and the eight principles set out for the investment bank of the future have maintained their relevance (see Figure 1).

Figure 1: **AFME-PwC 2018 principles for the investment bank of the future**

1. **Maintain a long-term focus:** Prioritise long-term investment in new technologies.
2. **Embed data as an enabler:** Treat data as an asset to become data and insight led.
3. **Embrace open technology:** Leverage open and shared platforms and standards as an accelerator of change.
4. **Adopt a collaborative approach:** Partner with external 3rd parties on areas which don't drive competitive advantage.
5. **Identify Industry Priorities:** Collaborate with other Investment Banks to solve common industry problems.
6. **Use Agile Work Practices:** Teams and solutions should be designed to be more flexible, agile and modular.
7. **Develop a Relationship-based Workforce:** Prepare for a workforce that is driven through a merging of business and IT skills.
8. **Enable Secure and Resilient Operations:** All new choices should be designed with resilience, recovery, and information security in mind.

Investment banks are today more mature and focused in their use of emerging technologies by having accelerated change in specific areas over the last two years (such as the adoption of Cloud Computing and the increased use of Data & Analytics capabilities).

However, leveraging new technologies and opportunities at scale has remained a challenge for both investment banks and the wider industry. This is due to many of the persistent challenges that were identified in our 2018 report, such as on-going pressure on returns, the cost of maintaining legacy platforms, and increasing regulatory requirements. These ongoing challenges to the current operating environment are requiring many investment banks to continue responding with a short-term focus. This will in turn act as a constraint for the longer-term technology and operations transformation required, and many of the benefits identified in our 2018 report to be realised.

This is creating a greater divergence between investment banks in terms of their investment profile and rate of adoption of new technology. The investment banks that were further ahead in 2018 have been able to capitalise on gains and strengthen their position as industry leaders. Those that continue to be constrained by short term cost reductions have been unable to gain momentum compared over the last two years[4].

We expect this trend to continue over the next two-three years as our survey identifies that the focus required on immediate priorities, due to a challenging operating environment, are not expected to diminish substantially.

4 A February 2020 survey by Moody's found that US global investment banks are leading in IT investments compared to their European counterparts due to their superior scale and profitability. https://www.moodys.com/research/Moodys-Global-investment-banks-spend-72-billion-annually-to-combat--PBC_1215133

## 2. Progress Against our 2018 Findings

The remainder of this section is a detailed assessment across the main themes that were discussed in 2018:

- Industry operating environment;
- Investment in change;
- Adoption of key technologies;
- Cybersecurity and operational resilience;
- Third-party partnerships;
- Culture, ways of working and workforce; and
- Policy and regulatory collaboration.

Each section outlines the progress made by investment banks since 2018 and the implications for the next two-three years.

**Leveraging new technologies and opportunities at scale has remained a challenge for both investment banks and the wider industry**

## 2.1 Operating Environment

**The main challenges and drivers identified in 2018 for investment banks' adoption of new technologies remain consistent today. However, the operating environment for the industry has remained a significant challenge over the last two years due to increased pressures on cost reduction, continued regulatory change, and most recently the COVID-19 pandemic.**

### 2018 report summary

The 2018 report identified several challenges in the operating environment for investment banks. These were:

- increasing regulatory requirements;
- ongoing pressure on returns;
- the cost of maintaining complex legacy technology platforms;
- the emergence of new technologies and offerings;
- evolving client expectations;
- intensifying competition for talent; and
- the potential impacts of Brexit.

### Current assessment

Discussions with AFME TOC members in developing this report confirmed that the challenges identified in our 2018 report remain consistent today. Continued regulatory requirements and pressures on cost reduction are as significant today as they were two years ago.

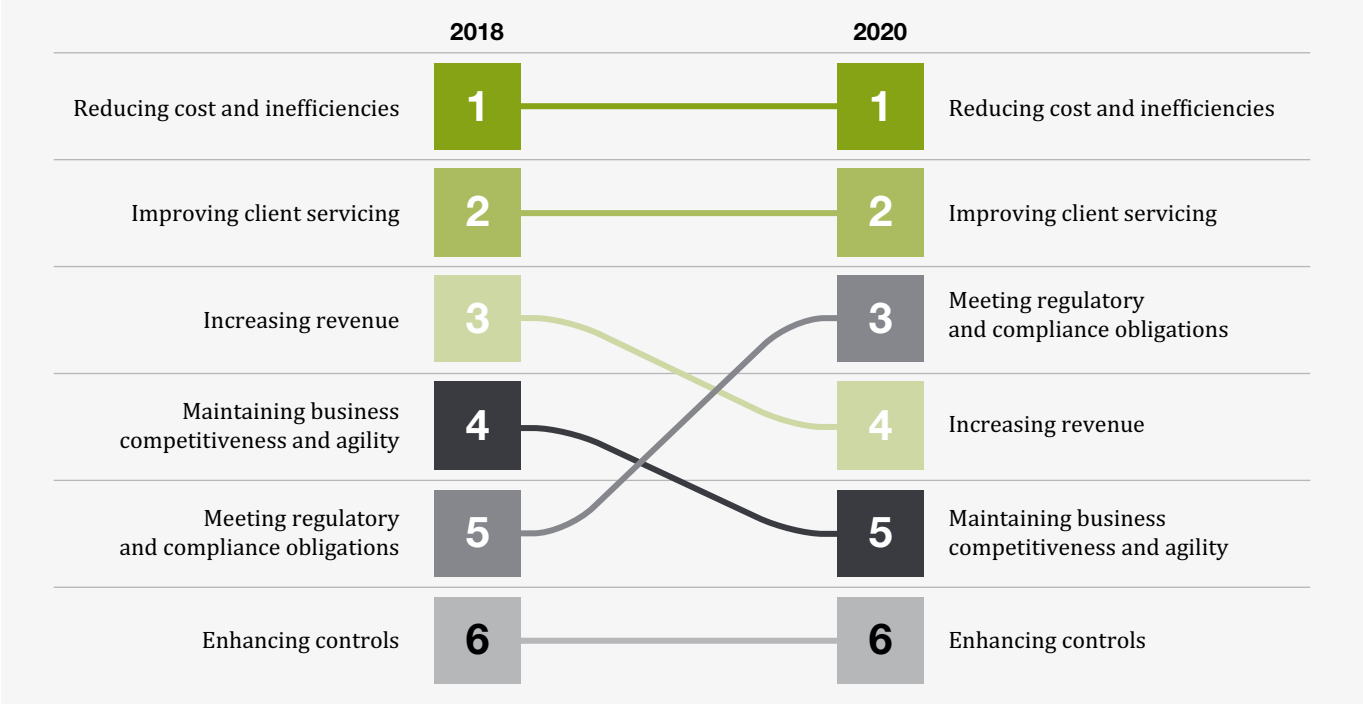
The regulatory focus is shifting from financial to non-financial risks (prompted by more prominent issues such as the concentration risk of third-party technology providers, or the heightened focus on the operational resilience of investment banks and the industry). The increased regulatory focus on non-financial risks is exacerbating the persistent challenges in the operating environment (such as the cost of maintaining, and complexity in migrating from, legacy technology platforms).

The results from our survey of AFME TOC member banks, outlined in Figure 2, show that the main factors driving investment banks' adoption of emerging technologies remain cost reduction and the need the improve client servicing. The most significant change from 2018 to today is the increased importance of meeting regulatory obligations.

"Our approach to technology change is still very regulation driven (including MiFID II, EMIR, SFTR and CSDR) but there has been a pivot to looking to front to back in terms of decisions on where we spend money and a pivot to a more agile way of working." **AFME TOC member**

**The operating environment for the industry has remained a significant challenge over the last two years due to increased pressures**

Figure 2: **Factors driving the adoption of emerging technologies, in order of importance**




Source: Survey of AFME Members, September-October 2020

Cost reduction remains top of the agenda as investment banks face a continued low interest rate environment, heightened levels of economic uncertainty, and a significant regulatory burden that put increased pressure on revenues and margins. Despite the improvements in investment banks' financial performance since 2018, with operating revenues increasing 7% on average[5], discretionary technology budgets have remained low.

New regulatory change and policy has not subsided to the lower levels that were expected in the 2018 report. The regulatory change agenda remains focused on the ongoing management of financial risks (e.g. CSDR, IBOR transition and review of MiFID II implementation) whilst new regulation on non-financial risks has increased (e.g. operational resilience, outsourcing, cyber, technology risks and digital finance). This means investment banks have had limited capacity to free resources to strategic projects and broader change-the-bank activity.

From interviews with AFME TOC Members, several other considerations have also increased in relevance since 2018 and are now more important areas of focus for investment banks' agendas. These include sustainability and climate change and social responsibility. This is supported by a 2020 PwC CBI survey[6] of banking and capital markets that found 83% of respondents identified these two areas as key drivers of potential future disruption in the industry.

The persistently challenging operating environment has continued to impact the competitive landscape for investment banks and has placed greater emphasis on the need to manage cost, compliance, client servicing, and revenue as drivers for new technology and transformation.

## Implications for the next two-three years

The persistent challenges in the operating environment will require investment banks to rethink their longer-term strategies across the products, services, markets and channels in which they currently or plan to operate. This assessment of longer-term strategies must include the technologies and platforms required. Strategies will also need to be more flexible, including the development of more Agile work practices. to allow banks to respond and adapt more quickly to new developments and opportunities as they arise (such as the ongoing challenges and opportunities presented from the COVID-19 pandemic).

5 Tricumen data FY 2017 - HY 2020

6 PwC CBI survey Q3 2020 results

## 2.2 Investment in Change

**Investment banks' expenditure in technology over the last two years has achieved a range of intended benefits (such as reducing client servicing costs or optimising existing processes). However, whilst optimism for future technology transformation has increased, the ability of investment banks to invest in change is still constrained.**

### 2018 report summary

The 2018 report identified that investment banks recognised the importance of adopting new technologies, but this was not being translated into wider investment prioritisation. The 2018 report identified that only 28% of survey respondents felt that the level of investment allocated by their investment bank to strategic technology change and transformation was sufficient. Furthermore, only 48% of respondents in the 2018 survey felt that their investment bank had an ambitious approach to technology change for the next five years.

For most investment banks a self-funding business case for technology innovation opportunities was still required in most instances, including those seen as industry leaders with large investment budgets and senior executive and Board support.

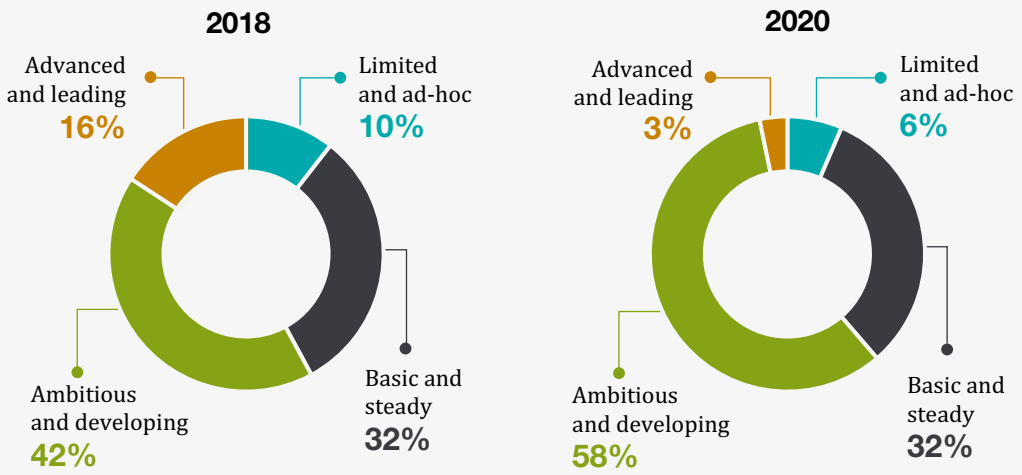
### Current assessment

In our survey for this report, 50% of respondents felt that investment allocated by investment banks to strategic technology and transformation change was sufficient; an increase compared to 28% in 2018. Equally, as shown in Figure 3 below, 58% of survey respondents felt that their investment bank had an ambitious approach to technology change for the next two-three years; a 10% increase since 2018. Although this is countered by a fall in the percentage of respondents that felt their investment bank was advanced and leading within the industry; from 16% in 2018 to 3% in 2020.

> "Budgets are tight and whilst anyone can make a case for investment, there is still a big focus on cost and we still have a number of regulatory spend areas such as transaction reporting." **AFME TOC member**

The changes from 2018 reflect an increase in the level of investment being made available for technology change. However, while the survey data indicates progress, our interviews with AFME TOC members suggest a more conservative view that overall investments are still too low to drive change at scale.

Figure 3: **Industry appetite for the adoption of emerging technologies (2018 vs 2020)**




Source: Survey of AFME Members, September-October 2020

New initiatives often need to demonstrate in-year efficiency savings, as a minimum expectation, due to the continued focus on reducing costs. Business cases therefore need to be increasingly quantifiable on the benefits and have senior executive or Board support.

"Everything is looked at in terms of short-term ROI and cost reduction is the main driver. Very few of our initiatives are focused on increasing revenue and innovation includes "regulatory defence" work." **AFME TOC member**

Strategic projects with longer term returns, such as replacing legacy platforms with Cloud Computing based solutions, are increasingly difficult to fund compared with projects that deliver much lower in-year benefits. This is particularly problematic for investment banks with less sustainable cost-to-income ratios where budgets are more tightly controlled.

Discussion with AFME TOC members also identified a view that the gap between those investment banks which can increase investment in strategic technology transformation to realise the benefits, and those that remain constrained with high cost-to-income ratios, has widened. An example is in areas such as regulatory reporting and stress testing: investment banks that invested early in improving regulatory reporting and data processing capabilities have now been able to advance further and realise efficiencies (e.g. reduce time to develop reports, increased data quality); however, investment banks that were not able to invest early continue to face challenges, whilst also dealing with an increased focus from regulators on how data is being collated and processed.

### Implications for the next two-three years

The changes seen over the last two years are likely to drive further divergence in the ability of some investment banks to increase investment in key technology transformation priorities.

It will be even more important that investment banks secure funding for long-term business cases so that the potential benefits can materialise before they risk losing further ground to competitors. Investment banks will also need to be more critical in their assessments of what technology change has been successful over the last two years, and has future potential value, and scale these "success stories" across the organisation. This will also help to de-risk future investment strategies and support business case approval.

A subset of investment banks (such as those with a large global footprint and sustainable cost-to-income ratios) will see increased opportunities to become platform providers for the industry. They will be able to leverage and monetise their technology engineering expertise and ability to invest in longer-term strategic projects (e.g. becoming product and service 'aggregators')[7].

At the same time, interviews with AFME TOC members outlined that another subset of investment banks, those who are increasingly focused on domestic and/or regional markets and on reducing their cost base, will be more opportunistic in buying and outsourcing IT infrastructure and services. Rather than building internally, they will acknowledge the significant investment now required to develop in-house engineering capabilities to solve existing and complex technology challenges. Many of these investment banks, with lower levels of technical debt (e.g. complex and critical legacy IT infrastructure) compared to their large global counterparts may use this as an opportunity to move quicker in certain aspects of their technology transformations.

"Larger banks may be more advanced, but they also have more technical debt, whereas smaller banks can be more targeted about where they invest, and have the opportunity to be more ruthless about removing legacy platforms." **AFME TOC member**

7 PwC research

## 2.3 Key Technologies

### 2018 report summary

In 2018 we identified four technologies with the potential to transform investment banks and the industry. These were:

- Artificial Intelligence (AI) and Machine Learning (ML);
- Cloud Computing;
- Data & Analytics; and
- Distributed Ledger Technology (DLT).

In 2018 many investment banks were running small scale pilots using AI and DLT and had started to deploy various Cloud Computing and Data & Analytics solutions. These were being implemented across a variety of use cases and targeted areas of the investment bank value-chain which were seen to have the greatest initial potential for adoption. However, none of these technologies were being deployed or used at scale across the organisation.

### Current assessment

Figure 4 from our survey highlights the current opportunities identified for the four key technologies across the investment banking value chain and whether the rating has increased from 2018.

Data & Analytics has been rated as having the highest potential and is today viewed as a key enabler for other front-to-back technology initiatives. AI/ML and Cloud Computing also have an increased potential for future transformation opportunities. Cloud Computing in particular has seen increased ratings across 10 areas of the investment bank value chain compared with 2018, reflecting the most significant change in sentiment. However, the positive impact of DLT remains limited, supporting our 2018 finding that large scale or industry-wide use of DLT will be a long-term and ambitious objective (beyond our 2018 five-year horizon).

Figure 4: **Areas of positive impact of technology across the value chain**

| | Sales and Trading | | | | Post Trade | | | Risk, Compliance and Finance | | | Information Technology |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Technology | Sales & Relationship Management | Trading | Advisory | Research | Trade Support & Processing | Product Management | Client Support & Servicing | Risk Management | Finance & Treasury | Legal & Compliance | Technology and Infrastructure |
| Data & Analytics | High | High | High ↑ | High ↑ | High ↑ | High ↑ | High | High | High ↑ | High ↑ | High ↑ |
| Artificial Intelligence | High ↑ | High | High ↑↑ | High ↑ | High ↑ | Med ↑ | High | High ↑ | High ↑↑ | Med | Med |
| Cloud Computing | Med ↑ | High ↑↑ | Med ↑ | Med ↑ | High ↑ | Med ↑ | Med ↑ | High ↑ | High ↑↑ | Med ↑ | High |
| Distributed Ledger Technology | Low | Med ↑ | Low | Low | High | Low | Low | Low | Low | Low | Med |

↑ Change in rating from 2018 (increased by 1 level)

Source: Survey of AFME Members, September-October 2020

Example use cases where investment banks are finding benefits from the increased adoption of these technologies include front-to-back process optimisation, Cloud-based client and internal management systems, and Data & Analytics to improve client servicing and risk and regulatory reporting.

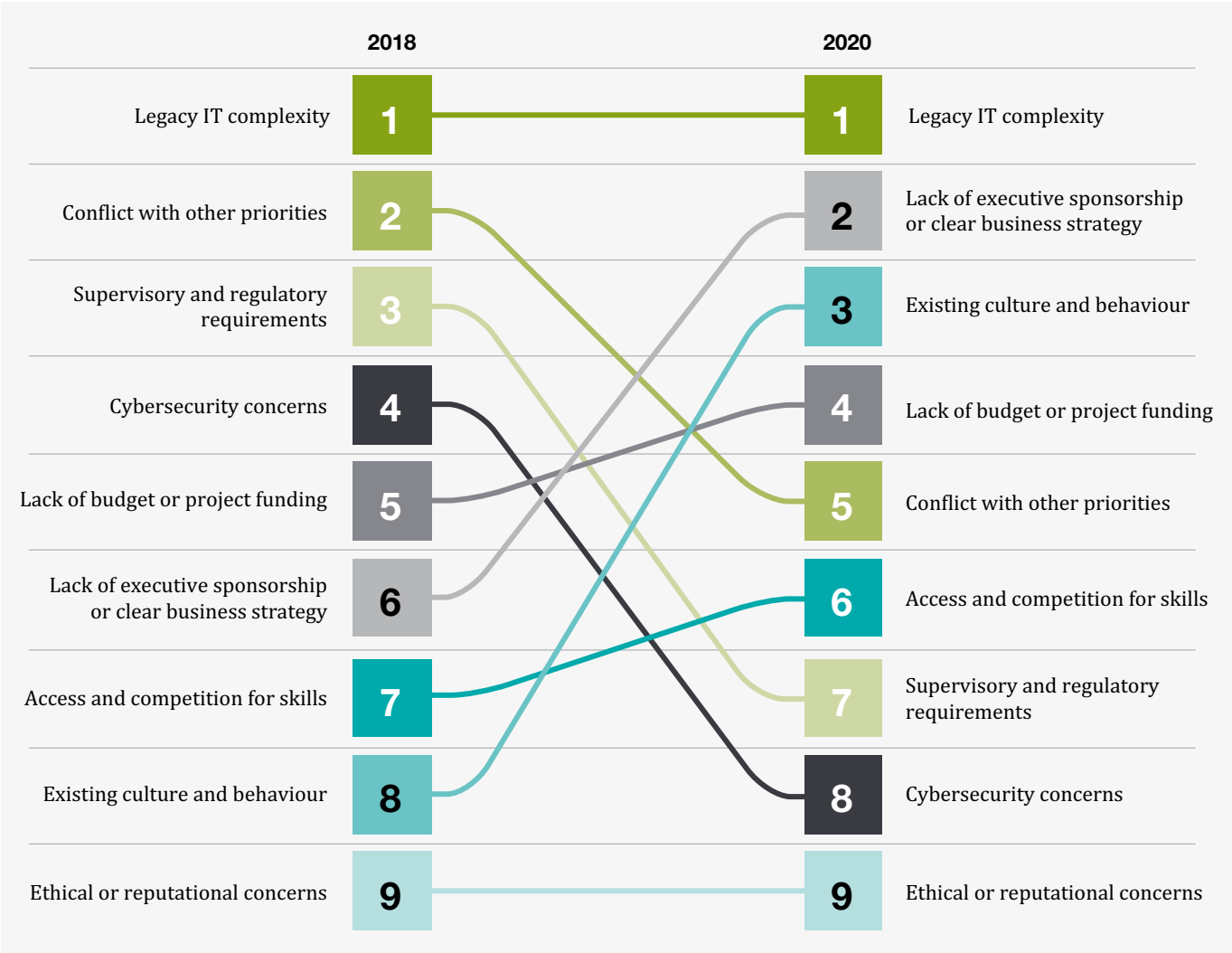
From interviews with AFME TOC members, the increase in the adoption of these technologies over the past two years has also helped investment banks to be more critical in their assessments of their long-term strategies and use-cases.

Figure 5 from our recent survey highlights that the main constraint to the adoption of emerging technology remains the complexity of existing IT and infrastructure (e.g. the difficulty in migrating from legacy platforms and a lack of interoperability). However, the lack of clear sponsorship or strategy, and the cultural resistance to change, have increased in significance. These shifts can be attributed to the increased focus on new technologies across investment banks as change moves from smaller scale use case or pilots towards an enterprise level (across their organisation).

However in our latest survey, only 17% of respondents believed that their investment bank was now realising the benefits across all four key technologies at scale across their organisation (although this was significantly higher for Data & Analytics at 33%). Investment banks are therefore still having to navigate the complex balance between the continued maintenance of legacy IT platforms and the exploration and implementation of new technologies. Whilst many legacy IT platforms require significant ongoing investment for maintenance and upgrades, investment banks still struggle to articulate the case for change due to the short term expectations, especially when in-year costs are less than the investment needed to undertake large-scale decommissioning and replacement.

From discussions with AFME TOC members, it is clear from many that continuing to delay these strategic decisions risks unsustainable levels of technical debt, due to the on-going costs of legacy maintenance, and a further increase in complexity, which will only act to further limit technology transformation.

Figure 5: **Top constraints on the adoption of emerging technologies**




Source: Survey of AFME Members, September-October 2020

## Implications for the next two-three years

Investment banks will continue to realise greater benefits as the four key technologies identified in 2018 mature and adoption increases, however the need to migrate from legacy IT platforms and simplify technical architectures will gain in importance. Further detail on the progress made for the four key technologies, and other emerging technologies, is provided below. The 2018 and current assessment for each technology is provided and the potential implications for the next two-three years.

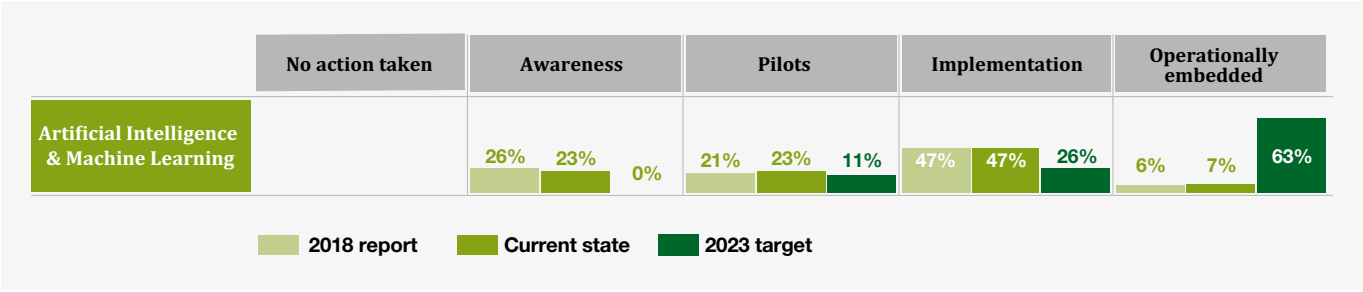
Whilst industry-wide adoption of these technologies has increased over the last two years the progress has been slower than the five-year vision set out in the 2018 report, reflecting the challenging operating environment and investment constraints. However, the targets set out in the 2018 report remain realistic for those investment banks which can continue to invest strategically towards the principles and vision we outlined.

The opportunities presented by Cloud Computing as well as Data & Analytics will set the foundation for further innovation, allowing for further advances and adoption of AI/ML capabilities.

### Artificial Intelligence (AI)/Machine Learning (ML)

| The use of AI/ML has quickly moved from small pilots (predominately within the front office) to broader implementation. Figure 6 shows that levels of maturity are the same as in 2018, however this reflects continued development and broader application across the investment bank value chain. There remain significant opportunities over the next two-three years to operationally embed AI/ML, as the maturity and trust is increased. | |
|---|---|
| **2018 Report** | **Today** |
| • A significant area of focus and development however largely used in front office activities (e.g. algorithmic trading).<br>• A wide range of applications being tested and used in pilots.<br>• Ethics and transparency key concerns to investment banks and regulators for broader adoption. | • Being deployed to solve specific business problems rather than hypothetical test cases.<br>• More use cases are emerging in the back office such as document processing using Optical Character Recognition (OCR), as well as email classification across operations, to support process optimisation.<br>• Making better use of unstructured data, and standardising internal data definitions, are key to making AI/ML effective at scale and to addressing auditability challenges.<br>• AI/ML are increasingly being embedded as part of existing and new third-party solutions, which is broadening their application across investment banks.<br>• Ethical and explainable use of AI are important considerations; as investment banks explore the 'art-of-the-possible' with artificial intelligence they are confronted with increasing grey areas around what they should do. |

Figure 6: **AI and ML journey towards target technology maturity levels**

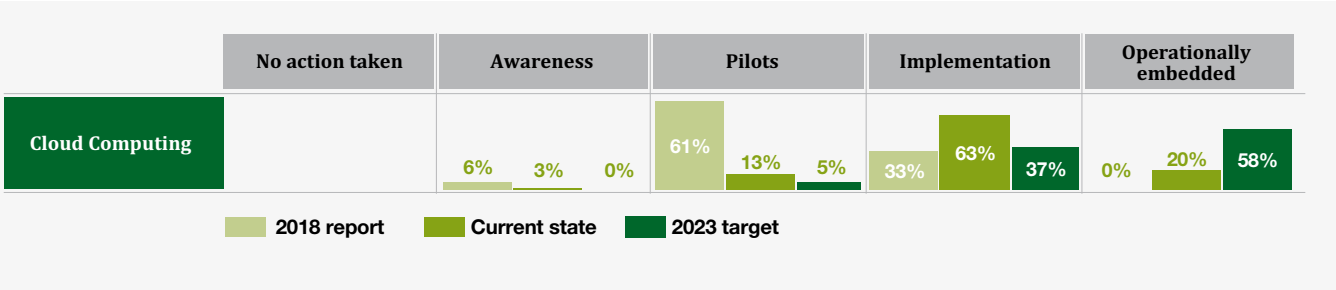



Source: Survey of AFME Members, September-October 2020

## Cloud Computing

| Cloud Computing is now viewed as a foundational component for investment banks' technology transformation. This is highlighted in Figure 7 which shows that the move from awareness to implementation (now 63%) has advanced significantly and is in line with our 2018 vision. For the next two-three years Cloud Computing business cases need to be built on innovation and agility-enablement, rather than just cost reduction. | |
|---|---|
| **2018 Report** | **Today** |
| • An enabler of cost reduction and improving IT infrastructure flexibility.<br>• Cautious adoption due to concerns about data privacy, security, and a lack of regulatory clarity.<br>• Many investment banks investing in private Cloud Computing infrastructure due to a reluctance to move more broadly to public Cloud Computing (given security and data privacy concerns). | • Security and data privacy concerns have reduced through greater awareness across the industry.<br>• Challenge remains in assessing the opportunities and risks of Cloud Computing Providers (CSPs), due to limited independent guidance or standards available.<br>• As highlighted by Figure 7, investment banks are actively transitioning more of their infrastructure to public Cloud Computing (e.g. Infrastructure as a Service – IaaS – to provide burst compute capacity for trade processing at peak hours; Software as a Service – SaaS – applications that can be quickly configured and rolled out across business units)[8].<br>• Adoption is not yielding the cost reduction levels expected; Cloud Computing business cases show significant benefit in transitioning existing computing demand, but costs can quickly rise as further demand increases.<br>• Frameworks and platforms to allow switching between CSPs to optimise spend and resilience are now important (e.g. multi-cloud).<br>• Concentration risk and oversight of CSPs are increased concerns for regulators and are driving specific regulatory measures[9]. |

Figure 7: **Cloud computing journey towards target technology maturity levels**




Source: Survey of AFME Members, September-October 2020

8 The Adoption of Public Cloud Computing in Capital Markets, AFME 2019

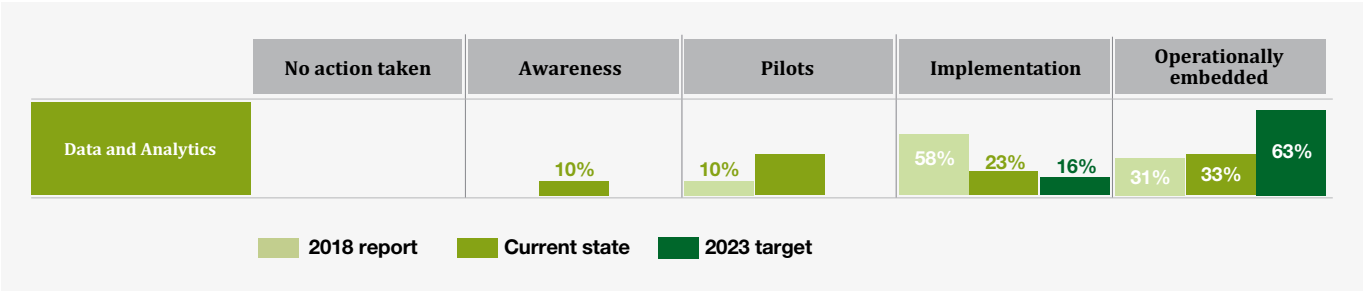
9 For example, the European Commission proposal for a 'Digital Operational Resilience' regulation to include oversight of critical third-party providers (CTPPs)

## Data & Analytics

**Data & Analytics is still viewed as an area of significant competitive advantage for investment banks; however, the quality, management, and control of data remains a challenge for many. Figure 8 shows that the proportion of investment banks that are now operationally embedding Data & Analytics remains consistent with 2018 (33% today; 31% in 2018). There is now an increased opportunity for creating open data architectures to reduce costs and find new revenue opportunities, however this remains at an early stage for the industry.**

| 2018 Report | Today |
|---|---|
| • A priority for technology transformation and competitive advantage, however largely focused on data controls driven by regulatory requirements.<br>• An area where many investment banks needed to improve their foundational capabilities (such as data governance, access, and quality) to meet minimum standards and achieve regulatory compliance.<br>• Seen as a long-term area of high investment, with 93% of respondents to our 2018 survey expecting to both implement and realise the benefits of Data & Analytics over two-three years. | • Remains a key priority for technology transformation.<br>• Key focus areas are data quality and granularity (e.g. to support regulatory reporting, mining email and voice data to enable trend analysis and better client management).<br>• Implementations such as document digitisation and classification of unstructured data are reducing costs (e.g. reduction in required physical space for document storage) and enabling improved Analytics and reporting.<br>• A significant proportion of data investment is now focused on Analytics (utilising Cloud Computing) to improve existing front-to-back operational processes and client servicing.[10]<br>• Being used to enable capabilities such as predictive incident management that increase resilience and drive down the run-cost of technology.<br>• A lack of data standards continues to be an impediment to industry wide initiatives.<br>• Concerns on the potential for increased operational costs through Data & Analytics transformation as volumes, and the subsequent computing required, continue to increase. |

Figure 8: **Data and Analytics journey towards target technology maturity levels**



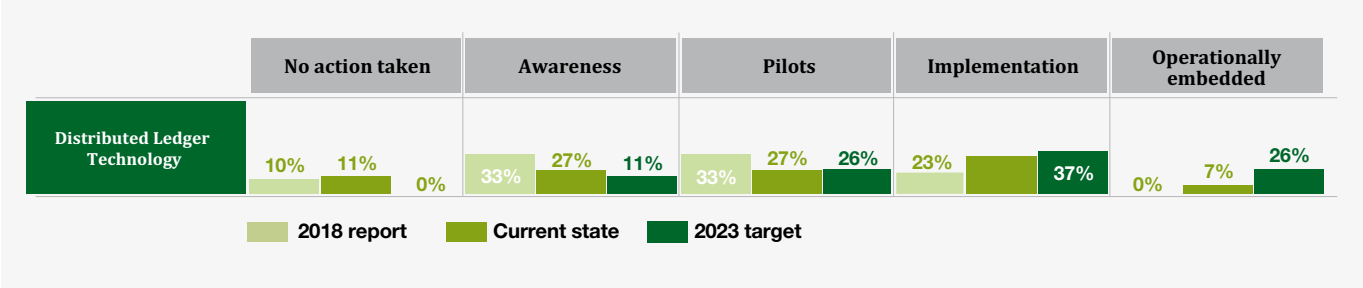

Source: Survey of AFME Members, September-October 2020

10 The Adoption of Public Cloud Computing in Capital Markets, AFME 2019

## Distributed Ledger Technology (DLT)

| Practical uses of DLT remain reliant on industry collaboration which is a challenge for the long-term adoption and interoperability of solutions. Figure 9 shows that the awareness, pilots and implementation of DLT remains largely unchanged from 2018. However, there is an increased focus on the development of private DLT networks for supporting investment banks products and services related to crypto-assets. | |
|---|---|
| **2018 Report** | **Today** |
| • Not seen as an area of immediate practical application but many industry initiatives were designing use-cases and running small pilots.<br>• Viewed as a technology that could have far-reaching implications for the industry but only in the long-term (over five to ten years).<br>• Increased industry collaboration, and technical standards, required to unlock the largest opportunities and benefits. | • Sentiment remains mixed on the longer-term impact of DLT for financial markets infrastructure; collaboration across the industry remains a challenge (e.g. developing industry offerings, standards, interoperability, use cases).<br>• Investment remains narrow around specific use cases where efficiency is the key driver.<br>• Some investment banks continue to be cautious adopters and have reduced their investment in this area.<br>• However, the increased focus on crypto assets (see other technologies and applications below) has reinforced the development and use of private DLT networks for some investment banks innovating in this area, raising interoperability challenges for the future. |

Figure 9: **DLT journey towards target technology maturity levels**




Source: Survey of AFME Members, September-October 2020

## Robotics Process Automation (RPA)

**RPA has reached a higher level of maturity within most investment banks where opportunities for tactical remediation, such as basic process automation, have been achieved. Further significant cost reduction is now limited as remaining opportunities are often in low-cost locations which do not always present a viable business case. However, strategic deployments of RPA continue to drive efficiencies and higher service quality (e.g. improving processes end to end).**

| 2018 Report | Today |
|---|---|
| • Used extensively for mostly tactical remediation and remained relatively cost-effective.<br>• Potential as a future technology to extend into more strategic, process efficiency improvement initiatives. | • Greater focus on front-to-back process excellence (e.g. eliminating rather than automating inefficient processes across multiple functions).<br>• Strategic deployments continue to be used to further eliminate time consuming and manual operational processes (e.g. connectivity to clients via APIs to allow direct access data such as trade confirmations). |

## Other technologies and applications

**The focus from investment banks on crypto assets has increased, with many now developing or having implemented specific products and services (on private DLT networks). This is expected to increase, however localised and cross-border regulatory uncertainty and potential new requirements may impact innovation in the long-term. Quantum computing is attracting greater interest but is unlikely to see any significant investment over the next two-three years.**

| 2018 Report | Today |
|---|---|
| • A small number of investment banks would lead DLT and crypto-asset adoption; 35% of respondents to our 2018 survey did not believe crypto assets had a viable use in the long-term.<br>• Monitoring of new computing methods, such as Quantum Computing, but no significant investment or pilots were planned. | • Increased optimism on the long-term use and viability of crypto assets and greater regulatory focus with global, regional and national regimes now in place or developing.<br>• A small number of investment banks are now participating in Quantum Computing research, but this remains theoretical. Early views that this capability may be at a similar stage to AI five years ago and could develop quickly. |

## 2.4 Cybersecurity and Operational Resilience

**The focus in the last two years on cybersecurity and operational resilience has contributed to the industry becoming more secure, however there is now an increasing risk of regulatory fragmentation in regional approaches. A risk- and principles-based approach, focused on outcomes rather than specific processes, remains key to ensuring that security and resiliency is increased but that innovation and change are not impeded.**

### 2018 report summary

The 2018 report stated that balancing new technology, security, and operational resilience would be a key priority for investment banks when considering any future technology change. Investment banks needed to continue focusing on embedding an enterprise-wide approach towards technology and innovation (i.e. across all aspects of the organisation) that equally maintains resilience and effective cybersecurity.

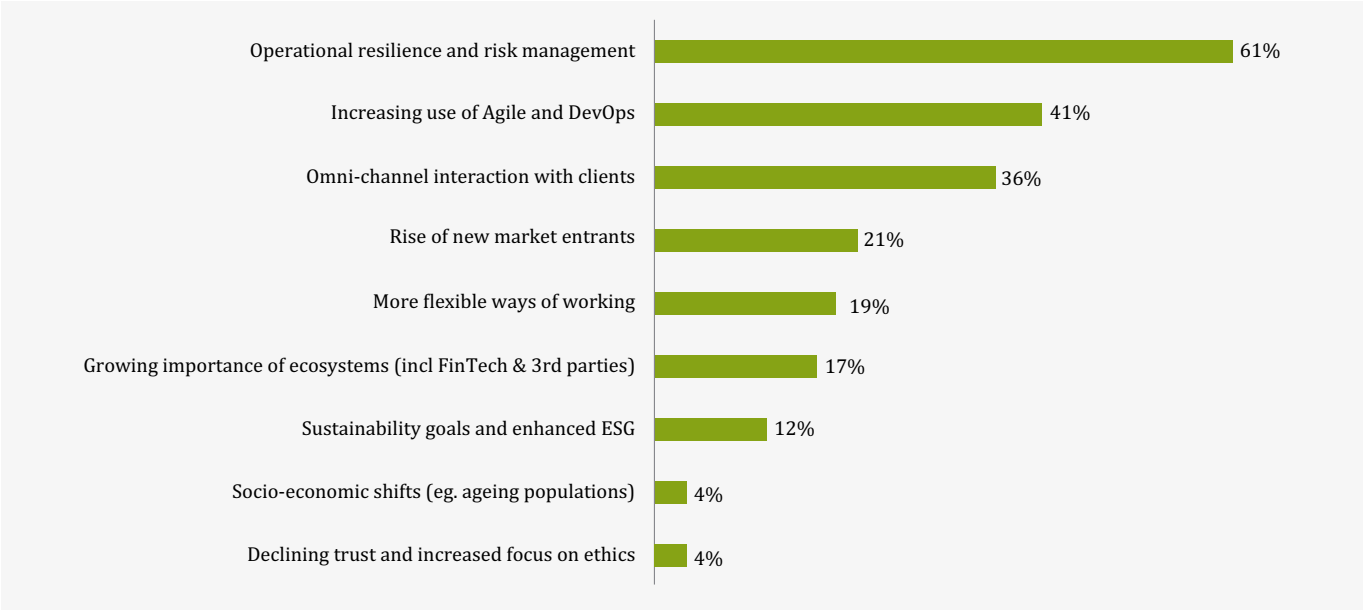
The report also identified that there would be a continued expansion of the regulatory focus on operational resilience. This would further increase the priority for senior executives and Boards of investment banks, and the industry.

### Current assessment

The need for investment banks to balance new technology, security, and operational resilience remains essential. This is to maintain the flexibility required for the benefits of new technologies to be realised and ensure that risk management frameworks and regulation can adapt to emerging trends without overly constraining innovation.

In our latest survey, shown in Figure 10, over 60% of respondents identified operational resilience and risk management as one of the top priorities for technology transformation. Operational resilience is increasingly viewed as a shared priority for investment banks and authorities to maintain confidence in the industry, support financial stability, and ultimately economic growth. During the last two years, and despite the circumstances posed by the COVID-19 pandemic, investment banks have remained resilient and adapted with agility; the result of significant efforts and investment in the preceding years.

Figure 10: **Macro-trends driving investment bank transformation**




Source: Survey of AFME Members, September-October 2020

Regarding cybersecurity, the capital markets industry has continued to demonstrate a high degree of control and response to the threats faced, including responding to an increase in cyber-related incidents during the COVID-19 pandemic (such as targeted phishing attacks for remote employees).

An area of increased priority for investment banks is third-party related risks due to the increased role and presence of technology providers in providing core services within the industry. This is evidenced by the increase in policy and regulatory frameworks that are now being proposed by authorities in the last two years, such as: the European Commission 'Digital Operational Resilience Act'; Basel Committee for Banking Supervision (BCBS) 'Principles on Operational Resilience'; and the Bank of England (BoE) 'Building operational resilience: Impact tolerances for important business services'. However, investment banks fully recognise that understanding and managing resilience and third-party risks is still the responsibility of the business.

"We have seen the COVID-19 pandemic demonstrate the benefits of Cloud from an operational resilience perspective, but further adjustments are required to transform how security and resilience is assured." **AFME TOC member**

## Implications for the next two-three years

We expect the focus on cybersecurity and operational resilience to remain a top priority for investment banks and regulators. The increased regulatory focus will be positive where it can ensure global coordination and alignment among authorities and reduce fragmentation that could undermine the industry's operational resilience. However, variations in regulatory expectations across, and within, jurisdictions could lead to unintended consequences; particularly given the increased prominence of global third-party providers and the interconnectivity of financial institutions. It will be important that there is alignment between authorities in terms of objectives, approach, and terminology so that there is a consistent operational resilience baseline for investment banks, third parties and regulators. This will reduce the complexity and costs for investment banks to implement any future measures required and allow for more effective supervision and reporting for investment banks operating across borders.

Equally, rather than a prescriptive approach, a principle- and risk-based approach focused on outcomes will be important to provide investment banks with the flexibility required to manage their individual risk profiles, appetites, and tolerances. This will allow investment banks to leverage their existing capabilities, processes, and standards (such as Business Continuity Planning), which have been matured over time and are well embedded within organisations.

**We expect the focus on cybersecurity and operational resilience to remain a top priority for investment banks and regulators**

## 2.5 Third-party Partnerships

**Third-party technology platforms and service offerings (e.g. FinTech[11], BigTech[12]) continue to mature and provide investment banks with increased options for ready-made solutions that avoid having to build in-house. However, an increased regulatory focus on third-party risk and concentration within a subset of providers could create uncertainty or limit the immediate appetite for change.**

### 2018 report summary

Our report identified that the opportunities from new technologies would lead to the investment banking industry becoming more open and connected. Investment banks needed to review their existing engagement models with third parties (such as market utilities, FinTechs and BigTech firms) to ensure maximum effectiveness of their future outsourcing, partnerships and collaboration.

Whilst FinTech firms were developing a wide range of offerings within financial services, these were more active and advanced in sectors outside of capital markets (such as retail banking). However, investment banks were increasing their partnerships with FinTech firms to ease collaboration and co-create solutions that focused on specific business opportunities or challenges (e.g. operations automation, AI and ML research and analysis).

### Current assessment

Investment banks are leveraging the increased availability and access to third-party solutions compared to 2018, whether from FinTechs or BigTech firms. Investment banks are increasingly working closely with third-party providers and moving from traditional vendor relationships to more active partnerships. For example, our interviews with AFME TOC members identified a subset of investment banks that are now using more sophisticated FinTech solutions for news sentiment analysis to support Anti-Money Laundering (AML) and fraud analysis. A second example is a subset of investment banks that are using post-trade derivative clearing solutions that operate across multiple clearing houses and brokers and enable a more digitised client service offering.

BigTech firms continue to develop their service offerings and the underlying technology (such as Cloud Computing, AI/ML, Data & Analytics), and are viewed by investment banks as an important enabler of future innovation and competitive advantage in the industry. In addition, BigTech firms are increasingly offering investment banking specific Software as a Service (SaaS) offerings in areas such as risk modelling. However, regulatory concerns on concentration and operational risk of third parties are now requiring investment banks to assess how, and where, BigTech firms will be utilised long-term (e.g. increased adoption of hybrid and/or multi-cloud models).

> "Third-parties are a significant focus for us. The challenge is that it is our responsibility to manage third-party risk from an outsourcing perspective. For those presenting a systemic risk, it should be an industry shared responsibility to ensure their safe use." **AFME TOC member**

Investment banks are more selective in identifying and working with third parties and using learnings from recent pilots or investment initiatives to help with this prioritisation. The preference is to create joint working relationships, with a smaller number of firms, where solutions are developed in collaboration to solve specific business needs and have the potential to be scaled across the organisation. This approach has evolved from 2018 when investment banks were focused on a broad range of FinTech firm pilots to see how the solutions could integrate with existing processes and platforms. The new approach is also allowing investment banks to reduce costs in vendor and relationship management

The market for industry utilities or shared services has remained static and industry consolidation to realise cost and efficiency savings, and unlock potential new revenue channels, has not materialised. Whilst not unexpected, discussions with AFME TOC members for this report raised the continued lack of industry-wide standards (such as KYC), and the complexity of establishing shared services at scale across the industry, as persistent issues.

11 Financial Technology - or FinTech - organisations ranging from emerging digital service providers to fully established Financial Services software vendors (PwC FinTech deals report 2020)

12 Large technology companies with extensive established customer networks (FSB)

"The Fintechs that will become successful have invested in their solutions and professional services but are able to apply their technology to our needs. These firms are working more closely with us to target specific use-cases and scale their capability." **AFME TOC member**

## Implications for the next two-three years

Investment banks will continue to identify and partner with a subset of relevant BigTech or FinTech firms to address specific business challenges (e.g. AML screening and monitoring).

Equally, investment banks may increasingly look to large providers (e.g. BigTech) for new capabilities and services that can support innovation and reduce costs at scale (such as data warehousing, or high performance computing for risk analysis and stress testing).

Similar to the findings in 2018, our 2020 survey highlighted that BigTech firms are not anticipated to move directly into capital markets financial products or services due to the regulatory requirements and burden this would present. However, their indirect role in the industry is expected to significantly increase due to their extensive engineering capabilities, innovation and security offerings, and the ability to operate as platforms for investment banks (such as by providing large scale and flexible Cloud Computing infrastructure and services). This resilience and scale will remain an attractive proposition for investment banks.

Increased regulatory scrutiny and requirements on BigTech firms is likely to change how they interact with the industry and may have implications for investment banks' long-term strategies on which products and services are used; and for which critical or important functions. Capabilities such as "multiCloud" and "open platforms" are expected to evolve and reduce regulatory and industry concerns (particularly the concentration risk of services within a small subset of third-party providers).

Outside of FinTech and BigTech, interviews with AFME TOC members suggested there is continued enthusiasm and potential for industry shared platforms over the next two-three years. The benefits of harmonisation and mutualisation (such as data standards for KYC or trade reporting) would enable the provision of shared services and industry utilities at a significantly lower cost for investment banks.

**Investment banks may increasingly look to large providers for new capabilities and services that can support innovation and reduce costs at scale**

## 2.6 Culture, Ways of Working and Workforce

**Investment Banks remain constrained by their approach to technology change and have struggled to yield the benefits of innovation centres of excellence (CoEs). Newer Agile methods are slowly becoming embedded, however, for many, these are not yet at scale.**

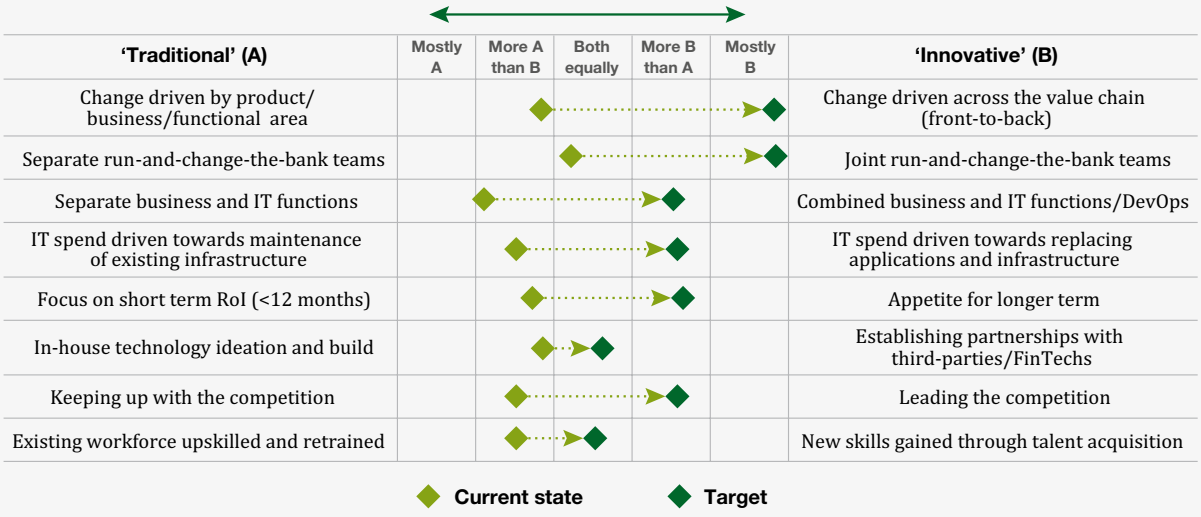
### 2018 report summary

In the 2018 report, 90% of survey respondents agreed that business and IT roles and expertise would continue to merge and create greater organisational agility towards change. This would enable the future workforce to be more focused on high-value activities, and client relationships, and develop increased knowledge and skills for developing technology solutions. This change in the profile of the workforce was anticipated to be more pronounced where activities could be automated more quickly (such as trade support & processing, and IT).

Our 2018 report also identified that investment banks were applying a range of approaches to promote, manage and govern innovation. Some investment banks had centralised innovation at a group level – a digital centre of excellence (CoE) – whilst others had decentralised innovation within individual functions or lines of business. Whilst the approach was expected to vary within each investment bank, a combination of both was expected to bring the most value for driving innovation within the organisation.

### Current assessment

Figure 11: **Journey towards target transformation approach**




Source: Survey of AFME Members, September-October 2020

In our survey for this report, we asked respondents to score their investment banks' current and target state with regards to their approach to technology and operations transformation. Shown in Figure 11 above, the factors listed under the first column were more traditional approaches (e.g. separate run and change teams), whilst factors listed under the second column were more closely associated with innovation and new ways of working (e.g. joint run and change teams).

The results show that, in some areas, investment banks are far off their target approach to transformation. For example, most investment banks are currently driving change within specific product or functional areas rather than front to back through the organisation. However, in other areas, such as establishing third-party partnerships and up-skilling existing workers, the difference was less pronounced.

As shown in Figure 11, investment banks still have considerable scope for integrating business and technology functions into more Agile ways of working. However, over the last two years, investment banks have made progress in this regard.

Over the last two years, investment banks have been more ambitious in adopting Agile work practices across entire teams, functions, and in some cases across the whole organisation. The increased adoption of Agile work practices is providing investment banks with the benefits of the Agile methodology across their business, operations, and IT functions. This is enabling investment banks to achieve better outcomes for their clients by reducing costs, driving competitiveness and being more adaptive to change, and is helping the capital markets industry become more flexible, innovate, effective and secure[13].

However, the adoption of Agile work practices at scale faces several specific challenges that will impact its further success over the next two-three years. In particular the investment and time required to embed new organisational structures and culture and changing existing governance frameworks and ways of working. From our interviews with AFME TOC Members, a main challenge identified was current operating models and functional siloes that are too rigid to create the multidisciplinary Agile teams required for innovation.

A second main challenge from our interviews with AFME TOC Members was the lack of senior sponsorship of technology change throughout the organisation. For example, some investment banks noted that CIOs which do not directly report to the CEO have significantly reduced influence over investment decisions. Equally, many roles and responsibilities are coupled to existing systems that do not present an incentive for change.

Regarding the approaches to promote innovation, a number of investment banks are now preferring a centralised function that has a mandate to drive profit and loss (P&L). This is opposed to previous approaches where innovation hubs or approaches were regarded more as a cost centre.

Investment banks have continued to up-skill non-technical staff across functions, as shown in Figure 11, as part of their shift in approach to technology transformation. Many have implemented several new pathways for graduates, and other junior staff, such as role rotation across technology and operations teams. Investment banks have also increased their drive on external hiring of technology skills at all levels in priority areas (e.g. Data Analytics).

"Increasingly we are looking to drive change across the organisation using Agile and customer centered change, through multi-faceted teams, that allow us to perform integrated transformation." **AFME TOC member**

## Implications for the next two-three years

Developing a culture that can help investment banks to execute their technology transformation will be key for the next two-three years. Specifically, increased senior sponsorship is seen as crucial for the wider adoption of new technologies, and new ways of working, across the organisation.

As previously noted in Figure 5, our survey highlighted the increased importance of executive sponsorship and a clear business strategy to technology adoption. Addressing this will necessitate appropriate, consistent, and frequent interaction across all parts of the organisation. This top down approach, such as communicating and embedding common strategic goals into the entire organisation, will be a key enabler for driving sustainable behavioural change.

This will require investment banks to move away from product and functional silos to consider end-to-end processes across the organisation (e.g. changes required for the front to back trade lifecycle). This is shown by some of the leading investment banks in this area which have realised significant benefits from re-engineering processes front-to-back, and embedding Data & Analytics, which is now helping drive sustainable cost savings.

As investment banks struggle to achieve further marginal cost reduction, we expect to see an increasing trend to empower CIOs to prioritise innovation as a source of revenue generation. Siloed approaches to the development and implementation of technology platforms will reduce as change at scale becomes a greater focus to improve efficiency, and boundaries between run-the-bank and change-the-bank further erode.

13 https://www.afme.eu/Portals/0/DispatchFeaturedImages/AFME_AgileTransformation2020_06.pdf

## 2.7 Policy Change and Regulatory Collaboration

**Investment banks must continue to navigate the necessity of strategic technology change within a fragmented and divergent set of regulatory requirements across the EU and globally.**

### 2018 report summary

The 2018 report identified that over the next five years investment banks and regulators would benefit from increased collaboration to assess where new technologies may present opportunities and challenges, including areas such as compliance, supervision, and market stability. The report anticipated that a more innovation-friendly environment for the development of new technology would emerge, which would result in greater consistency in regulation across jurisdictions and increased competition.

The report also identified an expectation from AFME TOC members that the level of new regulatory initiatives would subside over the next five years. This was because the capital markets industry was approaching the end of several significant regulatory programmes that had been initiated following the previous financial crisis (such as MiFID II and GDPR).

### Current assessment

Collaboration between investment banks and regulators has continued to increase over the last two years and there have been clear benefits to the industry. The creation of the 'European Forum for Innovation Facilitators (EFIF)[14]' is an example, which has provided a platform for supervisors to meet and engage with investment banks and third-party providers, sharing technological expertise and common views on the regulatory treatment of innovative products.

This collaboration has also enabled more awareness, and support, for developments such as the use of Cloud Computing (e.g. for improving resilience) and AI-based solutions (e.g. for compliance or financial crime); many regulators have also upskilled internally and brought in external expertise to supplement their work programmes.

However, the regulatory focus on non-financial, and specifically technology related, risks has increased since 2018. For example, the level of regulation related to financial risk (e.g. market exposure, capital requirements) has reduced in magnitude over this period, whilst policy and regulation focused on non-financial risks has seen an increased focus (e.g. resilience, outsourcing).

This has resulted in regulatory interest in how investment banks are adopting new technologies becoming more granular. For example, over the last two years, regulators have increased their focus on how investment banks are adopting new technologies across the value chain, such as AI and ML[15],[16],[17], to understand the potential uses cases, benefits, and risks they present. This is now leading to increased global, regional, and national guidance and regulatory requirements focused on emerging technologies.

Another example is the increased focus on systemic risk stemming from the increased use of third-party firms outside of the current regulatory perimeter (e.g. BigTech). For example, the provision of investment bank IT infrastructure or platforms through outsourcing. This is now also raising supervisory questions regarding the implications for competition and a level playing field across the capital markets industry. New entrants, such as BigTech firms, are expected to further increase their presence in the industry by supporting a wide range of financial services participants across capital markets (as opposed to entering and providing financial services themselves directly).

Finally, there remains significant divergence over regulatory approaches, standards, and definitions across Europe and globally (e.g. requirements for trade reporting, new regional frameworks for operational resilience and cybersecurity). This has not reduced the burden and cost of compliance for investment banks and is now a significant risk that could further constrain the adoption of new technologies.

14 https://eba.europa.eu/financial-innovation-and-fintech/european-forum-for-innovation-facilitators

15 https://www.iosco.org/news/pdf/IOSCONEWS571.pdf

16 https://www.bis.org/ifc/publ/ifcb50.htm

17 https://acpr.banque-france.fr/en/governance-artificial-intelligence-finance

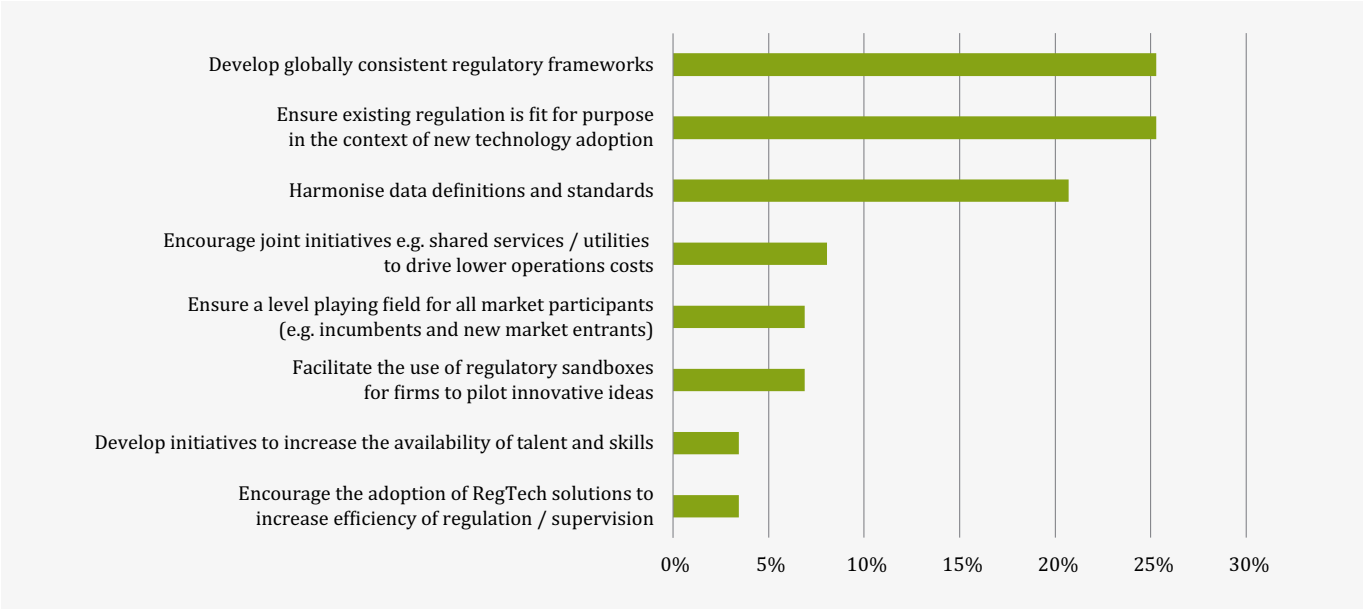
"Regulators are no longer simply interested in our outputs, such as risk and capital numbers, but want to understand the technologies and data used to generate them." **AFME TOC member**

## Implications for the next two-three years

The focus on non-financial risks will likely increase as regulators look to address any perceived or observed concerns from the increased adoption of new technologies, and increased use of data, and increased reliance on a smaller subset of third-party providers. It will be important that the principles of technology neutrality and a 'same risk, same activity, same regulation' continue to be applied to ensure that innovation and change are not inhibited during this critical period.

Regulators should also consider how the scope and nature of their oversight will become more technology focused, as the pace of change further accelerates within investment banks and across the industry. The creation of, and collaboration via, sandboxes, and regulatory bodies acting as facilitators for new industry data standards, will be two positive ways to address current fragmentation and provide consistency for investment banks operating cross border.

Figure 12: **In what way can regulators support technology change?**




Source: Survey of AFME Members, September-October 2020

Figure 12, above, shows the priorities identified by our survey respondents for regulators to support the industry in enabling technology change in a secure and resilient manner. Ensuring consistency across regulatory frameworks and fit for purpose approaches for new technology adoption were identified as top priorities.

Over the next two-three years the remit of regulators will continue to grow and extend to ensuring oversight and stability across a much more diverse financial ecosystem. This is expected to address concentration and supervision of third-party technology providers, and BigTech and FinTech firms, which will continue to gain scale across the industry. The recently published EU digital operational resilience Act[18] is an example of this increased remit expected (proposing direct supervision of critical third parties within the EU).

Regulators are required to maintain a principles-based approach and ensure that oversight and regulation are proportionate to the risks identified. This will ensure that new technologies and innovation can continue to be developed and that investment banks do not face additional barriers for technology change (especially any impact on the ability to take risk-based commercial decisions). Regulatory engagement across the industry will be essential to ensure that competition, innovation, and resilience are central to the increasingly interconnected financial services environment.

18 https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX:52020PC0595

# 3. The Impact of COVID-19

**The capital markets industry demonstrated significant resilience through the COVID-19 pandemic, adjusting to extensive remote working, and high market volatility and volumes, without major disruption. Whilst it is expected that the pandemic will accelerate technology change and transformation, the evolving situation means a high degree of uncertainty for longer-term implications remain.**

## Current assessment

The capital markets industry demonstrated significant global resilience through the COVID-19 pandemic, with many investment banks realising the benefits of prior investments in remote working and collaborative Cloud Computing based infrastructure and applications. From interviews with AFME TOC members for this report, investment banks were unanimous in their view that, had the pandemic occurred five years earlier, the situation would have been more disruptive. For example, the advances in technology adoption made over the past few years enabled a sudden switch to remote working whilst maintaining productivity and limiting major outages across key operations and offshore locations. The underlying resilience of the financial system was also able to cope with the higher market volatility and trading volumes witnessed during this event.

The pandemic also accelerated investment banks' ongoing or planned technology transformation initiatives. For example, such as automating and increasing the frequency of daily business reporting via Data & Analytics and Cloud-based tools (e.g. dashboards covering trade volume trending, failed trades and collateral call volumes). Initiatives of this nature are now embedded within business as usual operations and continue to provide value in the form of more readily available, and actionable, data across multiple functions (e.g. front office, operations).

From our survey, 90% of respondents agreed that the pandemic will be a catalyst for future technology and operations transformation. This was reinforced through interviews with AFME TOC members who also identified that the pandemic has brought an increased appetite for new technologies for both internal and external stakeholders. For example, the pandemic has changed the mindset of many clients that had previously been resistant to digital solutions such as electronic documentation approval.

Many investment banks have also seen tangible benefits to productivity and team cohesion because of remote working. Some investment banks have reported the positive impacts of flatter structures, more personal relationships, and greater connectivity with offshore operations.

However, while there have been positives in the response to the pandemic, there are equally concerns around the long-term implications for investment banks and their workforce. From interviews with AFME TOC members for this report, the wellbeing of staff working remotely over a prolonged period, and the potential for erosion of the cultural capital that many investment banks have built up across teams, were raised as ongoing concerns. This could lead to potential longer-term reductions in productivity, staff effectiveness and engagement, including the challenge of recruiting and onboarding new talent into the organisation, and the loss of development opportunities for junior staff from face to face interactions. This could create an additional hurdle for investment banks to overcome in integrating staff with the new skills required to develop and execute their technology transformation strategy.

Finally, investment banks are faced with strategic decisions on the implications of increased remote working for their location strategies and unused office locations, both of which will need to be linked closely with technology transformation objectives.

"Five years ago, managing the COVID-19 situation wouldn't have been more challenging, without-the technology available. it would have been impossible." **AFME TOC member**

## Implications for the next two-three years

It is anticipated that the pandemic will accelerate technology and operations transformation agendas that have been developed and initiated over the last two years. However, the evolving environment means that investment banks, and the wider industry, are faced with a high degree of uncertainty about the implications for the next two-three years.

As the COVID-19 pandemic restrictions continue there is a greater appreciation within investment banks of both the benefits and challenges of prolonged remote working and what this may mean for long term decision-making and technology transformation. Investment banks will have to balance these considerations as they look to increasingly integrate new technology solutions that enable collaboration within internal teams, and with external stakeholders such as clients and regulators.

The pandemic highlighted several industry process and practices, often driven by regulatory requirements, that can adversely impact resilience (e.g. reliance on physical documentation handling, in-person attendance, non-straight through processing communication methods). It will be important that the industry addresses these changes in the next two-three years to enable the use of new technologies or tools that can improve the efficiency and resilience of regulation.

The pandemic has also required investment banks to re-think conventional approaches to compliance and risk management in areas such as remote trading. Some investment banks are considering a shift to a limited but ongoing level of remote trading to drive longer term efficiencies. However, this will need to evolve in the context of meeting regulatory expectations to evidence supervision and controls.

**Investment banks, and the wider industry, are faced with a high degree of uncertainty about the implications for the next two-three years**

# 4. Calls to Action

This report has assessed the progress being made against our 2018 vision and principles for the investment bank of the future, centred on the adoption of four key technologies (AI/ML, Cloud Computing, Data & Analytics, and Distributed Ledger Technology). Additional considerations also covered in 2018 have also been included in the assessment (such as the workforce and new ways of working, and third-party partnerships).

The principles we identified in 2018, shown in Figure 13 below, remain relevant today and investment banks have made progress. However, the pace and scale of change remains challenged by a complex operating environment. The industry needs to accelerate a long-term strategy and remain critical in its' investments to maintain a competitive position.

Figure 13: **AFME-PwC 2018 principles for the 'investment bank of the future'**

1. **Maintain a long-term focus:** Prioritise long-term investment in new technologies.
2. **Embed data as an enabler:** Treat data as an asset to become data and insight led.
3. **Embrace open technology:** Leverage open and shared platforms and standards as an accelerator of change.
4. **Adopt a collaborative approach:** Partner with external 3rd parties on areas which don't drive competitive advantage.
5. **Identify Industry Priorities:** Collaborate with other Investment banks to solve common industry problems.
6. **Use Agile Work Practices:** Teams and solutions should be designed to be more flexible, agile and modular.
7. **Develop a Relationship-based Workforce:** Prepare for a workforce that is driven through a merging of business and IT skills.
8. **Enable Secure and Resilient Operations:** All new choices should be designed with resilience, recovery and information security in mind.

To support investment banks, and the industry, over the next two-three years we have identified five specific calls to action to complement the 2018 principles shown overleaf and enable the vision set out at that time.

1. **Prioritise investment in a long-term and clear change agenda**
    - Ensure budgets and investment do not discentivise strategic technology initiatives, and opportunities for architecture simplification, with longer-term and enterprise-wide payoffs.
    - Increase the flexibility of technology strategies to respond to emerging industry drivers (e.g. enhancing Data & Analytics capabilities) to support measurement and reporting against strategic priorities such as the ESG agenda.
2. **Accelerate the convergence of business and IT capabilities for increased flexibility**
    - Bring business and IT teams further together to broaden the implementation of Agile work practices at scale and leverage the range of technical skills in the workforce.
    - Refresh the framework for transformation and update accountabilities to cut across silos and unlock significant efficiencies (e.g. through the appointment of Chief Transformation Officers, or similar).
3. **Create an incentive structure for investment banks and third parties to collaborate**
    - Remain focused on advancing opportunities for shared services that can mutualise costs within the industry.
    - Non-bank industry participants should increase their preparedness and maturity where they play an increasingly critical role in the industry and ensure that security and resilience are prioritised.
4. **Build an organisational culture for innovation**
    - Incentivise teams to make decisions that are aligned to organisation goals; this should be reinforced through existing governance structures such as performance management and reward structures.
5. **Ensure industry collaboration is maintained for developing a new fit for purpose regulatory framework**
    - Regulators are requested to take a more principles-based approach that is globally consistent and ensures that oversight and regulation are proportionate to the risks identified. Regulators should also further leverage new technology to increase the efficiency of industry processes e.g. data standardisation for regulatory reporting.
    - Investment banks and third parties will need to remain focused on resilience and cybersecurity and embed a framework for risk management into the innovation process.

# Appendix I: Summary of 2018 findings and current assessment

| Findings | Our findings in 2018 | The status in 2020 |
|---|---|---|
| **Operating Environment** | | |
| **Investment in change** | Constraints on investment due to ongoing major regulatory programmes (e.g. MiFID II), and the continued cost of remediating or maintaining legacy technology platforms. | Investment constraints remain due to a persistent challenging operating environment (e.g. low interest). |
| **Key Technologies** | | |
| **Artificial Intelligence and Machine Learning** | A priority growth area with many pilots or contained uses underway, however at scale use remained mostly in front office algorithmic trading. | Increase in deployments to address specific business problems, rather than hypothetical test cases. Auditability and transparency remain key challenges, and further regulatory requirements are expected. |
| **Cloud Computing** | A technology that will reduce cost and improve IT infrastructure flexibility, however investment banks remain cautious due to security and privacy concerns. | A foundational component for transformation, innovation and resilience. Security concerns have reduced, however the implications of new regulatory requirements, and concentration risk and vendor lock-in, have increased. |
| **Data & Analytics** | An enabler for all future technology change and innovation, but many investment banks are still developing the foundational aspects required (such as controls, governance and IT infrastructure). | Significant investment has been made to improve existing processes and drive efficiency. Data initiatives are today driving cost reduction (e.g. reducing manual document handling) and transparency (e.g. greater insights through Analytics). |
| **Distributed Ledger Technology (DLT)** | Active industry involvement in pilots and consortium efforts but limited practical applications. | Sentiment broadly unchanged and challenges for pan-industry collaboration remain. However, the use of DLT for digital assets adoption has rapidly increased in importance. |
| **Robotic Process Automation (RPA)** | A key technology being used for cost reduction and operational efficiency (e.g. eliminating manual tasks), with mature levels of adoption and use across most investment banks. | Higher levels of maturity reached with the focus now on more sophisticated adoption (e.g. connecting to clients via APIs to access data, providing trade confirmations in their formats). |
| **Cybersecurity and Operational Resilience** | | |
| **Cybersecurity** | A primary concern for investment banks when adopting new technologies. Significant investment in skills, awareness, and tools made. | Maturity has continued to increase and remains a priority, with an increased focus on third-party risks and security. |
| **Operational Resilience** | Early policy measures being developed, with an expectation of increased focus from regulators and specific requirements for investment banks. | An industry imperative that has been further amplified by the COVID-19 pandemic. Increased global and regional activity with multiple frameworks being introduced, increasing the risk of regulatory fragmentation. |

| Findings | Our findings in 2018 | The status in 2020 |
|---|---|---|
| **Third-party Partnerships** | | |
| **Third-party Partnerships** | Expectation of a deeper connection between investment banks through utilities and shared platforms (e.g. technology providers), and some investment banks playing a greater 'service provider' role across the industry.<br><br>Expectations of investment banks to increase partnerships with FinTech firms to optimise specific parts of their existing functions. | Increased access and use of third-party solutions as they have matured (e.g. IT infrastructure hosting).<br><br>Uptake of FinTech propositions has remained gradual. Technical solutions have advanced, but their value in addressing specific business issues or bringing value at scale remains a challenge for investment banks. |
| **Workforce and Ways of Working** | | |
| **Workforce and Ways of Working** | Expectation that the future workforce will be relationship-based (e.g. client focused) and technology enabled (e.g. increased collaboration within investment banks).<br><br>Business and IT roles, and skills, beginning to merge (e.g. in trade support & processing). | Merging of business and IT functions continues, with scale now being realised which can support adoption of Agile ways of working.<br><br>Increased awareness, training, and adoption of technology within operational and non-technical teams (e.g. legal, risk, compliance). |
| **Policy Change and Regulatory Collaboration** | | |
| **Regulation** | Expectation that significant regulatory measures, particularly on financial risks, would subside following post-financial crisis reform. | Financial risk-based regulation has subsided, however a new wave of 'non-financial' regulation has emerged (e.g. operational resilience, security, technology and data focused policy). |

# Contributors

We are grateful to our Technology and Operations Committee member firms and the individuals who contributed their time and input for producing this report.

## AFME Technology and Operations

AFME's Technology and Operations Division brings together senior technology and operations leaders to influence and respond to current pan-European market drivers and policy. Find out more at www.afme.eu/Divisions-and-committees/Technology-Operations.

*Technology and Innovation in Europe's Capital Markets: A renewed imperative for the future of the industry* was led by the AFME Technology and Operations Committee as an initiative within the broader Technology and Operations Division.

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# / About AFME

The Association for Financial Markets in Europe (AFME) is the voice of all Europe's wholesale financial markets, providing expertise across a broad range of regulatory and capital markets issues.

We represent the leading global and European banks and other significant capital market players.

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