Embracing data analytics

Ensuring internal audit's relevance in a data-led world

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Foreword:
Rising to the data analytics challenge

This report aims to encourage internal audit to fully embrace data analytics and support the organisation in doing the same. Data-empowered senior management are more risk aware and can make smarter, swifter decisions. For internal audit, data analytics enables faster assurance and more incisive insights for the organisation to act on. The case for adopting a data-led approach has never been more urgent.

Since 2020, the world has witnessed two major risk events in the pandemic and the war in Ukraine. These have had multiple compounding downstream effects on supply chains, inflation, growth, costs, forex rates, cybersecurity, and workplace mental health. Organisations are striving for resilience amid the chaos.

Today's uncertainty is driving many organisations to revisit investment decisions. This renewed focus on tightening financial control is happening at the same time as internal audit is deploying data analytics to enhance and transform the value provided by the function.

For those who have already progressed on the data analytics journey the results are tangible. Demand for further development is now coming from within organisations themselves as they too see the obvious benefits. However, for those who are at an early stage of development or have not yet taken the first step on this journey, there may be a temptation to slow or even defer investment indefinitely and simply "deliver the audit plan as normal".

This is a short-sighted view that will inevitably create a widening gulf between the value delivered by internal audit functions who invest in data analytics and those who don't. A two-tier internal audit profession is bad news for everyone - for internal auditors, the profession at large and for the stakeholders who depend on us.

We urge all internal audit teams to push the data analytics agenda and engage with their peers across sectors. Discover and learn from what is being done elsewhere, what new insights internal audit is delivering and the additional value this is providing. Give careful thought to how you can upgrade your toolkit and use audit analytics to harness the power of data to deliver the broadest and deepest assurance coverage possible.

Consider whether you are failing to keep pace with what is expected of an effective internal audit function in the 2020s and then make the case for data analytics when speaking to the audit committee and other key stakeholders.

Data is key to the future for all organisations, it is therefore key for internal audit as well. Understanding what the data shows about risk resilience in today's complex environment will ensure the organisations' success.

No matter where your function and organisation are in their data analytics journey, there is always progress to be made. One step at a time.

John Wood
Chief Executive, Chartered Institute of Internal Auditors

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Senior Internal Audit Advisor, AuditBoard and Former President and CEO of IIA Global

About the research and methodology

To explore how the profession is progressing in its use of data analytics and AI/machine learning, the Chartered Institute of Internal Auditors hosted three roundtable discussions in August 2022 on the topic, in which members shared their insights and experiences. Building on this, we sat down with senior internal audit executives at three organisations that have either demonstrated instructive progress in their data analytics journeys or are applying these techniques at an advanced level.

Organisations represented include: abrdn, An Post, Barclays, Deloitte, Flutter Entertainment, HSBC, Irish Life, Legal & General, Lidl, Lloyds Banking Group, Met Office, Novuma, Phoenix Group, Post Office, Scottish Midland Co-operative Society, Skipton Group, SWAP Internal Audit Services, Technology4Business, The Government Internal Audit Agency, The Open University.

This qualitative research was combined with a quantitative survey that was run during September as a pulse check of data analytics and AI adoption and the perceived maturity of these applications within internal audit functions in the eyes of 298 respondents.

We would like to thank all participants for their time and contributions to this project, without which it would not have been possible. Their involvement is not an endorsement of the contents of this report.

Key highlights from our research

60%

of internal audit functions are already using some form of data analytics, an additional 7% having advanced to adopting AI-powered/machine learning techniques. However, nearly a third of functions are not using any data analytics techniques whatsoever. This needs to change.

69%

of those using some form of data analytics are at the earlier stage of the maturity curve, their approach being planned but transactional. Just over a quarter (27%) deploy data analytics on a strategic and integrated basis and only 3% see their use of these tools as fully optimised. All functions should strive to move up the maturity scale no matter where they are today. There is no final destination.

62%

of internal audit professionals report that finance is the main area of the audit universe from which they gain the most value from applying data analytics. As internal audit functions move up the maturity curve they should expand this range of applications, as this is potentially where the real benefits are to be achieved.

48%

of internal auditors see the top benefit of using data analytics as the greater level of assurance that can be delivered. This is just one of many associated, often mutually beneficial advantages, which also include improved risk awareness and efficiency gains. The days of routinely taking small samples are numbered.

49%

of survey respondents see the biggest barrier to data analytics progress as the lack of existing skills and resources in the function. CAEs will need to develop an approach for upskilling the team to fully exploit the benefits of these tools.

3%

of internal auditors are very concerned that advanced AI could replace their jobs. Just under two thirds (64%) say they are either neutral or moderately unconcerned. This majority understand that automated data analytics capabilities are a complement to, not a substitute for, judicious human internal auditors. AI, if used appropriately, will only serve to enhance internal audit work in the future.

Key takeaways

1. Today's maelstrom of risks means internal audit must remain relevant, stay close to senior management and understand whether it has a clear, integrated and data-enabled view of risk.

2. Level up the organisation. There is only so much data analytics progress internal audit can make if the organisation has poor data governance and systems, as there will be nothing for the third line to "plug into". In these circumstances, internal audit must identify relevant weaknesses to help drive the organisation in the right direction.

3. Start small. Beginning on the data analytics journey does not require major investment. Excel and in-built scripts in dedicated audit software can go a long way. Curious internal auditors should be given time and space to experiment. Failure is part of discovery and experimentation should be encouraged to achieve results.

4. Data analytics is applicable across the internal audit lifecycle, from the continuous monitoring of KRIs to improve audit planning and scoping, to in-audit analysis, through to reporting to the audit committee with data-led findings and managing audit recommendation follow-ups. Start small but think big.

5. Continuous monitoring using data analytics gives internal audit a clearer picture of risks in real-time. This enhanced risk awareness frees up the third line's bandwidth to focus its attention on what really matters and bigger emerging strategic risks coming down the track (e.g. inflation, rising costs, slowing growth etc).

6. Sample testing is no longer going to cut it. One of the biggest strengths of data analytics is full population testing and all audit functions should be working towards this as a matter of urgency, if they are not already there. Making this industry standard across the profession is a natural progression.

7. Challenge the data. Don't assume that findings are 100% correct or over-rely on data outputs. Internal audit needs to apply its subjective, analytical mindset always to interpret what data analytics is revealing (or not) to support its qualitative understanding of risks and control weaknesses.

8. Data is a powerful storytelling asset. Internal audit should have the confidence to move away from traditional audit reporting templates and integrate data into their findings in a clear and easily digestible way. Sharing powerful narratives with stakeholders equips them with deeper actionable insights.

9. Show off your biggest data analytics wins with the audit committee, CEO and CFO. Whether "wow moments" or overall gains from applying a data approach, talk up your results to senior stakeholders for maximum buy-in, selecting examples based on their individual needs and interests. This will improve the third line's reputation and can unlock meaningful budget allocations.

10. Share your success stories with the internal audit community. This helps everyone to develop, encourages new ideas and builds momentum, advancing the profession.

11. Champion data investment into the organisation and collaborate. Internal audit budgets are squeezed and there is often a greater will to level up the organisation's own data resources and capabilities. The third line can leverage this for its own benefit through shadowing, secondments and by sharing vital data tools, skills and techniques being used in the first and second lines.

12. Stay close to the organisation. Engage when new systems and data tools are being rolled out. The best time to understand new systems, advise on controls and determine the potential for applying audit analytics is at the design stage. Get in at the ground floor early.

13. Be prepared for obstacles. Data availability, accessibility and integrity are common issues that all internal audit functions face. This is an inevitable part of the data analytics journey and helping the organisation to solve these weaknesses will improve its data governance and maximise the potential of audit analytics.

14. The internal auditor of the future will be fully data-enabled. AI and machine learning are being used to detect risks and automate process outcomes testing, strengthening the third line. But computers cannot give a nuanced control design opinion. Internal audit will always require a human touch.

Plan of action

Value to IA and the organisation

Data analytics maturity
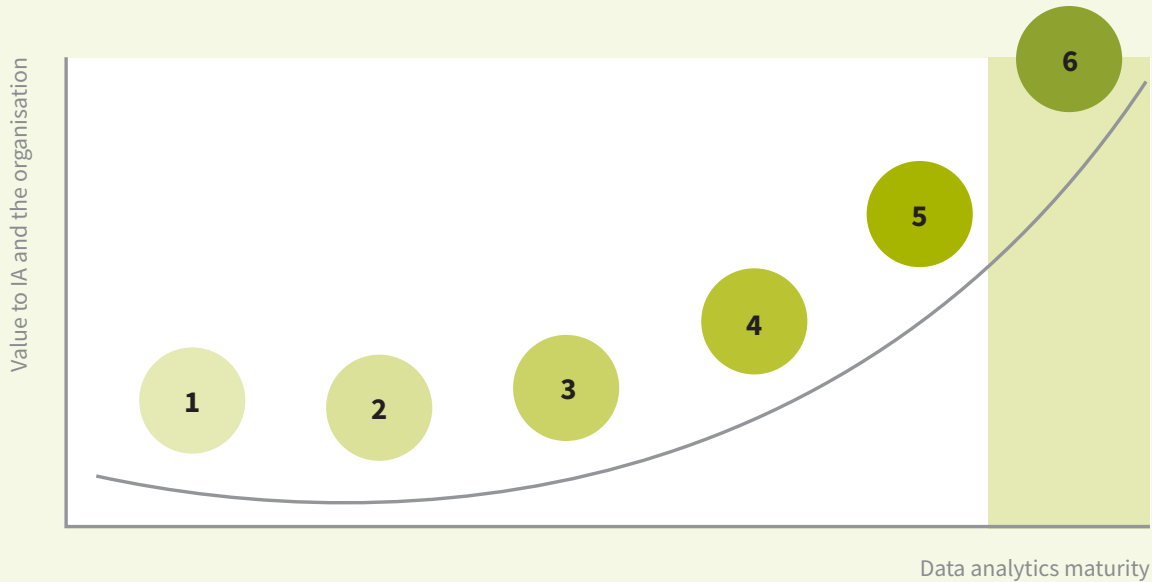
1 Zero data analytics activity

Action: Internal audit functions that have not embarked on the data analytics journey yet need to get moving post-haste. A lot can be achieved with a little. For example, begin experimenting with a core finance dataset using Microsoft Power Query in Excel to analyse and test the full data population. Join an interest group such as the Chartered IIA's Data Analytics Working Group. Discover what others are doing and begin to understand the potential for data analytics in internal audit.

2 Ad hoc, disjointed tactical use

Action: Demonstrate progress to the audit committee for buy-in and to access investment. Recruit a data analytics specialist or if this is not possible champion data analytics and data science investment within the organisation at large. Map the organisation's entire data universe and access as much data as possible. Embed continuous monitoring/risk assessment for greater risk awareness, planning and scoping.

3 Strategic use of data analytics but basic to medium-level techniques and applications

Action: Continuous risk assessment is now running in the background and audit planning pinpoints the biggest priorities. Formalise a data analytics strategy with clearly defined goals. Set up knowledge-sharing workshops and huddles so internal audit can learn from data specialists either within the function or the organisation. Further develop your peer group connections and learn from others' experiences and their practical applications of data analytics. Foster a culture of experimentation and continuous improvement. Expand application of data analytics to multiple risks and business functions/activities. Use software and self-coded bots to automate menial and repetitive tasks, such as financial controls testing or document gathering. Bring audit reporting to life with data visualisations to paint a clearer risk picture for senior stakeholders.

4 Strategic and integrated use of data analytics and data automation techniques

Action: Explore machine learning capabilities such as natural language processing (NLP) by coding bespoke tools, moving beyond the analysis of numbers and binary data entries alone. Contrast multiple datasets for more precise, incisive risk perspectives. Experiment with process mining to better understand deviations, control failures and anomalies across end-to-end processes. Set defined targets for the use of data analytics across audit activities to measure progress. Continuous monitoring and automation should cover all core processes and audits in green and amber risk areas, freeing up internal audit's time and resources to focus on the very highest priority strategic and emerging risks.

5 At the bleeding edge of the profession, having begun to integrate process mining and machine learning

Action: Further experimentation with emerging and AI-powered analytics techniques applied to both structured, semi-structured and fully unstructured data. Simultaneously analyse multiple internal datasets and where possible and relevant contrast this with external data analysis to deliver unique insights. Apply predictive capabilities to track audit activities and identify audits that may run over time or budget to put in place interventions. Similarly, develop predictive capabilities to understand the relationships between various business risks, identifying potential domino effects that may be likely to manifest as threats to the organisation in future.

6 Fully optimised and integrated data analytics and data science approach with predictive capabilities

Action: The function is as fully enabled as current technology allows and continuous, automated and predictive analysis are overlaid with internal audit's expert and intimate understanding of the business for unparalleled assurance provision. The internal audit function is no longer looking in the rear-view mirror at past issues. All available data is flowing into the function and internal audit is only focused on what matters, heading off risks before they become major incidents. The third line keeps pace with advances in machine learning and integrates them where appropriate, refining and honing its data approach.
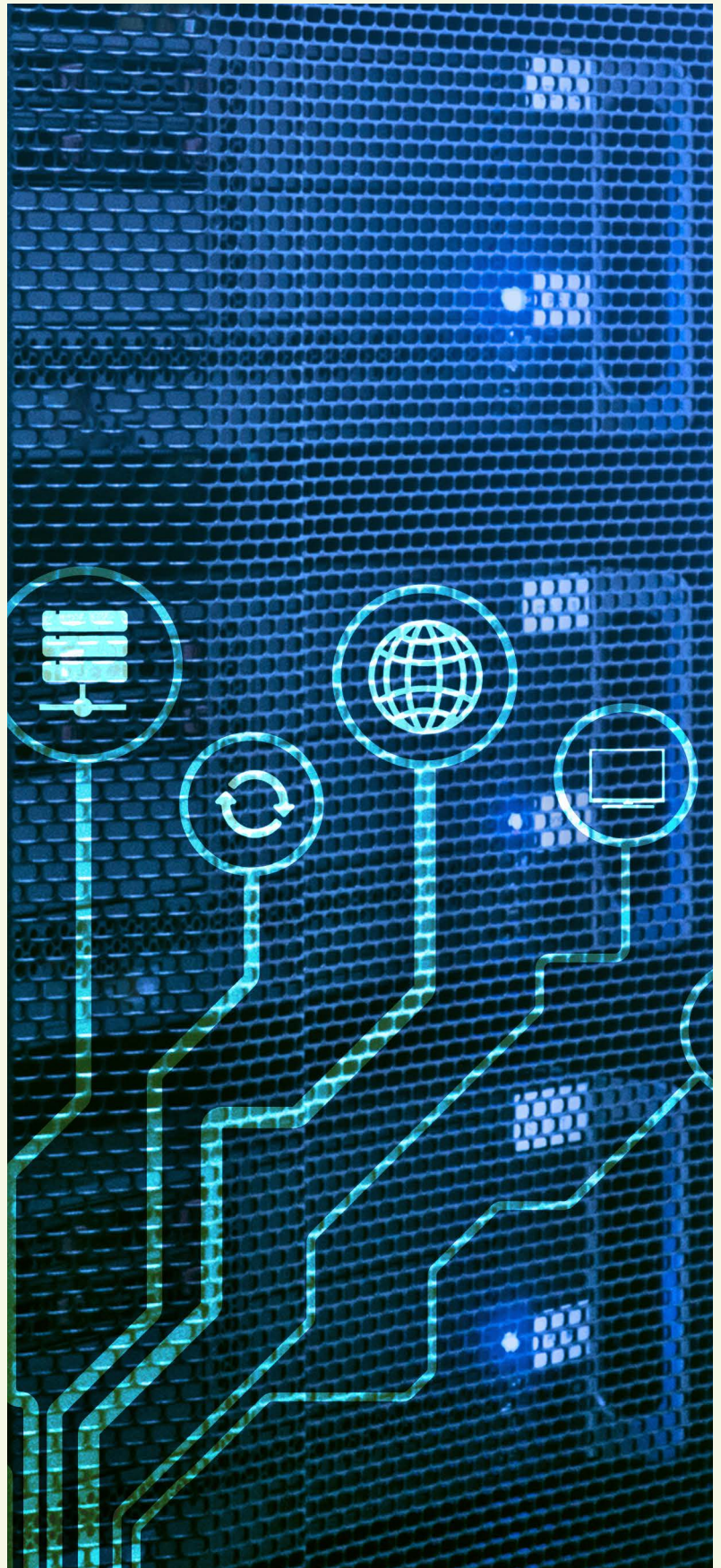
Busting common data analytics myths

Data analytics saves time. True and false. In due course data analytics should deliver sizeable and compounding efficiencies as applications are established and refined. However, this in itself can take time. Immediate results are not guaranteed. Investing the time and resources upfront will deliver high-value outcomes for those prepared to commit to the journey. Patience is a virtue.

Data analytics is expensive. False. For example, all internal audit functions have access to Excel and it can go a long way. Before running headlong into investing in the shiniest software or hiring in talent, see what's possible with the available tools and online learning resources. Also, consider what tools are already being put to use elsewhere in the organisation—it is often more cost effective to purchase add-on software licences or plugins for existing ERP systems than invest in tools for internal audit from scratch. Once the limits of existing software and skills have been exhausted, then push for the expansion of internal audit's data analytics capabilities where necessary. Crucially, this should only go ahead once there is a clear vision of what needs to be achieved, and what's required to reach those goals.

Data analytics isn't achievable with my resources. False. Most organisations are levelling up their data science and analytics capabilities. If there is no budget available for hiring expertise directly into the internal audit function, leverage the business's resources and build your external network as there is much to be learnt beyond the organisation's boundaries. The biggest data enthusiast in the internal audit team can pick up a lot by shadowing a data expert and listening to and bouncing ideas off their peers. The audit function should network with the organisation's best and brightest data people and share knowledge for mutual benefit, while maintaining independence.

Data-enabled risk awareness vital in an age of systemic risk

In a world full of systemic risks, data-enabled risk awareness is vital to support organisations in identifying how effectively these threats are being mitigated. At the time of writing this report, organisations face some of their strongest headwinds in years. The upheaval caused by the pandemic has been followed by inflation rates not seen for decades. Financial markets have been in disarray and to curb runaway prices the Bank of England, like most central banks, has been tightening monetary policy amid slowing economic growth. All of this is throwing up nasty surprises.

Systemic risks are now everywhere and internal audit must do everything it can to determine how well senior management understands the situation the organisation finds itself in. It's a complex environment and it may feel like an impossible challenge to deliver relevant assurance.

Standing side by side with senior management

Now is the time to stay as close to senior management as possible to understand how integrated their risk view is. Do senior management have a clear understanding of the organisation's key pressure points right now? Internal audit doesn't have to agree with this view, but it must check that the CEO and other C-suite executives have their eyes wide open and are looking ahead. This can be as simple as confirming they have defined a list of the top five risks to the organisation and its strategic objectives and related actions to mitigate against these.

Data is a key ingredient in all of this. If the executive lacks an understanding of the organisation's data and what it shows, they won't understand its potential breaking points. For example, are supply chains functioning to a level that allows the company to deliver to its own customers and keep cash flowing? Are input costs making certain products unprofitable? Does the company have a handle on its budget and is it tracking all of its operational costs? Is the

organisation aware of increasing staff absence rates and what this may indicate about stress and workforce mental health amid the cost of living crisis? Is there any response from the business to resolve any such issues? And, importantly, what data is there to support risk findings and the actions senior management may have to take?

All of this boils down to the criticality of data in improving risk awareness at the highest levels. Analytics technologies such as dashboards that aggregate data can be invaluable in supporting

Data is a key ingredient to mitigating risk

management's organisation-wide view of immediate "now risks" at this high-stress time. C-suite executives need to be fully engaged with this constant due diligence, continuously prioritising risk, with internal audit at their side challenging assumptions and the underlying data and analysis that underpins this top-level, strategic view.

Key questions

Q1. Has senior management defined the organisation's top five risks right now?

Q2. What data supports this view and is the data correct and reliable?

Q3. Are underlying assumptions checked as well as the level of interdependency between various risks?

Q4. Has internal audit developed its own view of the most impactful "now risks", supported by data, and how do these compare with senior management's risk priorities?

Q5. Are these reflected in the audit plan and should internal audit "go off plan" to support the business's immediate assurance needs?

Q6. Is there an ERP system in place that gives management a data-enabled, timely and accurate view of current, fast-moving operational and strategic risks?

Q7. Does the organisation and management have an integrated view of risk or is it disjointed and based on assumptions and guesswork?
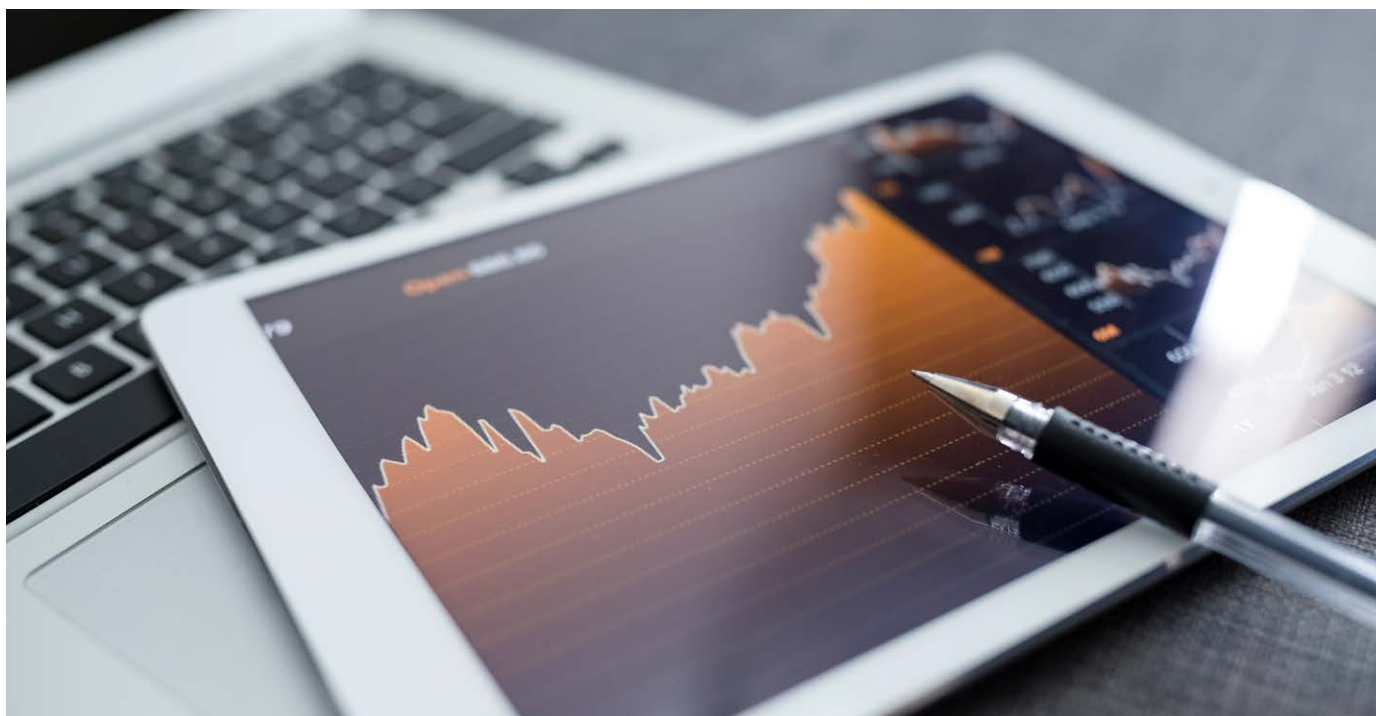
All risks everywhere

Internal audit is contending with a dizzying escalation of risks coupled with rising expectations of what it should deliver. Lasting pandemic disruptions, a weakened macroeconomic outlook and war have manifested some troubling downstream effects, essentially magnifying the whole range of existing risks.

The potential for fraud is increasing as the cost-of-living crisis bites. Cyber risk is rising as criminals seek to exploit dislocation since the pandemic and malicious state actors now look to sow disruption amid fever pitch geopolitical tensions. Treasury and forex risk is running high amid wild currency swings. Financing costs are escalating amid the rising interest rate environment, just as profits are under pressure from runaway inflation.

This systemic risk environment is keeping internal audit on its toes, to say the least, and is making data analytics a strategic imperative for the third line. Data analytics can boost the third line's efficiency and ability to identify serious red flags early.

Developing a fully data-enabled internal audit function may seem like a daunting proposition and there are undoubtedly hurdles to overcome. However, those only beginning on this path to maturity should recognise that data analytics capabilities are fast becoming non-negotiable. Even those that have already embarked on this journey and are seeing results from these efforts should seek to continuously advance in order to:

- Better and more quickly understand how various risks are developing within the organisation

- Deliver faster, broader and deeper assurance on the risks that matter

- Provide a more accurate picture of how effectively these various risks are being managed

- Help the organisation to better understand its controls, processes, outcomes and evolving risk profile

- More effectively identify causal risk relationships and trends, both internally and externally

- Reveal operational insights that would otherwise be unknown to the organisation

- Work hand-in-hand to symbiotically advance the data governance and data analytics capabilities of the organisation itself, in turn raising the potential of audit analytics in a virtuous cycle of improvement

Data analytics is applicable for all internal audit functions, big and small. Strategies and use cases will vary, but there is no third line that cannot be fortified by applying analytics techniques to its various activities.

Internal audit must open its mind to what is possible with data analytics. Audit analytics can be applied to much more than just numbers or binary entry fields, with machine learning increasingly adopted to parse huge volumes of text.
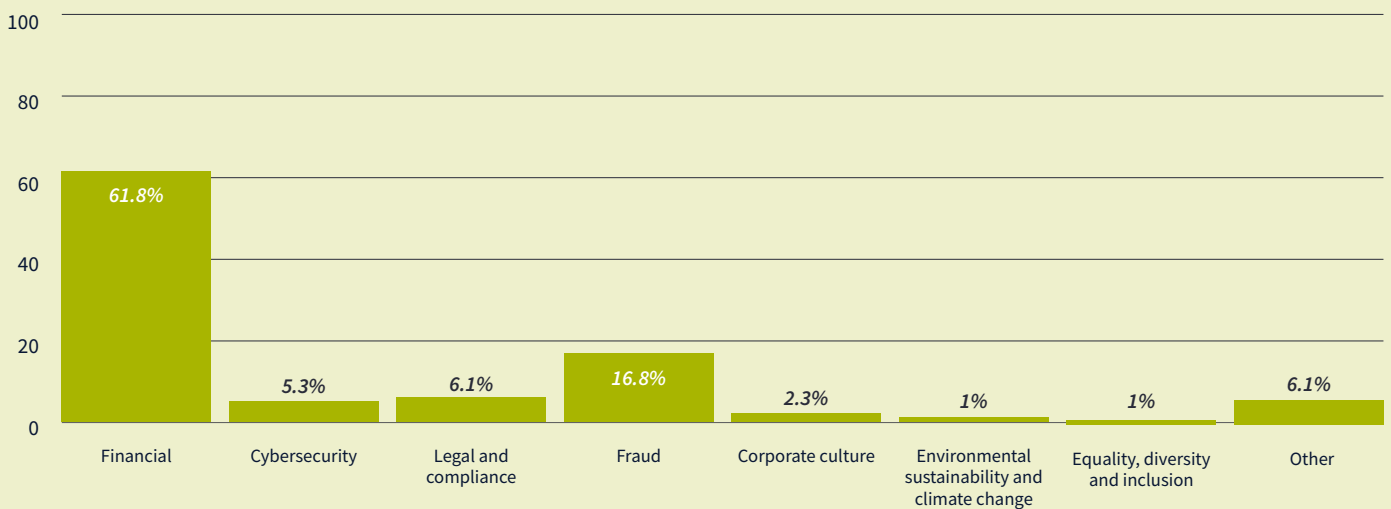
Currently, the third line is overwhelmingly directing data analytics towards finance-related activities. Our research shows that, across the audit population, 62% of internal audit functions are currently finding the most value from applying these techniques to financial areas of the organisation. Recognise that these tools can be applied to virtually any risk in some way, from analysing access rights management to identify network security weaknesses, through identifying critical cost inefficiencies in vendor contract management to assessing the effectiveness of governance committees. Some are even beginning to audit culture by contrasting quantifiable metrics such as operational performance, staff turnover, length of service, workplace survey results, customer and staff complaints and insider fraud incidents. NLP holds huge promise for this purpose. Text analytics can be applied to vast troves of documents, not only to scan for keywords but to determine sentiment. This can provide clues and insights into staff and customer satisfaction, employee motivation, discriminatory behaviours and other potential points of conflict requiring attention to bring culture back in line with expectations. The opportunities made possible with data analytics are only limited by your imagination.

Keep this in mind as the third line is expected to cover the breadth of operational and even strategic risks in a now systemically unpredictable and destabilised business environment. With data analytics, internal audit can achieve much more with less, provided it is willing to lay the groundwork. These efforts are all in the name of bolstering organisations' resilience at a time when they have never needed it more.

What area of the audit population do you get the most value from in applying data analytics and AI?

An overwhelming majority of data analytics use is put towards auditing finance-related activities. This suggests these techniques are being underutilised, with most data mature internal audit teams applying these techniques to a host of risk areas.

Financial	61.8%
Cybersecurity	5.3%
Legal and compliance	6.1%
Fraud	16.8%
Corporate culture	2.3%
Environmental sustainability and climate change	1%
Equality, diversity and inclusion	1%
Other	6.1%

Keep up or get left behind

By not developing its data fluency and analytics capabilities, internal audit faces a potential credibility crisis. As organisations and the technologies that enable their operations develop at a rate of knots, so too is the way in which risk assurance is being delivered. Digitalisation was accelerated by the pandemic. However, this secular trend has long since reached critical mass and internal audit must accept this reality by viewing the organisation, its activities and risk controls through a data lens, and integrating data analytics to enhance its service delivery. Failure to do so will mean internal audit is in danger of quickly losing relevance.

Our research shows that 30% of functions are still not using any data analytics techniques whatsoever. Of the 70% who are applying data analytics, 69% are doing so on a planned but transactional basis and only 3% report being at the furthest end of the maturity curve with fully optimised analytics adoption. There is a real possibility that organisations will increasingly look to external assurance providers with an aspiration for them to fill the void and achieve a higher quality of service, which is not always forthcoming. By one estimate, 33% of internal audit functions globally outsource some amount of their activities and this could increase[1].

External audit may step in here, expanding its assurance beyond its traditional financial reporting remit. There is already an indication of this in the UK Government's recent white paper, Restoring Trust in Audit and Corporate Governance. Among the recommendations is a call for existing professional bodies to develop external audit as a profession distinct from accountancy and extend its scope to cover areas beyond financial statements, such as cybersecurity and ESG. These non-financial risk areas are primed for audit analytics.

*These non-financial risk areas are primed for audit analytics.*

If internal audit's credibility is not at threat today, it will be in future if it does not embrace data and hone its understanding of what it says about the risk environment within increasingly digitalised organisations. Audit committee chairs in financial services companies now want to see their internal audit teams demonstrate at least the same level of data analytics competence as the business itself. In time this will become the general expectation. Simply put, if the third line doesn't understand the available data, how can it audit effectively and maintain stakeholder trust and confidence?
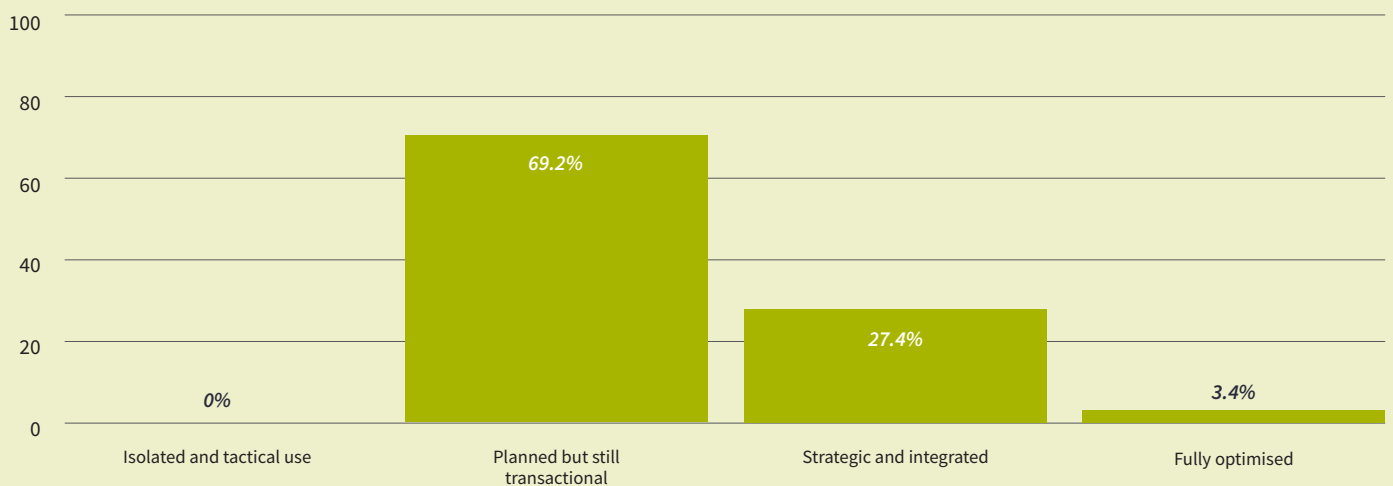
[1] Companies Increasingly Outsourcing Internal Audit, Internal Audit 360, February 2018:
https://internalaudit360.com/companies-increasingly-outsourcing-internal-audit/

Is your internal audit function currently using data analytics and/or AI as part of its audit work?

More than two-thirds of internal audit functions are currently using some form of data analytics in their work. This is a solid foundation, but there is room for progress.

No, my internal audit function is not using data analytics or AI

32.6%

60%

Yes, data analytics

7.4%

Yes, data analytics and AI
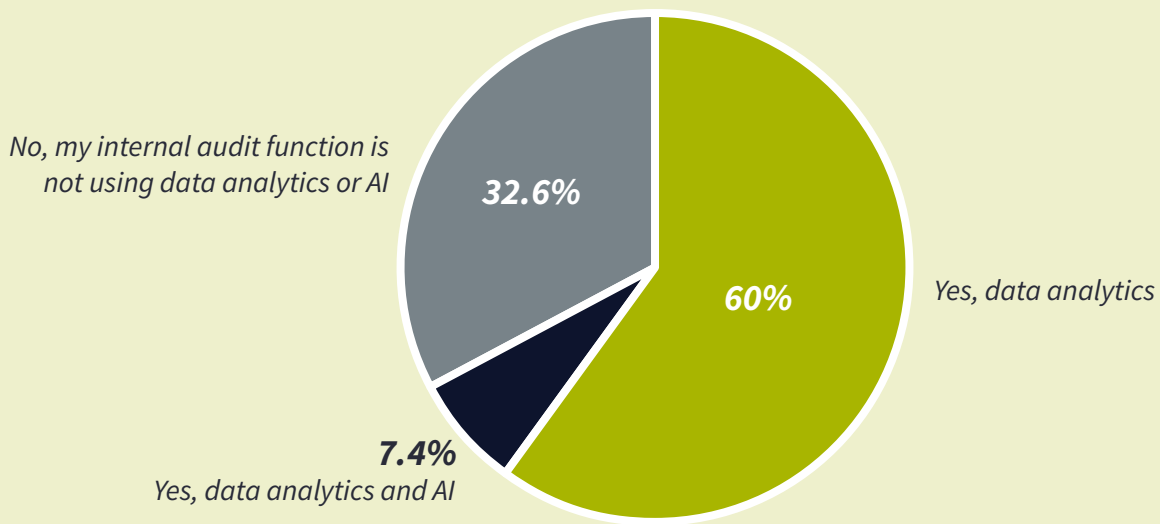
How would you rank your internal audit function on the following data analytics and AI maturity scale?

100	
80	
60	69.2% (Planned but still transactional)
40	
20	27.4% (Strategic and integrated)
0	0% (Isolated and tactical use) — 3.4% (Fully optimised)

Isolated and tactical use | Planned but still transactional | Strategic and integrated | Fully optimised

The majority of internal audit teams are at the lower end of the data analytics maturity curve, leaving plenty of room for growth and development. Learn from your peers to level up, many of whom are sharing best practice in the Chartered IIA's Data Analytics Working Group.

All eyes on risk: Continuous monitoring and whole population testing

Continuous capabilities

Continuous risk assessment is one of the highest-value applications of data analytics that internal audit can apply. It improves the third line's risk awareness, focusing its attention on what matters and at the right time. According to our survey, only 8% of internal auditors see this enhanced risk awareness as the primary benefit of these tools, with greater levels of assurance considered to be the main advantage, cited by 48% of respondents. In an environment in which systemic risks are boiling over, internal audit may be underestimating the value of this awareness and the ability to hone the audit plan with greater precision.

Depending on the available budget and existing software resources, Excel may suffice for monitoring purposes. This won't enable true real-time monitoring but will at least allow the third line to perform quarterly, monthly or ad hoc data imports to "check in" on the data. In organisations with ERP systems such as Oracle and SAP, internal audit can benefit from live analytics plug-ins monitoring in the background and parsing far larger volumes of data. Monitoring key risk indicators (KRIs) such as outliers and duplicates or material changes in the business will massively help with scoping/de-scoping the audit plan, making the third line's work more timely and relevant.

Continuous risk assessment is quickly becoming industry standard. At a time when stresses and strains are appearing in all corners of organisations and risk taxonomies are fast becoming outdated, close and ongoing oversight of risk is a must. This application of data analytics keeps the third line on top of warning signs, focusing its attention where it's needed most.

"There is immense power in saying that we've reviewed 10 million records and the process is being followed without any exceptions. That level of assurance is far more powerful for our stakeholders, as opposed to picking a sample of 30 or even 300. In this day and age, that's not going to cut it."

Audit Director and Data and Applied Sciences Specialist, FTSE 100 Banking Group

"The main benefit that we've seen from using data analytics is the move away from sampling to full population testing. When we're doing reviews, we're also bringing in different datasets and sticking those together to give us more insights, and hopefully give more insights to the auditee as well."

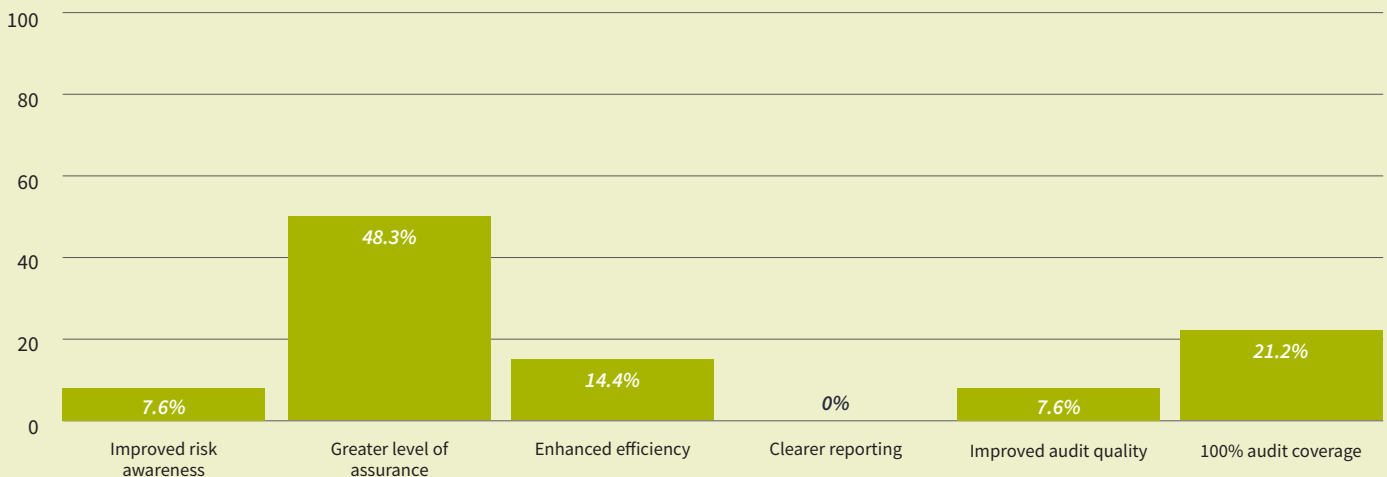*IT Auditor, Consumer and Business Finance Company*

Sampling is outdated

Sampling during audit testing is rapidly becoming a thing of the past. It is no longer fit for purpose as a default approach and in the majority of cases falls far short of providing the statistical significance required to give a true picture of control failures or risks. It should therefore be relegated post-haste wherever possible.

One of the most important advantages of data analytics remains the ability to run whole population testing. This may be possible, for example, in Microsoft Power Query within Excel, however this will only accommodate a limited number of data points. Software like IDEA and ACL or ERP-system integrated tools like Oracle Analytics and SAP Analytics Cloud can be used to interrogate and analyse far larger and contrasting datasets. Data trends can then be visualised, enabling auditors to quickly filter and compare data to identify patterns and understand what is happening. This is an impactful place to start.

If there is one takeaway from this report for data-immature internal audit functions, it is that they are urged to make the transition to continuous risk assessment and full population testing as soon as possible. Once this foundation-level adoption has been achieved, data analytics can be more fully integrated in new and exciting ways to take the internal audit function to the next level. The earlier that progress is made, the bigger the pay-off in the future.

What would you say is the biggest opportunity or benefit of using data analytics and AI within your internal audit function?

Improved risk awareness	7.6%
Greater level of assurance	48.3%
Enhanced efficiency	14.4%
Clearer reporting	0%
Improved audit quality	7.6%
100% audit coverage	21.2%

There are numerous benefits of applying data analytics to the work of internal audit. Most teams see the primary value in the greater assurance levels that can be provided. As systemic risks build, the profession may be overlooking the awareness advantages of embedding continuous risk assessment.

"Continuous risk assessment looks at the various business risks and uses that data to feed into the internal audit plan. If areas of the business haven't seen any material changes year-on-year, you de-scope it and move on to a more risky part of the business or an emerging risk that's been identified."

Director Risk Analytics, Big Four Consultancy

"We spend an awful lot of time on discovery, gathering key datasets before we decide what any scope of an audit will look like to identify key risks before we even speak to anybody. So we're using the data to tell us the story rather than what people want to tell us."

Head of Internal Audit, State-Owned Financial Services Group

The power of experimentation

Internal audit may not be synonymous with creativity, however audit analytics is very much about experimentation and trial and error. This will be unfamiliar territory for many. Internal auditors are traditionally process people and risk-averse by nature. It is important to understand that risk is not inherently negative. Few opportunities carry no risk whatsoever.

In most organisations the internal audit function is long established and will often have conducted its work in much the same way for years. This rigidity can make data analytics a tough sell to the internal audit function itself, let alone a priority for key stakeholders whose priority will be the timely delivery of audit reports.

Data analytics requires a fresh way of thinking. It means looking at the entire organisation through a data lens and considering ways of identifying risk relationships. Inevitably, experimenting with scripts to interrogate datasets and combining contrasting data will often lead to dead-ends. This is fine. Failure should not just be tolerated but actively encouraged. Internal audit needs to take measured risks by playing with analytics, failing fast and moving on. Without this dedicated process of trial and error, the third line will not discover new use cases that it can successfully repeat and share with the team, the wider organisation and professional networks.

This is all in the name of developing a more efficient, risk-responsive and insightful third line. Once curious internal auditors get a taste of what's possible with data analytics this can set off a positive feedback loop that encourages further experimentation. The most data-mature internal audit functions are continuously applying analytics in novel ways to see what results they uncover, even combining seemingly unrelated data. For example, what might an analysis of senior IT staff turnover and appropriate password management show? Is there a hidden relationship between the resale value of a company's newly launched product and rates of stock loss? To what extent is the language used in business email traffic consistent with the tone the organisation wants to set? The possibilities with data analytics are endless and it is only by experimenting that vulnerabilities can be uncovered. Without testing hypotheses, these unseen weaknesses may go unnoticed.

"Internal auditors need a creative and open mindset in terms of what's possible - and then the bravery to actually try something new and experiment to see what results can be achieved. Ten days might be sunk into trying something with no results. But the one in ten chance that something works could add the most value for the whole year and then be used repeatedly."

Executive Director of Change, Public Sector Internal Audit Services Partnership

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"One of the qualities you need when applying data analytics to internal audit work is creativity. You have to explore where the datasets are, extract the relevant data accordingly and then perform your analysis and write your audit from that. There is no uniform approach."

Head of Internal Audit, Retail Co-operative

"People think data analytics is harder than it needs to be. There's a lot of interesting stuff you can do with very simple analysis in IDEA and other tools. It comes down to how many lenses you apply when making comparisons between different data and data fields."

IT Audit Manager, FTSE 100 Bookmaking Company

Developing an audit analytics strategy

Progressing from ad hoc use of data analytics to a truly integrated data-led audit approach requires a clearly devised strategy. How exactly to define this strategy will depend on the organisation, the maturity of its data governance and the extent to which it has developed its own data strategy.

There is only so much progress the third line can make if data is poorly understood, there is a lack of accountability and ownership, the data is mismanaged and there is no sense of strategic direction at the organisational level. These are the foundations on which the third line's own strategy is built and progress is made.

Internal audit will find itself hamstrung if it attempts to run ahead of the organisation. Even in banks and other organisations with high data governance maturity, the potential for deploying audit analytics is often handicapped by basic data availability and accessibility issues. This is a common problem.

The third line can and should play a vital role in pushing the organisation to improve its standards and crystallise its own data strategy, by sharing observations of where the shortcomings lie and clear recommendations for improvement. As the organisation levels up, this in tandem will raise the potential of what's possible with audit analytics. Linking the two strategies will strengthen internal audit's investment requests. This requires close alignment and communication.

Organisations are constantly implementing new software and data storage models in their various functions. Internal audit should stay close to the organisation and engage early when new systems are adopted, getting in on the ground floor and advising on controls at the design stage. Taking a front-row seat early on will help to understand the implications of these operational transformations from an audit analytics perspective. The best time to understand a system and how analytics can best be applied to it is on day one.

"As a business, the maturity of our data is quite low. So there's a wider piece of work around the company's data strategy and getting the basics right and internal audit is looped into that initiative. Those limitations do make data analytics within internal audit more difficult and the business needs to make progress before an internal audit data strategy will see results."

IT Auditor, Financial Services Company

Mapping data assets

Identifying the entire data universe is the first step in developing the third line's own strategy. In practice, this won't remain static. As said, business systems are in a constant state of flux so this mapping should be revisited regularly or if there are major operational changes, such as back-office overhauls or after an M&A event. This will involve itemising and documenting the various data pools that are available for analysis, who in the organisation is responsible for them and reviewing their quality. If data hygiene is lacking, this needs to be addressed before any audit analytics is rolled out en masse. As they say: rubbish in, rubbish out.

Once the data universe is mapped out, internal audit must develop a high-level, top-down view of what it is actually trying to achieve and whether it has the resources to meet these defined goals. It is no use deciding to apply analytics for the sake of it. Fundamental questions need to be asked:

- What datasets are currently available? Financial data? Customer data? Vendor/contract data?

- What data would we want to apply data analytics to in a perfect world?

- What is the purpose of applying these techniques and what outcomes do we seek to achieve from this work?

- What techniques and applications will allow us to realise our desired outcomes? Continuous risk assessment/monitoring for scoping the plan? Data mining and whole population analysis? NLP for text analysis?

- Do we have the skills and tools necessary to perform that analysis and achieve those goals?

A key consideration when developing the strategy is how effectively the analytics tools available to internal audit can be technically integrated with the organisation's systems. This can have a significant bearing on investments made into software. It is critical to lay the right foundations early. For instance, it may be tempting to send auditors on a training course and buy software licences. However, doing this blindly is unlikely to yield positive results if the organisation later decides to upgrade its ERP system to Oracle or

SAP, which have their own analytics modules, thereby disjointing audit analytics integration and forcing internal audit to start from scratch. It is imperative, therefore, that this is not overlooked as it could undo early gains later down the line.

This is why staying close to the organisation and developing an understanding of its own data maturity path, strategy and investment plans is essential. It is next to impossible to set internal audit on the right path with a lasting strategy without first understanding the organisation's current data maturity and the direction it is heading in, both at the strategic and granular, technical levels. Once internal audit is "plugged into" the organisation with all available data flowing in and with clearly defined strategic goals, it can really begin to sprint.

"We conducted an EQA of a bank that already had a head of audit analytics and they were creating a strategy that we were asked to review. They wanted to build a data warehouse, invest in machine learning and so on. But nowhere did they state what the audit function needed, what the business needed from internal audit or whether tests were being built to achieve that."

Director Risk Analytics, Big Four Consultancy

"You need to step back and look at the various data pools and ask: Who owns them? Where are they stored? How do we access them? What are the challenges of applying data analytics to those pools and managing that process going to be?"

Head of Internal Audit, State-Owned Financial Services Group

Key questions

Q1. Does our internal audit team have a documented data analytics strategy? Does it articulate what we are trying to achieve and why?

Q2. Does the organisation have its own data strategy?

Q3. What data across the organisation is available for analysis to improve risk assurance?

Q4. Where is this data stored and who owns it?

Q5. How could data analytics be applied to this data to improve our assurance coverage, deliver more insights and make us more efficient over the long term?

Q6. What tools, skills and data techniques are required to fully realise the strategy that has been set? Are there any gaps between what we want to achieve and what we are able to achieve - and how can these be closed?

Upskilling the internal audit function

A data analytics-enabled internal audit function is only as effective as its people. To move away from sporadic, ad hoc use of data analytics and fully embark on the journey requires improving internal audit's general level of data fluency, software proficiency, and encouraging the team to view the organisation in a new light. One common upskilling approach is to invest in training. Anecdotally, this is one of the least effective approaches. Like a foreign language, skills and insights are quickly forgotten unless put to immediate and frequent use.

Another option is to recruit. But is it more effective to hire a data analytics-capable auditor or a dedicated analytics and data science specialist with coding skills? Each approach has its strengths and weaknesses:

Internal auditors understand the task at hand. They are already familiar with business processes and risk controls, know the expectations of the third line and have the necessary qualifications to perform their duties. A talented data analytics specialist will be able to apply sophisticated analytics and visualisation techniques and even build apps, but may not intuitively understand the risk implications of their analysis or how to interpret data findings.

Recruiting specialists is something of a cheat code or a shortcut to progress. Specialists can share their expert knowledge with enthusiastic and engaged auditors, who in turn can share with their colleagues, democratising data analytics across the internal audit team. Many have found that recruiting a data guru or building a bench of such specialists promotes a more data-centric mindset. Talented experts can do much more than support audits with deeper analysis than would otherwise be possible, they can code bots and tools for automating tasks and inspire the team to think in new ways. This can have positive compounding effects.

"The biggest lesson we've learned is the importance of winning the hearts and minds of internal auditors. Upgrading the technical skill set is one thing, but establishing a data-first mindset supports everything else. It was necessary to train the leadership as well. You need the right tone at the top because significant effort is required when launching a data analytics strategy and ramping up the use of analytics."

Audit Director and Data and Applied Sciences Specialist, FTSE 100 Banking Group

Leveraging the organisation

Many internal audit departments lack the budget for this kind of investment and may be expected to make do with what they have. Given the high demand for data analytics skills, recruiting specialists may not always be realistic. This should not dissuade CAEs from encouraging the organisation to invest directly into its data staff and technology.

The business world is increasingly data-driven. Organisations know they must keep pace by using data analytics to better understand their customers, their sales strategies and to unlock growth opportunities and cost savings.

A loophole for budget-constrained audit functions, therefore, is to collaborate with the organisation, which is likely to have deeper pockets for investment. Shadowing and secondments can go a long way. Many internal audit teams are making early and rapid progress by simply asking others what they are working on and how it has been developed, absorbing their expertise for use within the third line.

Moving beyond the organisation, leverage the progress of the best in the profession by attending the Chartered IIA's Data Analytics Working Group or other available meetups. Learn from others' successes and failures and gain insights into the most effective tools and practical applications, the easy wins and pitfalls to avoid. This sharing of knowledge and experiences is already pushing the profession forward on a number of topics. There is no better way to progress than to hear from those who have already been there and done it.

Above all, audit skills and experience should take precedence. Audit analytics skills are a powerful supplement to internal auditors' unmatched sense and judgement. It is in marrying the two where the greatest results are found.

"It is not that difficult to find the technical skills required for data analysis and visualisation. But if that person doesn't have the audit experience and doesn't understand the logic of what's being analysed in an audit context, they can end up down a rabbit hole of analysing data and forgetting the whole purpose of what the audit is and what you're trying to achieve."

Head of Data: Internal Audit, FTSE 100 Asset Manager

"An effective approach to getting the resources you need is to partner with the business on a business problem. So you get them to go and ask for the investment with internal audit sitting on their shoulder and saying 'we'll use this too.'"

Founder, Audit Analytics Software Provider

"Showing people the art of the possible helps to create the cultural change that gets internal auditors interested in embedding data analytics. There are lots of interesting things you can do with very simple analysis and it comes down to how many different lenses you apply when making comparisons between different data fields."

IT Audit Manager, FTSE 100 Bookmaking Company

"Data analytics people are not always great at translating the data. We need to work more closely with the analytics experts and then make sense of the findings and translate it into operational language that the board and other senior stakeholders actually understands."

Head of Audit & Customer Service, Nationwide Supermarket Chain

Key questions

Q1. Do we have the requisite skills available to fully exploit the potential of data analytics?

Q2. Do we have spare budget to allocate to upskilling the function through training or hiring data analytics expertise directly into the function?

Q3. Is there a centralised data analytics team or individual data analytics specialists within the organisation whose expertise we can benefit from?

Q4. Who are the data science champions within the organisation and how can we collaborate with them to improve our own capabilities?

Q5. Are we making the most of our professional networks to learn about data analytics and how it can be applied within our team?

Q6. Is there a data analytics culture in our audit function and what can we do to better promote a data-first mindset?

Visualisation: Bringing data analytics to life

One of the greatest advantages of audit analytics is the impact that can be made through storytelling when reporting to the audit committee, board or management. This can be an uncomfortable transition in a profession that has stuck with uniform, text-based reporting templates for decades. It has been drilled into internal auditors that using one type of audit report across all audits improves efficiency and comparability. Internal audit functions are encouraged to challenge this assumption.

Communicating a qualitative opinion is far more powerful when supplemented by hard data that is clearly visualised and easily digestible using tools like Power BI, hammering home key messages and insights. This may be as simple as breaking down the percentage of controls that are fully functioning versus those that are not working as intended. Visualisations can also be used to clearly show the rate at which audit recommendations are being followed up on, closing gaps.

As ever, experimentation is key here. Internal audit should move away from relying solely on the standard template approach and play with different data visualisation techniques that bring their audit findings and business insights to life, making them more communicable and higher impact. The third line can employ all the data analytics possible, but without senior stakeholders understanding findings these efforts will be futile.

Playing to your audience and sharing wins

This is where internal audit should share its biggest wins. This is hugely beneficial for buy-in, which in turn can free up budgets for investment into internal audit's data analytics capabilities, by hiring dedicated data analysts and upgrading the function's data analytics software toolkit.

Sharing these wins should not only be limited to the "what" but also the "how". As the third line becomes more sophisticated in its application of analytics and data science techniques, decision-makers will likely begin to ask how they achieved their insights and findings. Demonstrating the art of the possible can dramatically elevate internal

audit's standing. It can also better enable the first and second lines, who may seek to adopt techniques and analytics models for their own use.

Playing to the audience is critical when presenting findings and business insights. The audit committee chair, CEO and CFO have different wants, needs and levels of understanding of the organisation. Sharing tangible, actionable data analytics wins aided by visualisations to the appropriate audience delivers the biggest results. An audit committee chair will have a bigger picture perspective of the organisation and its attendant risks compared with a CEO, who may want to understand findings in greater operational detail. A CFO will take a more financially-focused view. Middle management will care about the risks and insights in their given department. Playing to the audience in question is key.

"Visualisation, presentation and storytelling are so important. You can have as much data as you want and throw it all into a report, but it won't mean anything if your audience doesn't understand it. Simplify the evaluation into something which is meaningful for your audience."

IT Audit Manager, FTSE 100 Entertainment Group

Key questions

Q1. Is our internal audit function capitalising on the benefits of data visualisation in our reporting?

Q2. Are we over-relying on a standard template approach?

Q3. Does our reporting do enough to tell the story of our findings?

Q4. Could data visualisation enhance our audit reporting and the impact of our findings?

Q5. Are we going as far as we can to share our data analytics wins with key stakeholders and what those analyses have revealed, supported by data visualisations?
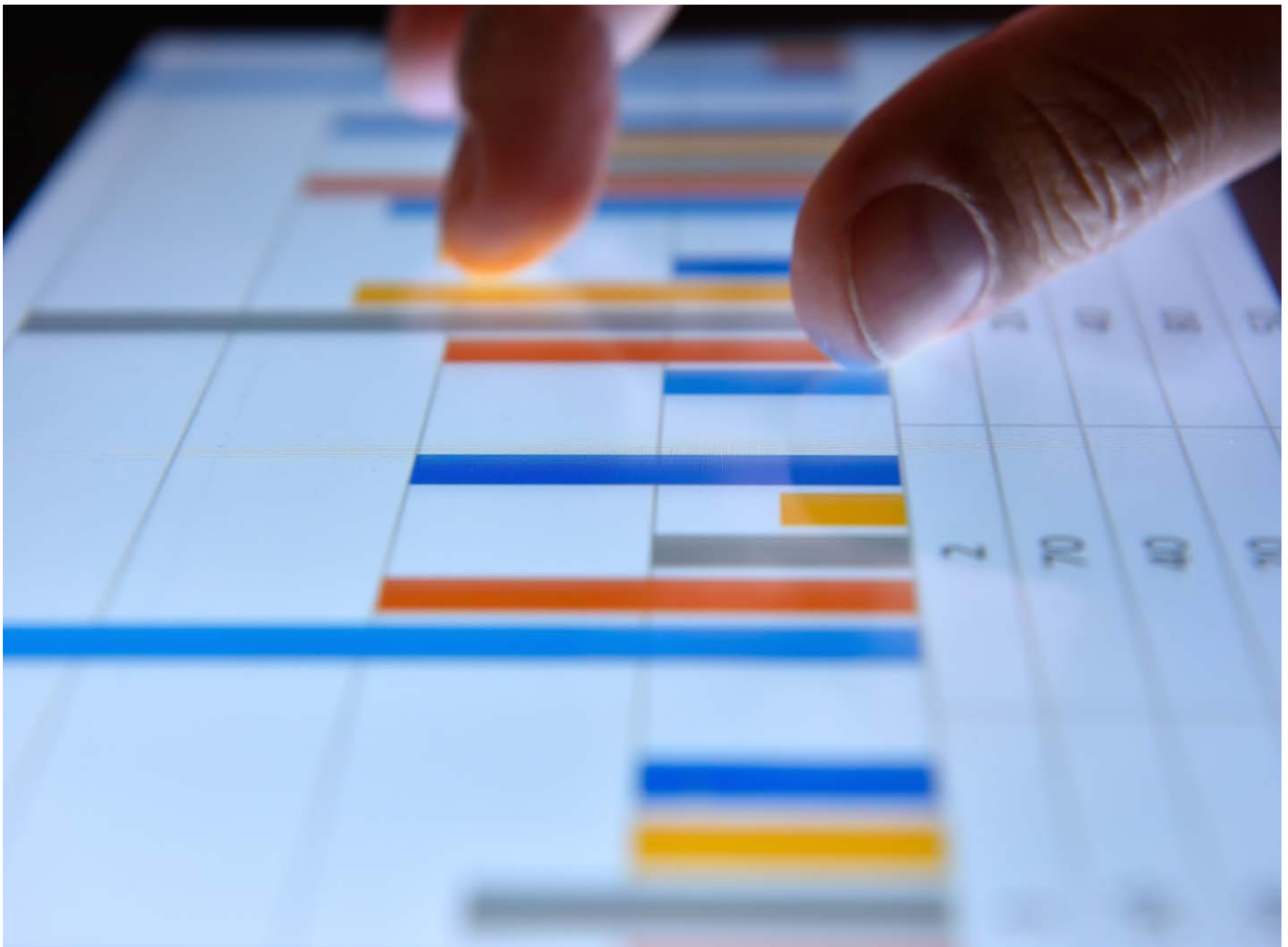
"It's important to highlight to stakeholders what's in it for them and share tangible examples that are tailored to who you're speaking to. It's no use sharing everything. If you have five examples, pick two and go into more detail that might add more value for that specific audience. What was found and why is it important?"

Internal Audit Data Scientist, FTSE 100 Insurer

"An audit report with data-driven findings as opposed to sample-based findings lands more easily. There's less passion in the debate and the findings are much more actionable. All of us are in cost-constrained environments right now and this approach takes some of the heat out of the audit clearance."

Head of Internal Audit, FTSE 100 Global Investment Company

Advanced techniques and applications

Some truly ground-breaking progress is being made by internal audit teams at the bleeding edge of the data analytics maturity curve. These are the teams that have recruited specialists, established clear, measurable data strategies and are on the data analytics journey for the long haul, their results having long since justified the invested time and costs.

Unsurprisingly, it is banks that are the torchbearers for the internal audit profession, exploiting some of the most sophisticated analytics and data science applications available and walking the path of continuous progression. These more advanced techniques and applications are suited to various stages of the audit lifecycle and can be applied complementarily, tackling multiple tasks on a single audit assignment.

These can be summarised as follows:

Robotic process automation - Businesses use RPA to improve efficiencies by automating otherwise high-volume, repetitive and otherwise manual tasks. That covers a lot of ground for the third line. RPA bots can greatly speed up time-intensive, menial jobs, automating, for example, mass document gathering for analysis and testing. RPA can also be applied to controls testing itself, such as automating the analysis of the segregation of duties over transaction flows to ensure that people entering transactions are independent from the control owners. While RPA adoption is a step beyond manual full population testing, it's at the left-end of the maturity curve compared with other advanced applications like machine learning and process mining. RPA functionality also comes preloaded into many audit software programs, though internal audit functions with data specialists are self-coding apps with Python and R language for dedicated, bespoke purposes to offload mundane, clearly defined, rules-based work to tireless bots.

Machine learning – A subset of AI that can be divided into two categories: supervised and unsupervised. Supervised ML involves training a model with tagged or labelled data, feeding it specific instructions that tell it what relationships, and therefore which anomalies, to look for. This tends to make it the more accurate of the two types of machine learning but also more restrictive.

Unsupervised ML requires only general instructions, the algorithm itself learning the various relationships across unstructured datasets and clustering this information. These techniques are being used by internal audit to interrogate vast volumes of data to uncover outliers and reveal trends that warrant further enquiry. Natural language processing (NLP) has been adopted in mature internal audit teams to analyse the text in documents. This goes beyond simply searching for keywords, it can detect semantics by analysing the context in which those words are used and then clustering documents based on topics and sentiment. For example, auditors may use these to scan committee minutes for evidence of governance failings in projects, or to understand whether customer communications are appropriate and compliant.

"We use a lot of NLP utilising Python libraries that make it a form of supervised machine learning. We're using that text analytics for the clustering of complaints and certain other risk events that involve commentary, regulations, policies, as well as project and governance-type audits. We're also using supervised machine learning for anomaly detection."

Audit Director and Data and Applied Sciences Specialist, FTSE 100 Banking Group

Process mining – A method of tracing operational processes based on event logs. In the past organisations would manually map processes by hand and file them for reference, in the hope they would be followed in practice. The digitalisation of processes means that data can now be tracked through the plumbing of an organisation. Companies are using process mining to identify, analyse, correct and monitor end-to-end processes that stretch across the entire business. Given that a fundamental part of internal audit's remit is checking whether processes are working as expected, process mining is being rapidly adopted to identify unexpected process deviations that could hint at control design weaknesses or people actively bypassing standard procedures.

Predictive analytics – Analytics can be categorised into hindsight, insight and foresight. Machine learning is already being used to identify correlations in even the least structured data to give internal auditors a more transparent view of what has happened or is happening. That is hindsight and insight. The art of using historical and current data to make projections about what might happen in the future holds vast potential for risk assurance. This will require training AI models to understand causality. For example, insider risk may be showing as amber today and therefore not be a top priority. However, bringing together multiple data feeds such as security monitoring activity, staff satisfaction survey findings and stress leave rates may indicate that insider risk is likely to increase in the short term. Predictive capabilities have the potential to direct the third line's attention to areas of the business that have a higher probability of moving from amber to red and vice versa. This is highly complex and will require a deep understanding of risk causality. This has not been cracked yet but is the next frontier in audit analytics. If achieved it will be a game-changer, making the third line truly forward-looking, especially as external data feeds such as currency movements, interest rates and supply chain information are synthesised with internal operational data within increasing accuracy.

"Analytics was originally being used for data visualisation and coverage. Increasingly, it's become about outlier and anomaly detection to inform what the auditors will investigate. In terms of the more innovative stuff, we've used unsupervised machine learning over our entire trading platform and across three years of history to look for anomalies in there. That was exciting and produced good results. We're now experimenting with different use cases for NLP."

Head of Data: Internal Audit, FTSE 100 Asset Manager

"Process mining is a data science discipline that hasn't really got a look in within our function and we're really trying to get that going. During COVID a lot of banks didn't use their core banking system when providing loans for businesses, especially in the US. They created robots to deliver those and it was almost zero-touch from a human being point of view. How do you audit that? That's not a manual walkthrough. The value of process mining is immense in a world where processes are constantly digitalising."

Global Head of Audit Systems, Analytics and Innovation, FTSE 100 Banking Group

Risks and challenges

Integrating data analytics is not without its challenges. Anything worth doing comes with risks and potential stumbling blocks. According to our survey findings, the biggest barrier to the adoption of data analytics and AI, cited by 49% of internal auditors, is a lack of existing skills and competencies. The next widely reported challenge, cited by 24% of respondents, is the cost and limited available budget to implement these capabilities. This is followed by a lack of time (12%) and a lack of senior internal stakeholder buy-in (9%).

These are all closely related and interdependent, and this report has already offered solutions to these obstacles. To recap:

1. Upskilling the internal audit function is best achieved by recruiting dedicated data analytics specialists, preferably with Python or R coding experience so they can develop relevant apps that deliver audit efficiencies.

2. It's no secret that budget constraints are hamstringing many internal audit functions. As already mentioned, championing data analytics investment directly into the organisation that internal audit can then leverage off through shadowing or secondments may be a shortcut to opening up the third line's access to data analytics.

3. Experimenting with analytics and sharing your biggest successes in visual audit reports is an effective way to win over senior stakeholders, which in turn can free up audit budgets.

Data issues

Any existing data vulnerabilities are first-line issues that will need to be addressed. Internal audit can add considerable value by highlighting the lost opportunities from data integrity and governance weaknesses and honing focus on the fundamental changes required to correct these missteps. Of the 6% of respondents in our survey who reported facing other barriers to the adoption of audit analytics, two thirds highlighted data availability, accessibility and integrity issues.

Availability: Does the data even exist? Is it recorded and stored by the organisation? If not, is there a good reason why this is the case? Internal audit should articulate how this data deficiency may be holding the organisation back and what the benefits of collecting, organising and storing this data are. This extends way beyond risk assurance. Data can provide critical insights into redundant workflows, operational bottlenecks, superfluous costs and even commercial opportunities.

Accessibility: Access issues can arise if internal audit does not understand where data is stored or how to gain access to it. This is why mapping the data universe is essential. The third line should have unfettered access to any and all areas of the organisation. If access to data is denied, explicitly or implicitly, this could be a symptom of deeper governance issues that need addressing. Can internal audit access the required data directly or does it need the help of the IT department?

"The main risk I see is elevating data to the point where it's the single source of truth, believing the data above all else. We shouldn't be doing that. There's always bias within data."

Data Analytics Specialist, Central Government Internal Audit

Integrity: Poorly managed or incorrect data will make any audit analytics efforts redundant. The value of any analysis is only as good as the data inputs. Internal audit will need to report back to the business any data quality, management or storage concerns so that these can be fixed. As the organisation improves its standards, it will raise the bar for what can be achieved with audit analytics.

Data protection

GDPR is a common obstruction. The huge penalties that come from non-compliance have understandably made people nervous about sharing data. This is largely overstated. Internal audit is part of the organisation so there should be no issue with data passing to the third line and being stored on file as evidence, provided it observes the organisation's strict security policies.

GDPR also specifically applies to personal data, which is any information relating to an identified or identifiable person. Therefore, the law doesn't apply to much of the data that internal audit would want to analyse anyway.

However, concerns may arise where internal audit services are co-sourced/outsourced or being delivered across a group, GDPR treating each legal entity as a third party for data sharing purposes.

Two actions are necessary to overcome this:

1. Check whether the data is personal. In many cases it won't be. In any testing that involves personally identifiable data it can easily be anonymised with zero impact on the audit. For example, you don't need to know everyone's name to run a payroll review, an employee ID number and department will suffice for analysing outliers or trends.

2. Adopt and observe the organisation's data sharing agreement. The UK's Information Commissioner's Office recommends that all organisations have such an agreement in place, covering the purpose of any sharing of personal data, what happens to that data at each stage, and the roles and responsibilities of parties involved in that sharing.

Progress blockers

Resistance to change is natural. Making progress with audit analytics is often handicapped by a simple unwillingness to take action. In our engagement with the profession we come across four common blockers to data analytics progress:

The organisation: If the organisation is making little progress in improving its own data governance and making best use of its data assets, it can take some convincing to share internal audit's vision of what's possible. The organisation must develop a holistic view of what is required to enhance its own competencies and systems and why this is a necessary foundation to overlay audit analytics for improving risk assurance.

The CAE: The head of the internal audit function may simply not see the value in upgrading the toolkit, or believe that the pay-off isn't worth the time and investment.

The team: Internal auditors may believe that "if it ain't broke, why fix it?". They've come this far without using data analytics with no complaints, so why change?

The board/audit committee: The audit committee chair may simply want assurance answers today.

CAEs should reflect on whether it is themselves that are blocking progress and what they can do to set the tone and embed a data culture within their team, encourage experimentation and sell the value of data analytics to senior management and the board.

"The broader risk with data analytics is falling back on the quantifiable. You don't want to move too far away from what the actual overall risk is. What's the audit question that we're trying to prove or disprove? Although as auditors, I think we're good at balancing the two and weaving them together."

Executive Director of Change, Public Sector Internal Audit Services Partnership

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Missing the bigger picture

A broader risk with data analytics and AI is putting blind trust in data testing and losing sight of the bigger picture. Since data is quantifiable and testable, there can be a tendency to see it as the be-all and end-all. The team may have access to tools and data analytics specialists, who can run the necessary tests. But without an innate understanding of the organisation's processes and the risk implications of findings and what they actually mean, poor and misleading conclusions may be drawn.

Risk is not always so easy to quantify. Data can reveal insights but may not answer what internal audit is attempting to prove or disprove, or directly show that a control breakdown is occurring. For example, running a 100% population analysis across accounts could uncover after-hours vendor payments in a given month. However, in and of itself, that may say nothing about whether duties are segregated – perhaps relevant staff worked overtime during a busy period.

"Even though our audit charter allows us access to data that still doesn't mean you can get through the governance and actually achieve that access. That is a huge challenge."

Audit Manager, Public Research University

In this way, data findings will often raise more questions than answers. Why are there outliers? Why are errors concentrated to one timeframe? Why does this show something different to what has been reported by staff? It is not necessarily internal audit's responsibility to answer these questions but present them to management for them to step in. Data offers clues and it is internal audit's job to interpret those, dig deeper and share its findings with the organisation to resolve any potential lingering risks.

What is the top barrier or challenge preventing the greater adoption of data analytics and AI within your internal audit function?
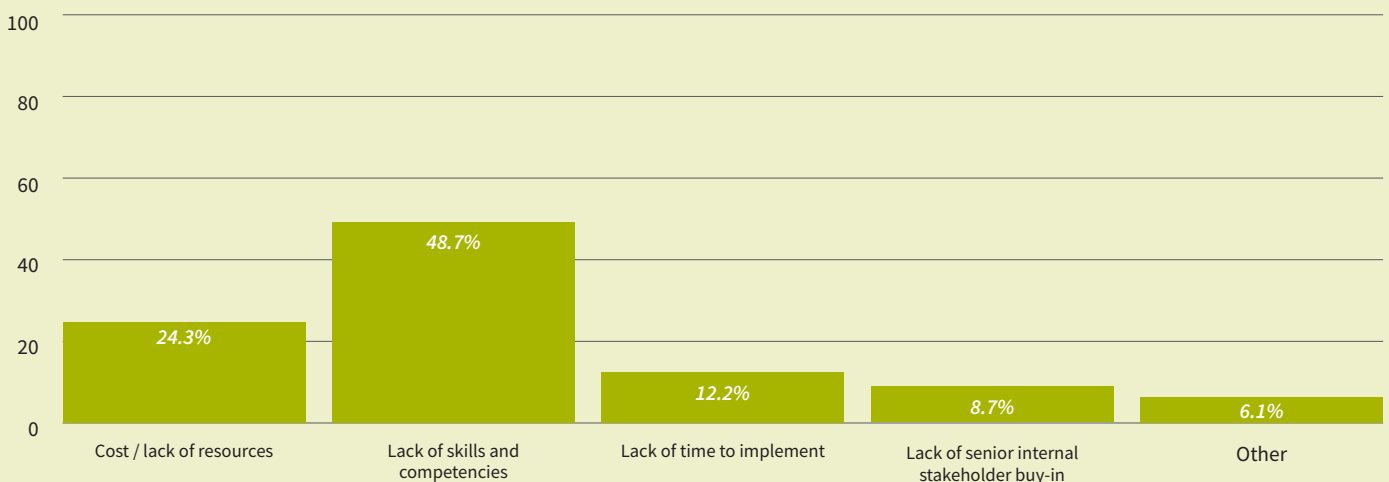
By far the biggest challenges to the adoption of data analytics in the eyes of survey respondents are a lack of existing skills followed by a lack of resources. A lot can be achieved with a little, especially by tapping professional networks and shadowing data experts.

The future internal auditor

As greater levels of automation are embedded and more internal audit grunt work is offloaded on to software, some may be questioning whether they are on the cusp of being replaced. While it's true that AI is disrupting standard business practices and displacing workers in many industries, internal auditors should not fret about losing their jobs to robots.

Our research shows that, in the main, internal auditors are not overly worried about this prospect. Nearly two thirds (64%) say they are either indifferent (i.e. neither concerned or unconcerned) or unconcerned that they could be replaced in future by AI and other advanced technologies. Less than 3%, meanwhile, are very concerned about this outcome.

Automated analytics and AI are not a substitute for internal auditors. They are the toolkit, equipping the third line and enhancing its risk awareness, speed and scope. Manual knowledge gathering and interviewing combined with personal judgement and common sense will always be fundamental. Bots cannot feel what is happening or read the room.

The bottom line is technology can test process outcomes, but it cannot deliver an opinion on control designs or actionable recommendations. For example, supervised machine learning may be used to automate a full scale review of network access rights management to discover whether IT staff are keeping on top of data leak risks. However, that will not advise on next steps, such as the need to periodically rescind access.

Using these tools to extract information or glean patterns may not even give a true or full picture of the state of the organisation and its risks, either. It is the job of internal audit to apply its smarts, intuition, and tacit understanding of the organisation, its people and processes to interpret technology-powered findings.

However, the profession cannot rest on its laurels here. Those who do not develop their data fluency and proficiency in more advanced, automated analytics applications such as RPA and ML over the coming years will find they offer decreasing value to the third line's activities. This trend is already in motion.

The risk mix is growing more complex, and expectations are rising. By retooling itself, internal audit can develop into a more strategically positioned, business advisory role, shifting its focus away from core processes and paying closer attention to emerging systemic threats. Learning to do more with less will elevate internal audit's standing and credibility. If it chooses not to adapt, it may soon be left behind.

"I'm not concerned that advanced AI and robots will replace auditors. They work hand in hand and you need people to provide that context to what you're seeing in the analysis."

Data Analytics Specialist, Central Government Internal Audit

"We can replace a lot of the boring things that we have to do multiple times a day with technology. That allows us to spend more time actually speaking to people, engaging with auditees and senior stakeholders, and answering the 'so what?'"

IT Auditor, Consumer and Business Finance Company

"It's not about replacing the efforts of internal auditors. We need professionals sensing and feeling and with experience who can understand and assess what's going on with regard to control processes, governance and the management of risk. How can we give them tools that allow them to do that at a scope and speed that would not otherwise be possible?"

Director of Innovation, Central Government Internal Audit

"If your current skill set doesn't evolve and you're still trying to follow the standard document reviews, you'll be replaced. But overall headcount won't change. RPA and AI can deliver better reviews than manually sifting through documents. But you also need people who understand the automated models being used by the business and the risks around it"

Director of Innovation, Central Government Internal Audit

Are you concerned that in the future advanced AI and robots could replace internal auditors?

2.6%	13.9%	33.9%	30.4%	19.1%
Very concerned	Concerned	Neither concerned or unconcerned (neutral)	Unconcerned	Very unconcerned
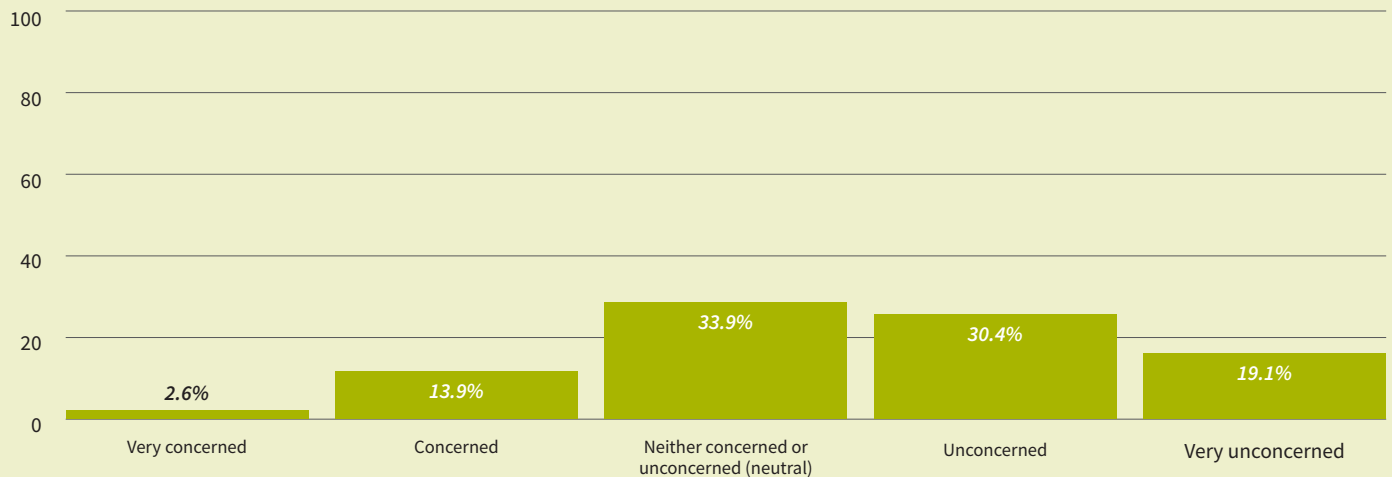
Internal auditors are largely unconcerned that they will become obsolete as machine learning is increasingly applied for advanced data analysis and continuous risk monitoring. These developments will ultimately enhance the third line and free up human auditors' bandwidth to engage with the organisation more fully and focus on emerging and strategic risks.

Case study:
An Post

Harnessing existing capabilities

There are currently seven people in An Post's internal audit function, who until three years ago were using Excel and IDEA in a piecemeal manner, with no formal data analytics strategy in place. That changed after Caroline Derham joined as Head of Internal Audit in 2019 and established a new strategy to advance the function. Maturing the use of analytics was at the heart of that vision. Fortunately, there was an existing data analyst in the organisation who was able to share their knowledge and skills. "I wanted to ensure that my team were thinking with a data mindset and were encouraged to work with the analyst, who could say 'I can do X, Y, and Z'," says Derham. "They could then apply that. That collaboration is where the magic sauce was found and that really moved things forward" Today, the analyst is confident coming forward with potential risk issues they are directly identifying, while the internal audit team is far more data literate and works independently with analytics tools. This collaboration has been absolutely fundamental to the success of the data analytics strategy.

Another catalyst has been ensuring that the standard audit approach integrates data as a first port of call, the team viewing every audit as a blank page in their discovery work rather than dusting off and repeating audits from previous years. After exploring the data to find where the risks in the organisation lie, only then does the team set about interviewing staff - but always starting with the data.

Use cases

The first major use case at An Post was continuous auditing. There is an ongoing debate about whether continuous auditing/monitoring should sit within the second or third line and this depends on the maturity of the organisation itself. At An Post, it was decided this should be rolled out in the third line to begin with. These models were built in Excel in the first instance. Most data analytics can be done with Excel or CAAT software like ACL or IDEA, and this should

be the starting point for any internal audit function experimenting with data analytics before investing in advanced apps.

This continuous auditing tool tracks a number of KRIs such as duplicate payments and open purchase orders within accounts payable, helping internal audit to build a historical trend analysis of that dataset as it applies to large suppliers and high expenditure areas. Continuous auditing of KRIs is also being applied to procurement to ensure compliance with government and EU guidelines and rules. This use of analytics for monitoring cornerstone processes has unleashed bandwidth to refocus the audit plan on higher-risk areas. It is the intention for these continuous auditing processes to be handed over to the relevant business functions as embedded continuous monitoring. This will allow the internal audit function to develop future continuous auditing tools and repeat the cycle.

Moving to Oracle

After building and embedding proof of concept tools in Excel, analytics activities were migrated to Oracle Analytics, with data extracted from the business's ERP system. Oracle is capable of analysing the organisation's whole data populations, unlike Excel, which struggles with larger data volumes. Other benefits include tracking audit trails which clearly show how an analytical model was put together, as well as the ability to join various data sources for cross-analysis. Clear audit trails show whether joins between disparate data pools are being made correctly. Excel can struggle when various large datasets are linked. Oracle also offers improved dashboards and makes continuous auditing faster and simpler, enabling true automation of KRI alerts rather than relying on manual, periodic data imports.

Crucially, the decision for internal audit to use Oracle was founded on the organisation itself already using the platform. When making the leap from Excel to a more advanced tool, it pays to carefully consider how effectively it will integrate with existing systems. It is easier to piggyback off what is already being used than to start from scratch.

Overcoming challenges

One of the biggest obstacles to applying data analytics within internal audit has been data availability, accessibility and quality. An Post's data analyst was tasked with identifying and pulling together the various datasets spread across the organisation.

They were responsible for adopting a holistic view and discovering:

- What is the data universe?

- What are the various data pools?

- How can they be accessed?

- Who owns them?

- Where are they stored?

What will be the key challenges associated with using that data?

Those findings were then brought to internal audit to develop a view on how all of that data could be used to improve the third line's assurance work and deliver fresh insights. This reconnaissance mission is no easy task, especially if the third line's data strategy has a head start on the organisation's own data progress and maturity. It requires figuring out who to talk to and may entail the data universe being mapped out for the first time.

Data quality and integrity is also a major challenge. As powerful as harnessing a data analytics tool like Oracle Analytics can be when it is supported by a rich data warehouse, if data management and governance was lacking when that repository was set up, it is likely to pose serious limitations. Even when quality issues are found, there is the challenge of remediating these by working with the right people in the company to validate and, if necessary, repair or update the data.

Adapting the audit reporting approach

An Post's internal audit team is now introducing storyboards in its reporting packs. data analytics requires adapting the reporting style since traditional qualitative templates often cannot accommodate the story that comes out of a data-led piece of work.

These storyboards pull out the key data findings in a digestible 1-2 page visualisation and have been extremely well received by the audit committee. Because boards or audit committees only meet on a quarterly basis, and are therefore not intimately familiar with the inner workings of the business, they benefit from key risk information being distilled and translated into clearly presented data.

This reporting style has been equally valuable for the business itself. Operating procedures and processes in certain cases may be immature or require updating. However, analysing the data through the company's various systems then visualising those findings has enabled internal audit to tell the story of what is really going on.

Advanced tools and the road ahead

An Post's internal audit function is now piloting process mining as part of its next step in its data analytics journey. Process mining indicates whether various controls are operating as designed or are faulty by visualising the actual transaction and data flows. It's highly valuable because it has countless applications. For example, it can be used across customer services to understand complaints versus happy paths to resolve inefficiencies and underlying issues, or to identify whether redundant IT infrastructure is sitting idle.

The third line will often audit activities that span the business, but often these are not viewed as end-to-end processes. It is not always possible to taxonomise organisation-wide processes by simply interviewing people. Where these have been digitised, mining clearly identifies the journey that data takes. "I'm very excited about that because it might uncover a whole host of sub-processes that we're not aware of," says Derham. "That could not only improve how we look at the organisation, but support the company's transformation initiatives as it looks to re-engineer the back office."

In October 2022, An Post established a centralised data analytics team to uncover operational and commercial insights and support data-driven decision-making within the organisation. This is a major development and internal audit will work closely with this new team to complement its risk assurance activities and the work of the existing analyst. Derham sees this as a catalyst for elevating her team's work to the next level.

Lessons learned

You have to start somewhere, so start small and experiment. It's not necessary for the CAE to establish the full strategy or a training programme. Everything begins with taking just one dataset for an area of the organisation. Find somebody with enough curiosity and Excel proficiency to play with the data to see what they come back with. It's a process of trial and error and experimentation, says Derham. "You may be surprised by what you learn from this exercise."
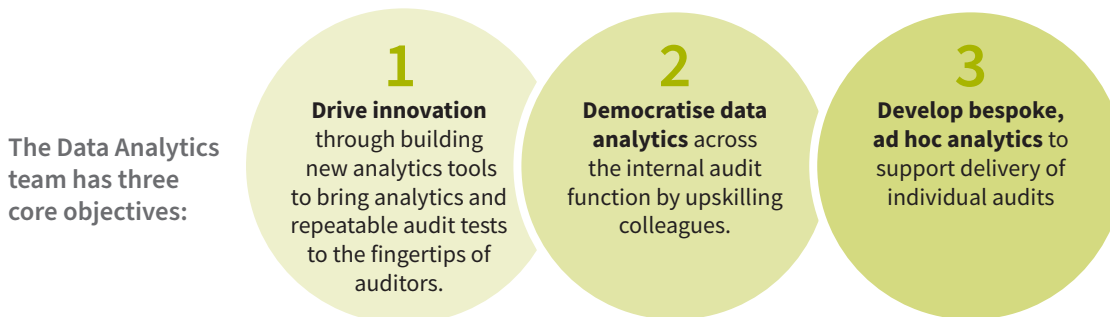
Case study:
Lloyds Banking Group

Measurable progress

A few years ago, little over 5% of Lloyds Banking Group's (LBG) internal audits featured advanced data analytics. Today, advanced analytics techniques are used on over half of their audits, with close to 70% leveraging some form of data analytics. This rapid progress is in no small part thanks to the formation of a dedicated Data Analytics team within LBG's approximately 350-person Group Internal Audit department.

The Data Analytics team has three core objectives:

1
Drive innovation through building new analytics tools to bring analytics and repeatable audit tests to the fingertips of auditors.

2
Democratise data analytics across the internal audit function by upskilling colleagues.

3
Develop bespoke, ad hoc analytics to support delivery of individual audits

Building reusable tools

The team has developed easy-to-use tools that deliver immediate value to auditors. For example, a tool badged as the Reconciler automates the reconciliation of two datasets, emailing the results and a proforma workpaper to the auditor. The People Search tool swiftly retrieves non-sensitive colleague information for use in audit testing. Another tool, the Spreadsheet Checker, assesses spreadsheets searching for common issues, such as inconsistent formulas, errors, external data references, and hidden rows and columns, reporting these in an easy to follow, colour-coded report.

At the more sophisticated end of the scale are reusable tools that use advanced techniques such as natural language processing to parse unstructured text documents. One such tool is the Committee Pack Analyser (CPA). This tool uses NLP to identify the subjects discussed in committees, the attendees, who was delegated specific actions and so on. These insights can inform discussions with management and direct auditors to higher risk areas. "Most internal audit departments assume that you can't apply data analytics to governance audits. With the CPA we can identify the key topics discussed, assess the governance of a project and how that aligns with chosen frameworks," says Hussain Shehryar Humayun, Audit Director – Applications, Data and Applied Sciences at LBG.

Combining advanced analytics techniques

The Data Analytics team has been deploying a wide range of advanced analytics techniques including robotic process automation, optical character recognition (OCR), NLP, supervised and unsupervised machine learning, and process mining.

A recent audit combined several of these techniques to consider whether customer communications were in line with internal and external requirements, for example, by using clear, fair, and non-misleading wording. First, RPA was used to download thousands

of documents including PDFs, image files and others from multiple sources; this saved days, if not weeks, of auditor time compared to if it had been performed manually. Next, OCR was used to convert the images and scans of printed documents into computer-readable text. Then NLP was employed to assess whether the customer communications were appropriate. This involved more than simple keyword searches - semantic analysis with a pre-trained machine learning model was used to consider the meaning and context of the language used. In parallel, process mining was applied to give a data-driven view of the communications review and approval workflow.

Process mining

Process mining combines data science and process analysis and is an invaluable tool for auditors seeking a data-driven understanding of processes and controls. Process mining is being adopted or piloted in data-mature organisations, both within internal audit and across the wider organisation.

There are many use cases for process mining, as long as audit trails, transaction histories or similar logs are available. LBG internal audit has applied it to activities as diverse as know your customer checks and anti-money laundering case handling through to problem management, customer rectification and recruitment processes.

Through analysis of process flow data, process mining can show how many transactions follow the expected path and highlight those which do not follow the process design. It can, for example, identify transactions skipping a key control, repeating steps, or breaching a service level agreement. Internal audit can then investigate the root causes and bring them to management's attention.

Process mining has made a big impression at LBG. "From internal audit's perspective, process mining can show potential compliance issues. From management's perspective it can also identify efficiency and process optimisation opportunities," says Humayun. "Management typically asks how we found these issues, and how they can deploy the same techniques to better understand and improve the business."

Democratising data analytics

For all the technological advances made by LBG internal audit, this has fundamentally been a people-focussed journey. Successful adoption of data analytics first and foremost requires winning the hearts and minds of internal auditors and inspiring a cultural change.

The Data Analytics team could have simply created tools for various repeatable tasks and handed them over to the auditors, however this would not have created the data-driven audit function that LBG wanted. While the internal auditors may not be data scientists per se, they are continuously building their analytics skills and understanding of the potential of analytics through ongoing democratisation and knowledge sharing.

The strategy started at the ground level. "We wanted to encourage people to use analytics, so we didn't set the bar too high or demand that the auditors start with anything too complex. Just using Excel can deliver a lot of value," says Humayun.

Since encouraging the internal audit team to integrate analytics into their audit work, auditors have made increasing use of the tools developed by the Data Analytics team as well as spreadsheets and visualisation software. Auditors who want to upskill further are trained to use audit analytics software, databases or programming languages, as appropriate for their needs. These have the benefits of handling far larger datasets as well as offering more flexible and powerful tools for deeper analysis.

Lessons learned and value-added insights

Developing data analytics capabilities can make the work of internal audit far more efficient, both by increasing levels of assurance and coverage, and as well as through automation and economies of scale. It is important to remember that results won't be achieved on day one. It will likely require a significant investment in people, time, and technology in the early months and even years, especially in organisations with weaker data governance. Identifying, accessing, and reformatting the required data alone can be a major challenge.

LBG's experience shows that laying this groundwork has been more than worth the effort. Significant benefits include:

- Delivering insights that help auditors to understand the risk landscape and assist in audit scoping and planning

- Enhancing assurance through 100% population testing, where possible, or risk-focused sample selection

- Identifying exceptions that would otherwise be unlikely to be identified, through the use of novel analytics techniques

- Automating routine testing so that auditors can focus on outliers and exceptions

The bank is taking a keener interest in the analytics capability built by internal audit and how it could help the broader organisation. Over the past year, internal audit has been involved in around 40 internal and external knowledge sharing sessions, with stakeholders requesting discussions about how internal audit uses data analytics in its work. "When we talk about the positioning of the internal audit function, this is what makes us really strong," says Humayun. "There is no bigger endorsement than our stakeholders coming to us to ask how we have done something and what they can learn from us."

Case study:
The Government Internal Audit Agency

The Government Internal Audit Agency (GIAA) is the shared internal audit function for the majority of UK government departments and various arm's length bodies. The agency has around 500 staff, comprising auditors, counter fraud specialists and associated support teams, and delivers upwards of 1,500 audit reports every year.

Three years ago Iain McGregor was drafted into the GIAA as Director of Innovation and Development to spearhead a number of change initiatives. On talking to agency staff it soon became clear that data analytics was the biggest innovation opportunity. A small team was assembled to explore what skills, tools and templates were needed to move this forward. As a board and executive committee member at GIAA, McGregor brought the proposal to his colleagues and all were behind the decision to lean heavily into building out the agency's data analytics capabilities. The question then became what model to use to achieve this.

Two common options were on the table: train existing auditors to improve their data analytics proficiency, or hire in a number of internal auditors with data analytics skills. Instead, a third model was chosen. "I wanted a core team of specialists and I didn't care if they were auditors or not," says McGregor. "I just wanted to see passion for data analytics. That's what makes a perfect candidate because they will have a great time trying to apply that to internal audit."

This blank-slate recruitment approach is ideal given the breadth of the third line's assurance activities, spanning everything from cybersecurity to HR and all in-between. Three people were hired to establish this dedicated capability, with further additions currently in the pipeline. Almost immediately these specialists were delivering value.

Immediate results

One of the earliest wins was analysing timesheet compliance for overtime claims. Previously the audit had taken hours to analyse a small number of sheets. One of the first tasks assigned to Lauren

Petrie, Data Analytics Specialist, was automating this at scale. The coding took an afternoon. That algorithm was then used to analyse hundreds of time sheets in seconds.

It's the same story for many audits that have to be repeated year after year, often by different people who previously had to decipher what steps had previously been taken in Excel to perform the analysis. "Not only does coding these tasks show exactly what steps have been taken, you don't need to write it again," says Petrie. "You just point the script at the data and it'll run it for you. So you put in that upfront effort and it's reproducible each year and at a much greater scale."

Text is data

There is often a tendency to assume that data is just numbers and, therefore, data analytics is limited to the analysis of financial datasets. However, data encompasses anything that's recorded and stored, including text. The GIAA's team of data specialists have been pushing the boundaries on this, coding an NLP-powered app known as the Insights Engine that enables internal auditors to search reams of documents and meetings minutes. All files are fully searchable and filterable and can be automatically summarised using word clouds and other analytic features, meaning auditors no longer have to manually sift through documents taking notes. This search tool can also determine the sentiment of language, for example whether it is positive, neutral or negative, allowing internal auditors to filter documents accordingly. The Insights Engine can be used to identify patterns, trends, themes and any potential bad practice in auditee materials, as well as to analyse the agency's own past audit reports.

Indeed, a major use case for the tool has been delivering the annual opinion on the effectiveness of the governance and risk management controls across 13 separate government departments. This involves pulling out the key trends and findings from audit reports and summarising those insights for the year. In the past it took a team several days to produce 13 opinion reports. Using this NLP-powered app, it takes one person to produce 100 opinion reports in the same time.

Knowledge sharing

Before the data analytics team was established, there was some data analytics activity in the GIAA using Excel and IDEA but it was disjointed. Without a centralised team in place it was difficult to coordinate those activities or share use cases across the agency. There is now one point of contact in each team, collectively forming a network of data analytics evangelists, sharing what projects are being worked on and how analytics is being harnessed for those audits for closer collaboration across the group.

Passion is highly contagious. The core data analytics team led by Petrie supports enthusiastic and curious auditors eager to elevate their work, not only by taking on delegated tasks but training auditors how to apply data techniques for themselves. It's been found that if auditors dip into data analytics infrequently they soon forget what they have learned and revert to manual analyses to save time. Consistency is key here.

"A small number of auditors will make that transition to the use of data analytics and then there's everybody else. It's about promoting what data analytics can achieve to spread the gospel and expand those capabilities organically," says McGregor.

Further supporting this transition is an online training platform where staff can learn coding basics to improve their technical abilities, inspiring them to develop their own analytics apps. When they run up against problems, the data analytics team is on hand to coach them and guide them on how to iron out any coding issues. This is all part of the bigger picture of improving the GIAA's data fluency, opening staff up to the art of the possible and, in time, making data analytics a business-as-usual activity.

Limitless use cases

The GIAA is finding countless ways to make use of data analytics. For example, it is being applied to vendor management to understand where gaps exist or if any trends stand out, such as jobs being raised at the weekend, whether suppliers are providing their contracted services or if the organisation even needs the level of service provision it's paying for.

One data analytics application that is expected to see more use in future is email analyses. "A network analysis of the interconnections in email communications can reveal a lot about what's going on in an organisation because emails are used for so much," says McGregor. "So many processes are initiated via email so digging into that can show how effective those processes are in terms of time delays and bottlenecks."

There is huge potential for supporting the efforts of the agency's counter fraud specialists, too. If it's suspected that there may be an issue, email analysis may identify network patterns and communication between people that may prompt further enquiry. This can also be overlaid with external datasets to delve deeper and pinpoint whether patterns are simply random or can be confirmed with supplementary data. For example, integrating Companies House's API and comparing business director details with employer information and contracted business services has the potential to uncover red flags.

The use cases are essentially limitless. Indeed, the GIAA is finding that its application of data analytics since establishing its dedicated team of specialists is having a flywheel effect. The more use cases that are developed, the more potential is being unlocked, in a virtuous feedback loop. "It opens the discussion up in new ways that may not have previously been considered," says McGregor. "People see what's possible and start to ask, 'what if?'"

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First established in 1948, we obtained our Royal Charter in 2010. Over 2,000 members are Chartered Internal Auditors and have earned the designation CMIIA. About 1,000 of our members hold the position of head of internal audit and the majority of FTSE 100 companies are represented among our membership.

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