

Tech Index 2022

Pathways to growth in a troubled world

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“Welcome to the 2022 Tech Index report. Alongside the data and insights you will find some interesting images which have been taken using Kirlian photography, you can find out more about this process at the end of the report. We hope you find the report useful and please contact one of the Tech Index contributors to discuss any of the topics covered in the report.”



Mark O’Conor
Partner,
Global Co-Chair,
Technology Sector,
London



Erin Gibson
Partner,
Global Co-Chair,
Technology Sector,
San Diego



Trent Dykes
Partner,
Global Co-Chair,
Technology Sector,
Seattle

Pathways to growth in a troubled world

At a time of deepening political and economic uncertainty across the world, European technology companies remain surprisingly optimistic about the prospects for growth in their sector.

That is the clear conclusion of our sixth Tech Index, based on interviews with senior executives from 350 companies across the tech sector with revenues ranging from EUR10 million to more than EUR10 billion.

The continuing sense of confidence in the tech sector is at odds with the mood of many businesses. For many it's not a case of watching economic and political storm clouds gathering on the distant horizon. Instead, they see the storm approaching fast and are already battling significant headwinds.

Yet, despite inflation climbing to its highest level for 40 years, interest rates rising rapidly after a prolonged period of historic lows, and the increasing threat of recession across major economies, this has not shaken the nerves of tech companies in our survey.

They continue to believe the economic environment remains conducive to growth and, in fact, are more confident about current conditions than at any time since we began running our biennial Tech Index in 2013.

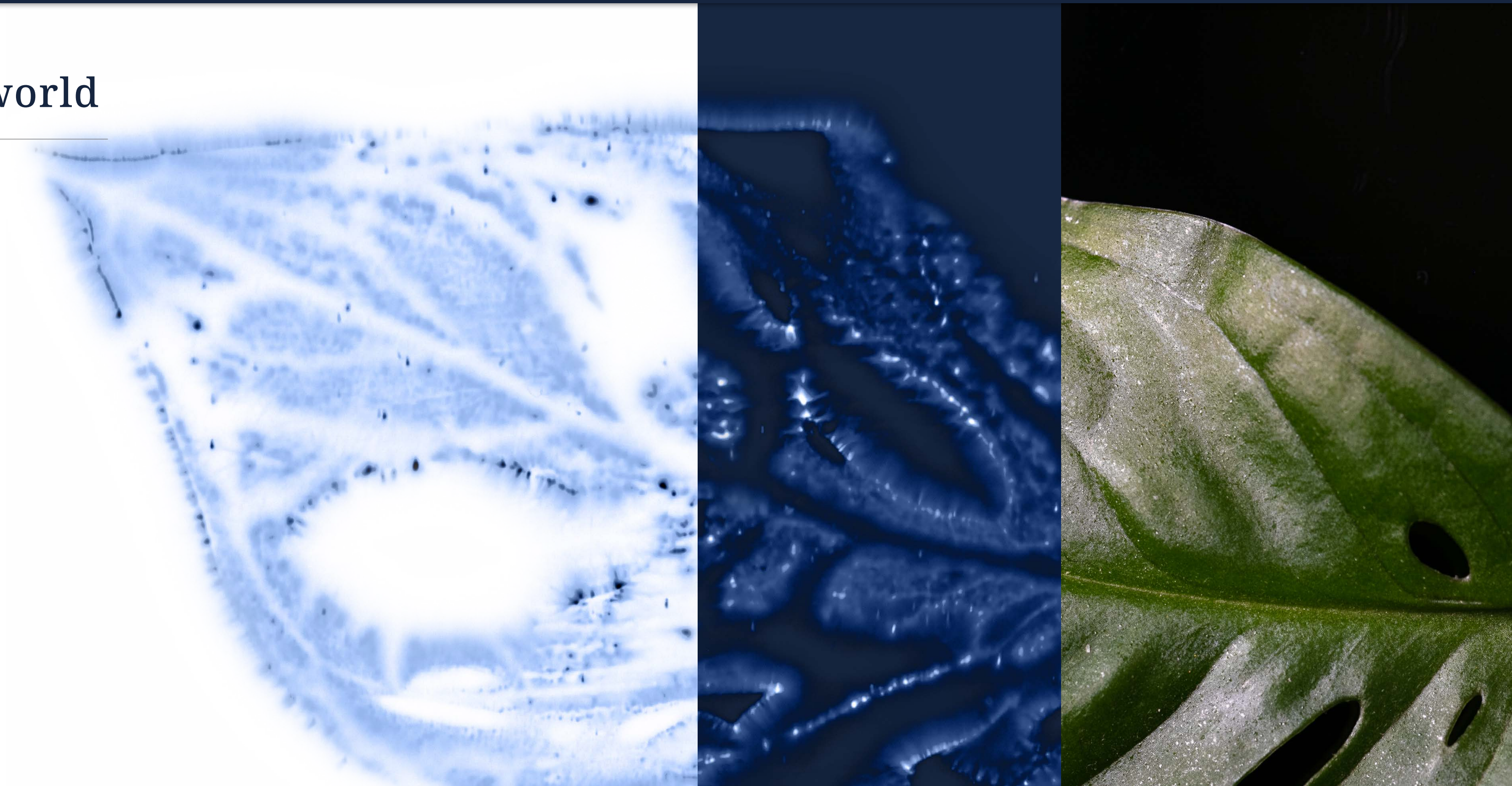


Image: Leaf under the Kirlian effect



Mark O'Connor
Partner,
Global Co-Chair,
Technology Sector,
London



Kristof De Vulder
Partner, Brussels



Larissa Bifano
Partner, Boston



Lord Clement-Jones
AI Policy and
Regulation Consultant,
London



Tom Heylen
Partner, London

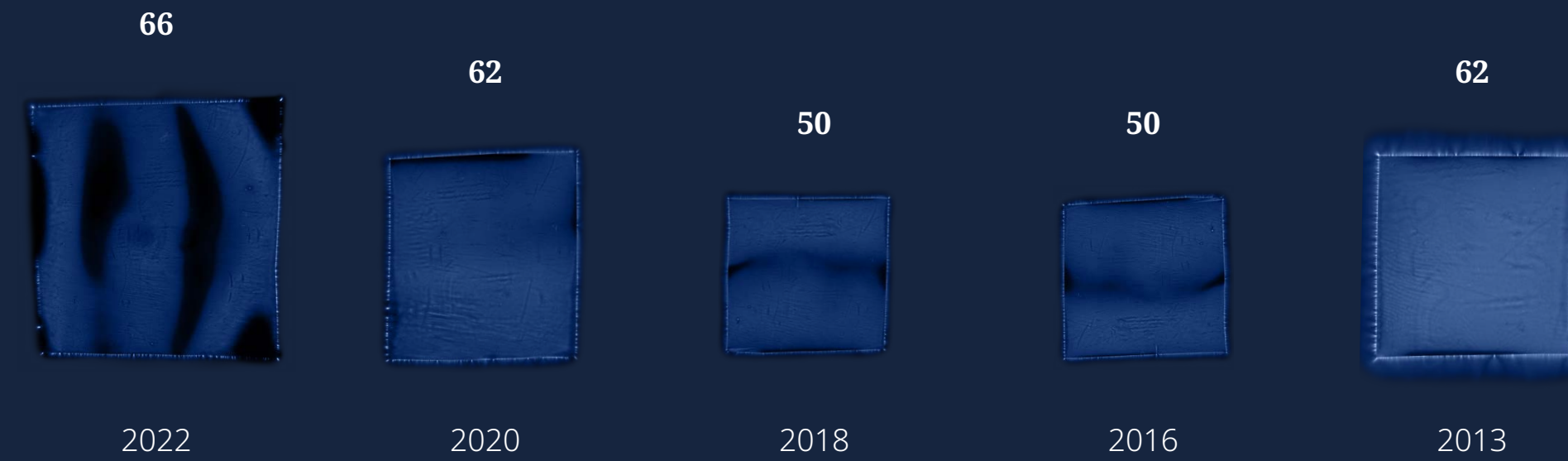


Alexandra Kamerling
Partner, London



Steven Phillips
Partner,
Washington, DC

How do you feel the current economic environment is affecting growth in your sector?



How do you feel the current venture / capital markets model is affecting growth in your sector?



Companies are expressing growing confidence that the economic environment will support growth. The current venture / capital markets model is the only area in which the Tech Score has seen a slight decrease vs 2020.

Image: Copper foil under the Kirlian effect

In another surprising finding, respondents also express growing confidence in national and European regulatory regimes at a time when regulation around key technologies is already intense and continuing to evolve, often in ways that are hard to predict and prepare for.

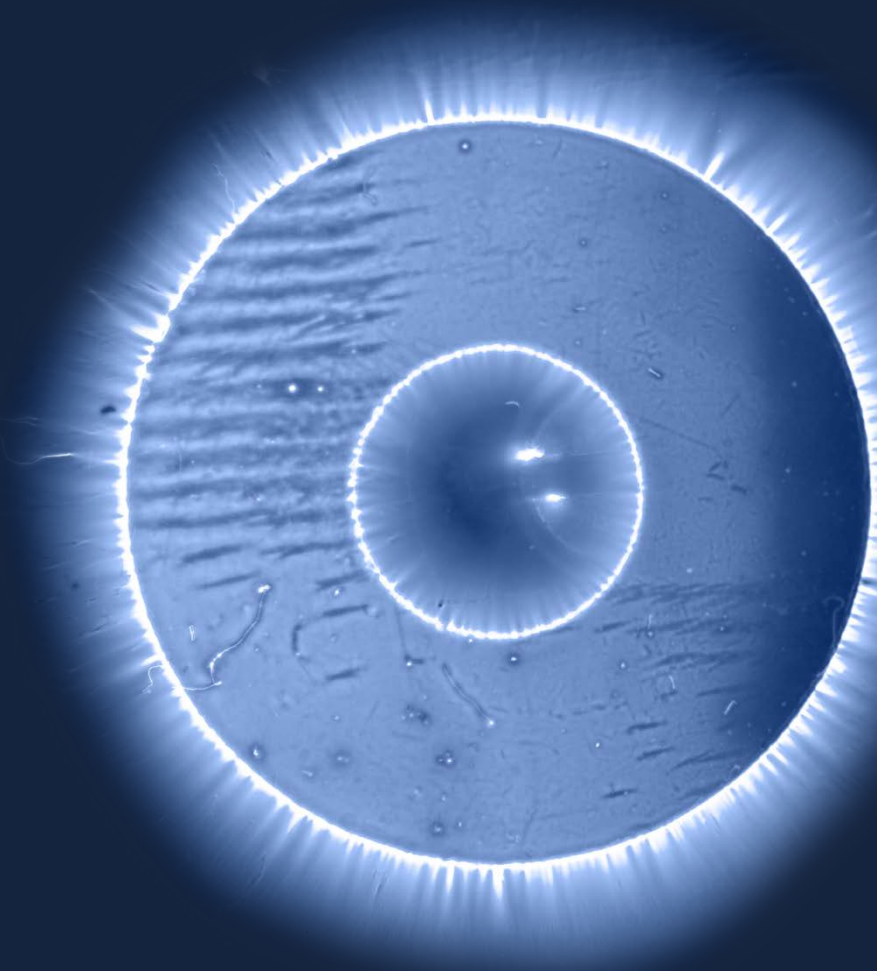
Tax regimes, the environment for developing and exploiting intellectual property and access to talent, are also viewed more favorably in 2022 than in our last survey in 2020, even if by small margins.

The only area where sentiment has worsened slightly is in relation to how the venture/capital markets model is affecting growth, perhaps a reflection of tighter credit markets in the first half 2022 after recent boom years in corporate financing.

The overall Tech Score

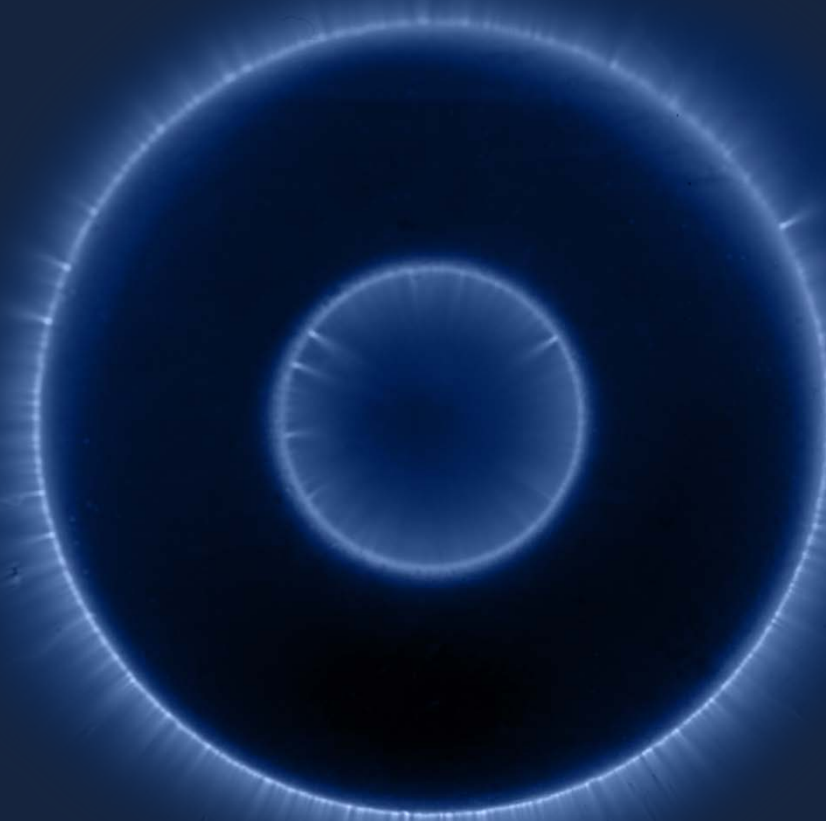
Overall Tech Score 2022

68



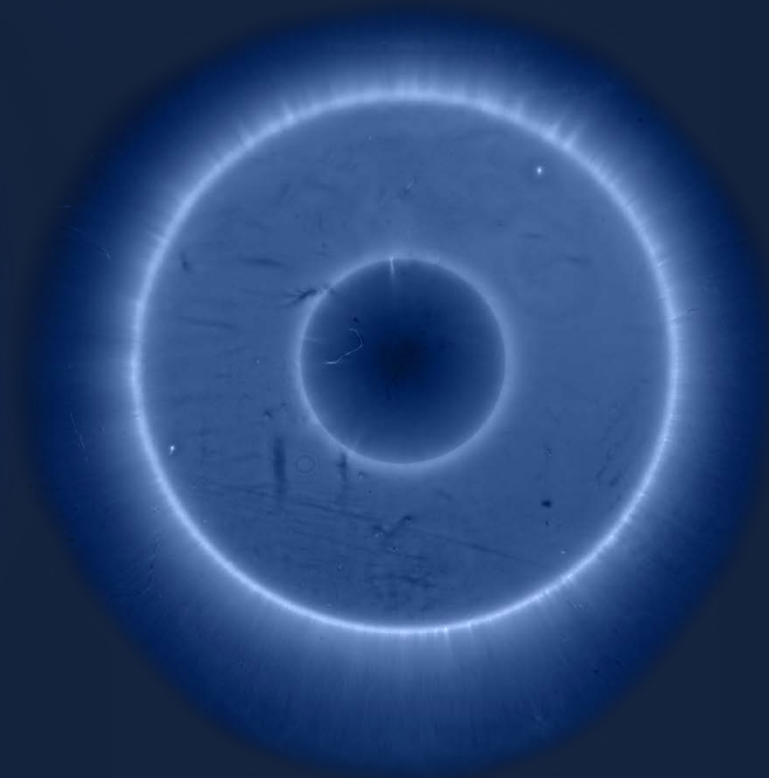
Previous years

67



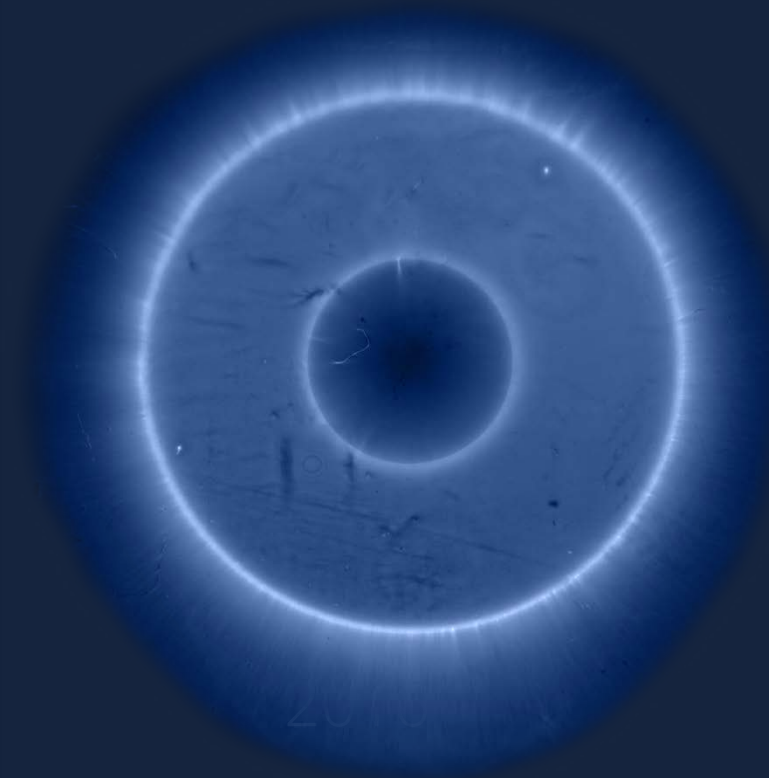
2020

54



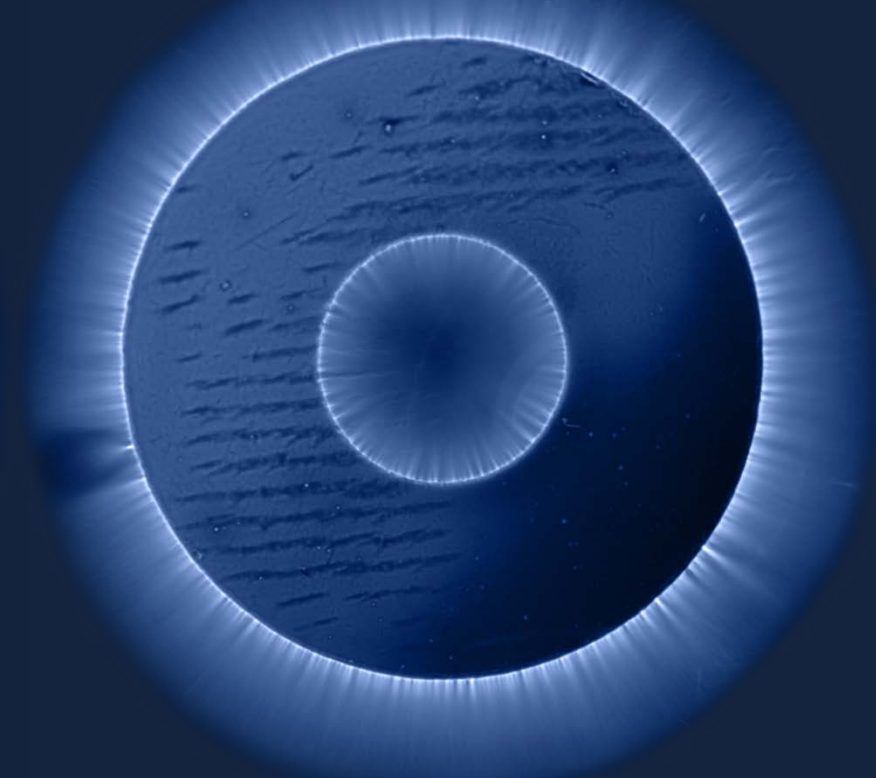
2018

54



2016

64



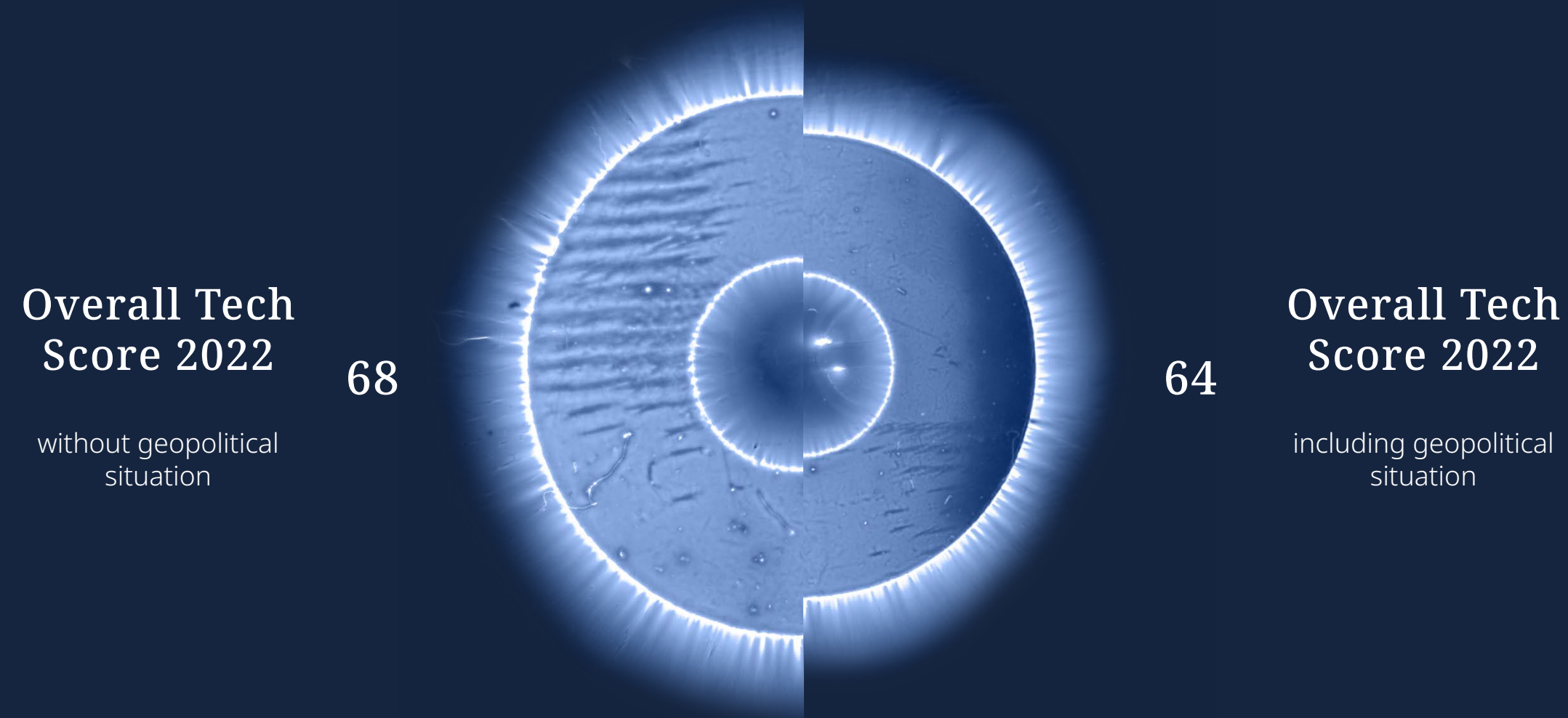
2013

[See the Appendix for details of the research sampling and methodology](#)

The overall Tech Score of 68 for 2022 is slightly higher than in 2020, indicating a sustained trend in positivity about the environment for growth vs 2016-2018.

Image: Computer component under the Kirlian effect

Overall Tech Score 2022 – with and without geopolitical situation



Taken together, the overall Tech Score from our survey stands at 68 in 2022, just ahead of 2020 and representing a sustained upwards curve in optimism since 2016.

However, this extraordinary sense of optimism diminishes significantly when respondents are asked to reflect on the current geopolitical situation, a question included in our survey for the first time this year.

When war in Ukraine, the effects of Brexit – widely seen as negative – strained trade and diplomatic relations between China and the US, disrupted supply chains, and ever-tightening national security controls around key technologies like 5G, are factored in, the score drops to just 43.

And when those more sober findings are incorporated, the overall Tech Score falls back to 64, the same level we recorded in our first Index in 2013, although still higher than the 2016 and 2018 scores, which stood at 54.

For detail on how we calculated the Tech Score, please see the [Appendix on p.56](#).

When companies' views on the geopolitical environment are factored in, the overall Tech Score brings the score down to 64, reflecting the dampening effect of this area on companies' overall outlook for growth.

Image: Computer component under the Kirlian effect

Geopolitical and economic reflections

Revenue growth

Nevertheless, respondents remain undaunted and widely expect to see their revenues growing faster in the next year compared with the last 12 months. In fact, two-thirds expect revenues to increase by at least some extent, and just one in ten say they think turnover will go into reverse.

Part of that is down to the continuing efforts they are making to build back better from the COVID-19 crisis. Although 20% believe COVID-19 will continue

to have a negative impact on the supply side of their businesses in the year ahead, that compares with nearly 80% in 2020.

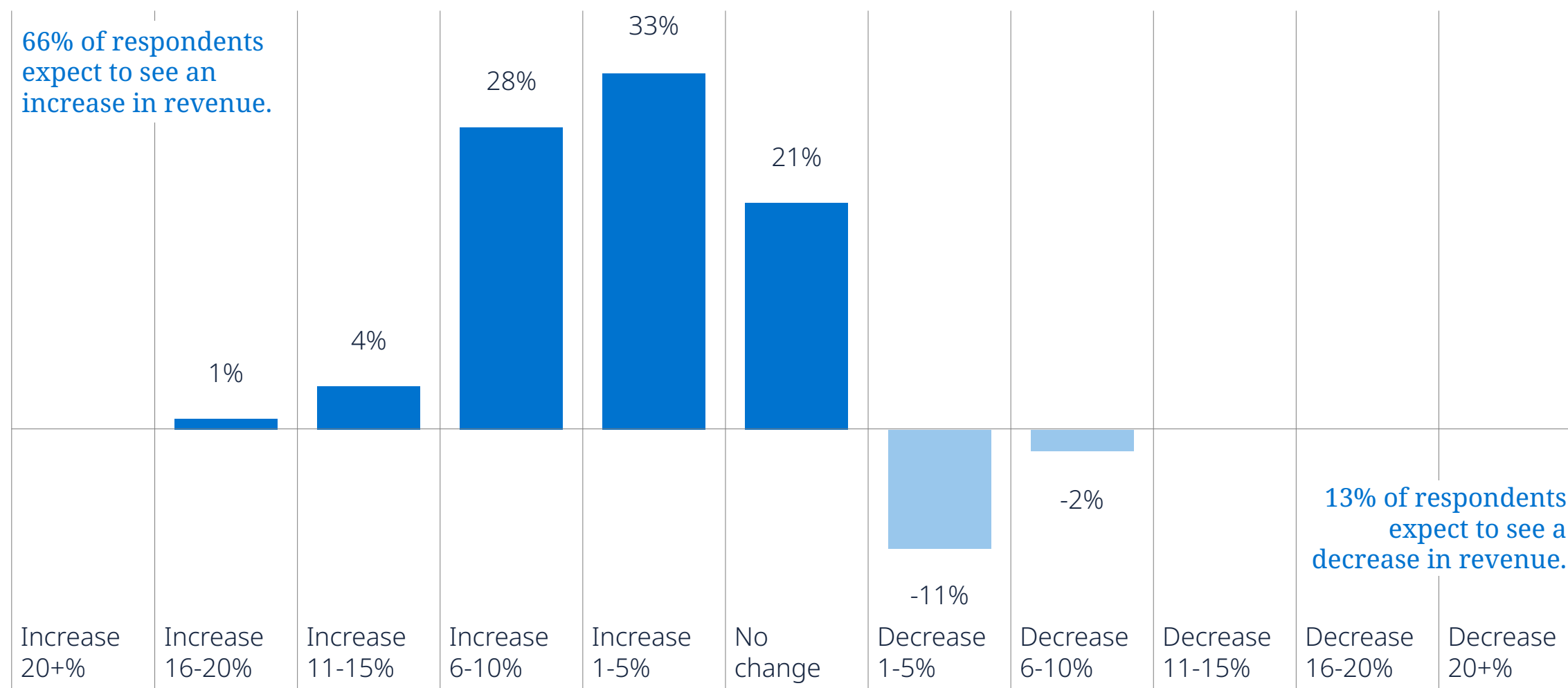
And there are signs that companies are becoming increasingly agile in mitigating the lingering impact of COVID-19, with 99% saying they are taking some sort of action to speed their post-pandemic recovery.

Most commonly they are refining their product and service offering or adjusting their pricing. Other tactics include temporarily reducing headcount, deploying

new technologies, seeking growth through acquisitions and renegotiating supplier contracts. A tiny proportion say they are permanently reducing their workforces, temporarily closing their business or considering insolvency.

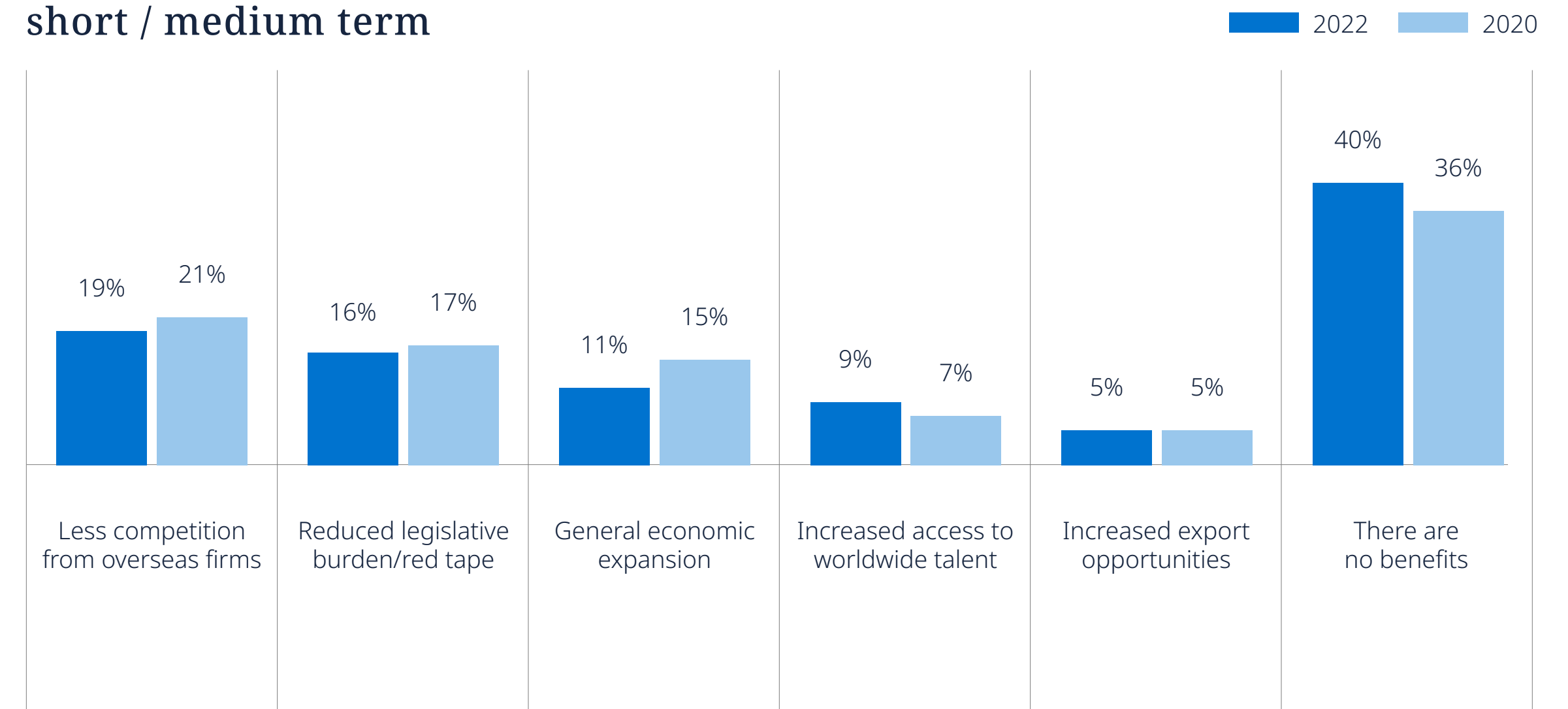
Meanwhile, only 10% of companies see benefits from the UK leaving the EU, including 19% who say it will mean less competition from overseas firms, and 16% expecting a reduction in red tape. Significantly, 40% see no benefits at all.

Expected change in revenue in the next 12 months compared to last 12 months



Companies are generally positive about revenue growth in the next 12 months, with 66% expecting at least some increase in revenue. However, 1 in 10 expect revenues to decline.

Main benefit for business of the UK leaving the EU in the short / medium term



Companies are slightly less likely to foresee short/medium term benefits from the UK leaving the EU in 2022 than was the case in 2020. Reduced competition remains the most commonly identified benefit, followed by reduced red tape.

An opportunity to innovate

These optimistic findings on revenue growth again look slightly surprising given the current economic climate.

But it's important to make a distinction between consumer-facing businesses, which are most likely to feel the impact as the cost-of-living crisis inevitably reins in customer spending, and those serving industrial and commercial markets.

For the latter, readiness to invest in new technology and new product offerings appears to remain high for now. They also continue to be able to raise new money to finance growth, something that has become more challenging in recent months for companies serving consumer markets.

More generally, we have noticed a clear trend among some of our clients to turn these challenging times to their advantage. Rather than batten down the hatches, they are looking for opportunities to innovate their way out of difficult market conditions.

And we see evidence that some companies have learned important lessons from the sharp and protracted downturn following the global financial crisis. Those that chose to respond to the crisis by cancelling important projects and contracts, often came to regret what they later viewed as an overreaction. They are determined not to make the same mistake again.

That's particularly important at a time when the process of digital transformation is intensifying with the prospect of companies, across sectors, being able to accelerate growth by embracing powerful new business models.

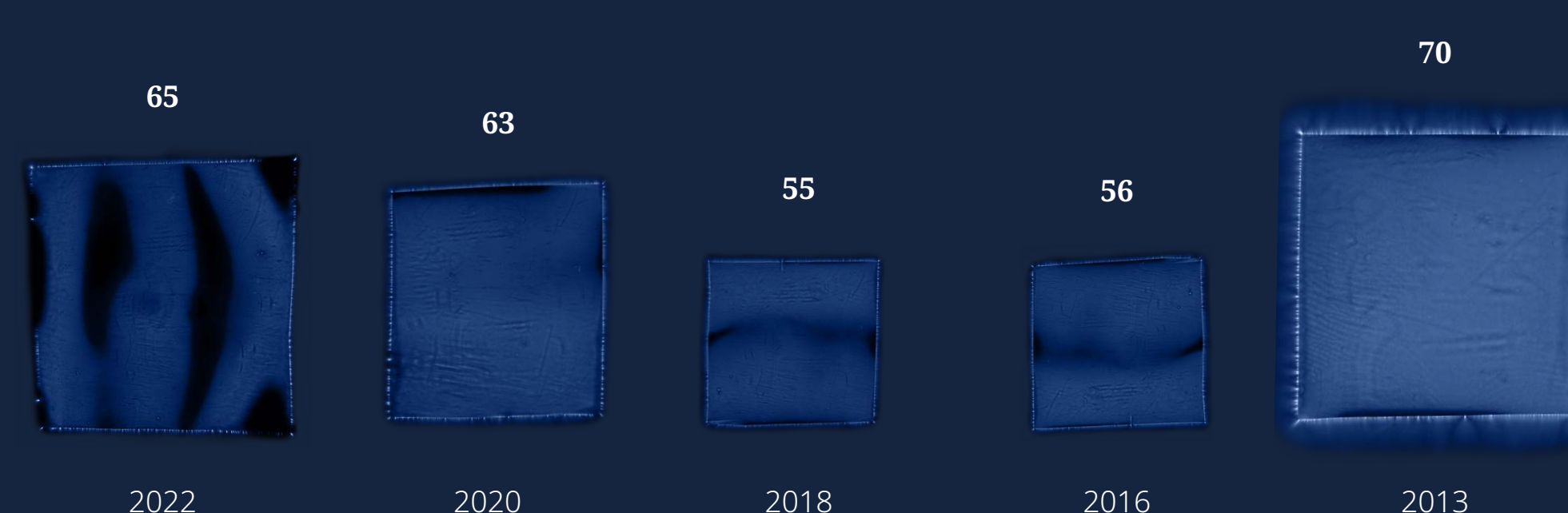
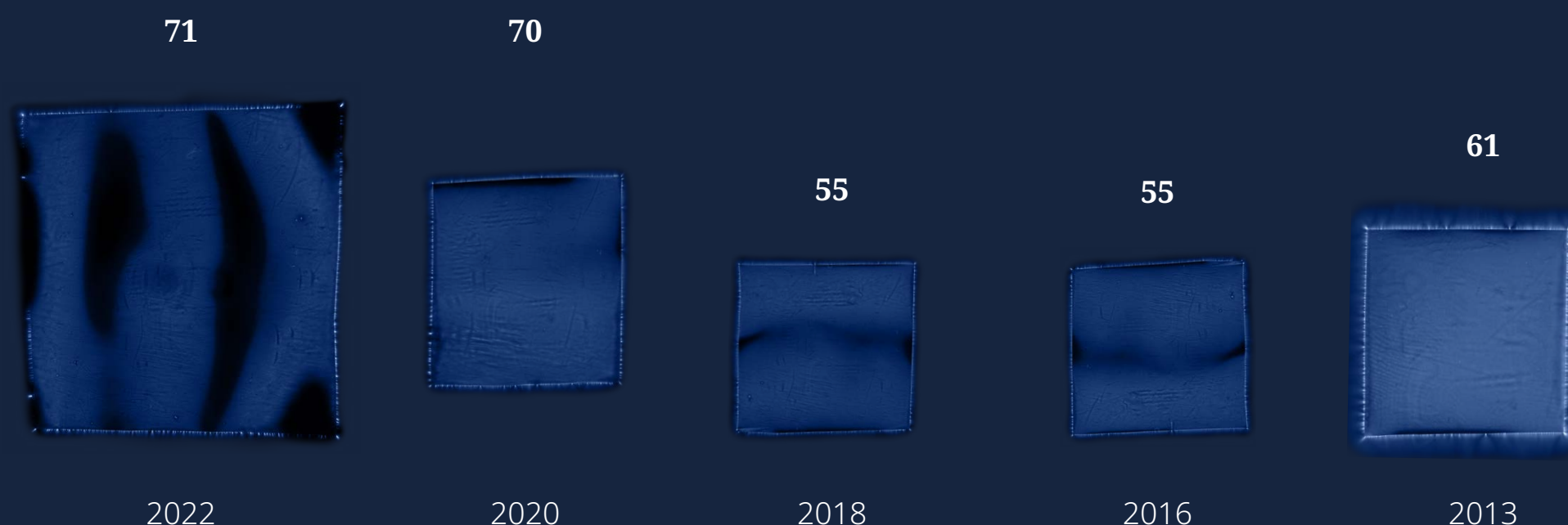
The question is: will boards continue to see investment in this area as a priority? Or will they fall into the trap of delaying investment, only to find themselves tied to outdated legacy systems that leave them at an increasing disadvantage in the market?

Here our survey uncovers some contradictory findings. In some areas, notably fintech, change is increasingly being driven by C-suite executives, rather than by the IT function, as in the past.

But where overall digital transformation is concerned, the position is reversed, with senior management not yet seen as significant drivers of change. Given the strategic importance of true digital transformation, that is a worrying finding.

How do you feel the current regulatory environment in your country is affecting growth in your sector?

How do you feel the current regulatory environment in Europe is affecting growth in your sector?



The domestic regulatory environment receives a higher Tech Score than the European regulatory environment, but the latter score has seen a slightly greater increase.

Image: Copper foil under the Kirlian effect

Regulation – getting ahead of the curve

With the volume of regulation around key technologies continuing to grow, it's surprising that companies in our survey are so relaxed about both national and European regimes.

Even more so, since there is a growing divergence between EU and UK regulation in key areas such as AI and fintech, adding complexity to an already complex environment.

But there are signs that tech companies have become more accustomed to operating in a highly regulated space. Signs too that, yet again, they have learned lessons from embracing complex new regimes, most notably the EU's GDPR data protection regulations.

Many companies struggled to set up effective GDPR compliances processes, forced to go through time-consuming and expensive remediation programs to rewrite contracts once the regulation had taken full shape.

We see a real determination to get ahead of the curve this time. They want to ensure that products they are creating today can still be sold in three or four years' time without the need to make constant adjustments to compliance procedures.

That's a tricky process given that some regulation is at a very early stage of development and will often, as is the case with AI, be subject to a different overall approach in the EU compared with the UK and the US.

In addition, there is a growing view that regulators, far from just imposing constraints on companies, are increasingly looking to use regulation as an enabler.

The European Commission sector inquiry into consumer Internet of Things technologies, published in January, looked at how to lower barriers to entry into a market, dominated by a few vertically integrated players, opening the way for new entrants.

National security controls tighten

The area where regulation has tightened most dramatically in recent years is around national security. Across the globe countries are imposing upfront scrutiny of corporate transactions and increasingly tough restrictions on foreign direct investment and infrastructure supply chains.

This has been most noticeable in connection with 5G technologies where, led by the US, but eventually followed in many other jurisdictions, Chinese vendors continue to be forced out of the market.

We're seeing a tightening of controls in many other sectors where industries, from utilities to airlines, are designated as critical national infrastructure, although this can sometimes be a flimsy fig leaf for protectionism. Given the sensitivity around digital technologies, companies in the tech sector find themselves right at the center of the action.

Respondents to our survey overwhelmingly believe that enough provision has been made to safeguard national security where 5G is concerned, although 20% still call for further measures, such as tighter regulatory controls.

The perception is that the debate over national security and 5G in the US reached its pinnacle under the Trump administration.

But the reality is that there has been little or no change since Joe Biden's election. US/China trade frictions have not eased and show little sign of doing so, especially given the increased tensions over Taiwan.

The one difference is that President Biden has tried to take a more multilateral approach, working with allies to confront China, and there are signs that different national regimes are becoming more alike in their aims, even if different levers are being used to achieve them.

With semiconductor supply chains still heavily disrupted, chip manufacturing is increasingly in the spotlight from a national security perspective. Key players in the market, including China itself and Germany, are increasingly taking action to protect their industries.

Meanwhile new legislation in the US, passed in July, has unleashed USD54 billion of investment to build a powerful domestic semiconductor industry amid efforts to onshore production and loosen the dependence on Taiwan and South Korea for chip supplies. In briefings ahead of the law passing, it was made clear that national security was a key reason for the measures.

That investment was dwarfed only days before by the Inflation Reduction Act, which included provisions for USD370 billion of investment in green energy technologies and electric vehicles.

The legislation is widely regarded as a significant step change in US efforts to tackle climate change. But environmentalists have complained that the benefits of this ambitious program are being undermined by strict US content provisions contained in the measures. Companies working on these technologies will only qualify for tax credits if they source key raw materials, such as lithium for batteries, onshore or from a country with a free trade agreement with the US.

More widely, the US commitment to invest in green technologies only hints at the trillions of dollars of private capital that is being amassed to deploy on ESG related investments in the coming decade. This will undoubtedly be a source of significant future growth in the tech sector, where two-thirds of companies we surveyed see important business opportunities.

Resilience

To what extent the optimism currently being shown by European tech companies is justified will be determined by how geopolitical issues play out in the coming months and their ability to keep innovating in turbulent times.

It's far from clear whether the current economic headwinds will be relatively short lived or will develop into a shock as deep as the COVID-19 crisis.

But, for now, companies we surveyed appear convinced that they are resilient enough to weather the storm and have plenty of reason to be positive about the sector's long-term growth potential.



Image: Coins under the Kirlian effect

Special section – ESG

Making the leap from compliance to performance

Sustainability and environment, social and governance (ESG) issues have risen quickly up the boardroom agendas of companies across almost all sectors – and in a remarkably short space of time.

But engagement with the ESG agenda varies significantly between companies. Many are focused on compliance at a minimal level; relatively few are showing true leadership in this critical area.

That divergence of approach is not surprising, given that relevant regulation is relatively under-developed in many jurisdictions, leaving companies struggling to find their bearings.

That’s certainly the case in the US where, in the absence of hard law, the companies with the most advanced ESG agendas rely on private governance initiatives rather than regulation.

But even in Europe, where regulation is much more advanced (though still evolving), there is a clear divide between companies that approach ESG from a basic compliance stance and those that see a real business opportunity in adopting a more strategic, performance mindset.

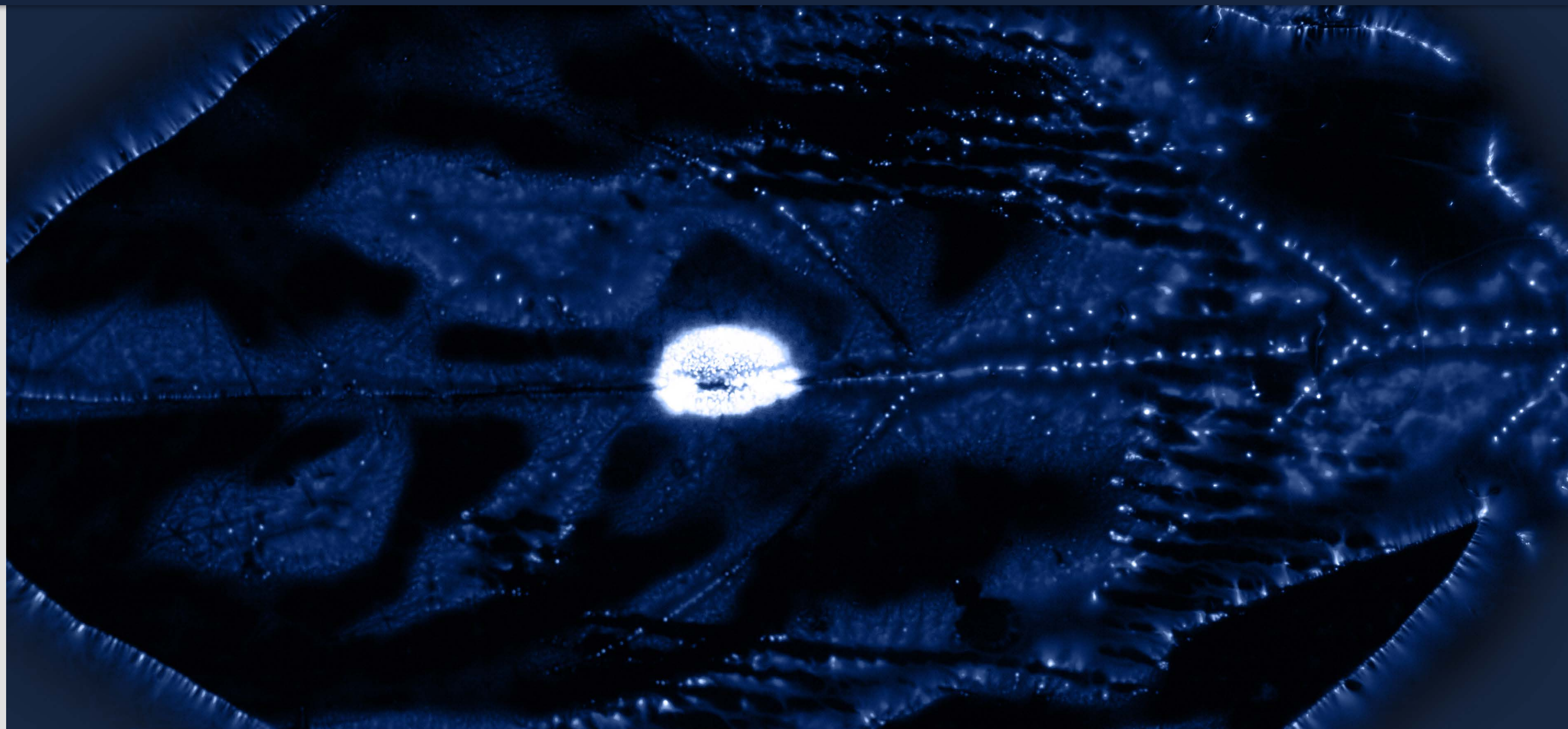


Image: Leaf under the Kirlian effect



Natasha Luther-Jones
Partner,
Leeds and London



Rhys Davies
Partner,
London and Perth



Jesse Medlong
Associate,
San Francisco



Arjen de Snoo
Legal Director,
Amsterdam



Sanjay Shirodkar
Partner,
Washington, DC
and Baltimore



Paul Hopman
Partner, Amsterdam

A question of priorities

This dichotomy is, to some extent, evident in the soundings we have taken for this latest edition of the Tech Index, where we asked several new questions to gauge where ESG matters currently sit on boardroom agendas.

Two-thirds of our respondents said they saw business opportunities around the ESG agenda, including one-third who see significant opportunities. Only 7% saw ESG as either a moderate or significant threat.

More than two-thirds of companies see business opportunities around the ESG agenda, with one-third seeing significant opportunities.

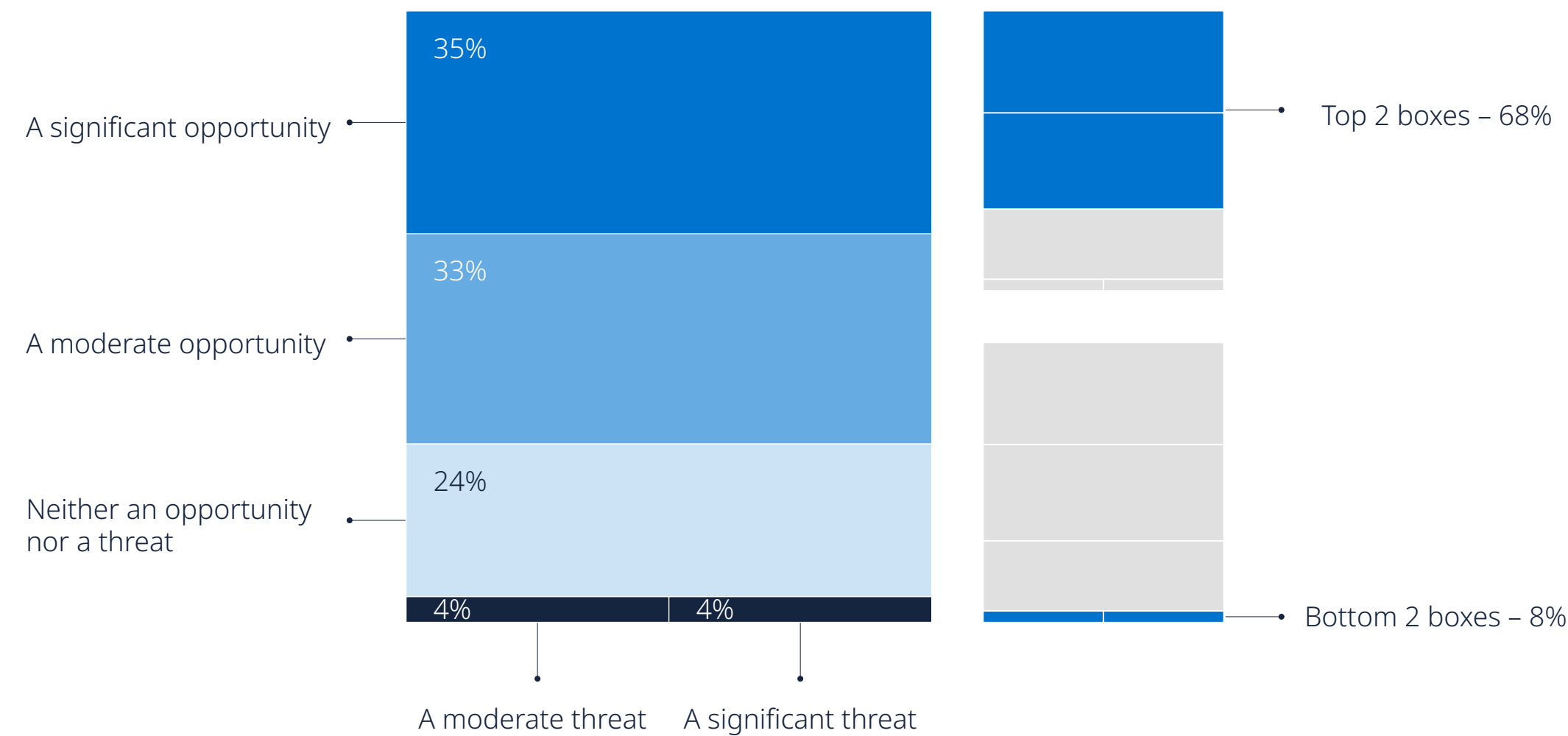
When asked to rate how high a priority ESG issues were for their business, nearly half of respondents rated them between 8 and 10, with 10 being the top priority. On average, companies rated the priority level at 7, clearly suggesting that this issue is front of mind for most companies.

But when asked whether the level of priority given to ESG matters had changed since the start of the COVID-19 pandemic, the results were far more mixed and, perhaps, more revealing.

Here companies were evenly split among those that said the priority level had increased, those that said it had remained the same and those who said ESG issues were a lower priority compared with other concerns. With companies continuing to recover from the shock of COVID-19 only to find themselves rocked by a whole new set of economic and political headwinds, it's perhaps unsurprising that some are reducing their focus on ESG.

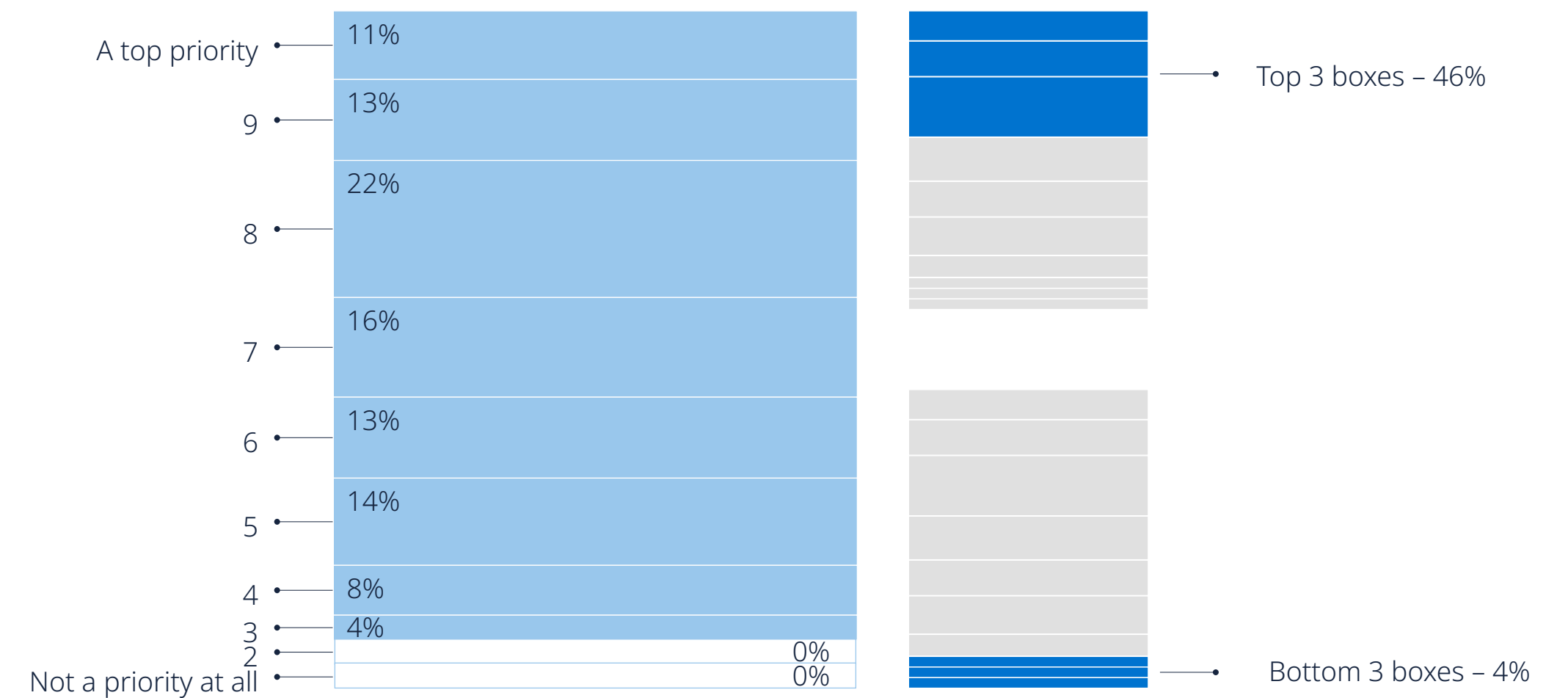
But the trend is worrying when extreme weather is making the impacts of climate change so immediately evident and when the pandemic has exposed levels of social inequity that must be urgently tackled.

Views on business opportunities in ESG



More than two-thirds of companies see business opportunities around the ESG agenda, with one-third seeing significant opportunities.

Prioritization of ESG issues



Companies are also tending to prioritize ESG issues in their own business, rating the level of prioritization as 7 out of 10 on average. Around half identify the prioritization level as at least 8 out of 10.

Levels of ambition

In working with clients, we typically see them at four levels of ESG ambition.

The lowest level is about achieving compliance, with companies asking: what is the bare minimum we must do to meet existing regulation?

Other companies are making exaggerated claims or greenwashing their achievements in this area, writing “cheques” in their marketing or investor relations communications that they may not be able to cash. In extreme cases, companies can find themselves being investigated by market authorities or regulators and even heavily fined when making unsubstantiated claims.

At the next level, some companies are beginning to benchmark themselves against market-leading organizations to see where and how they can improve their own performance.

Finally, some companies are showing genuine ambition and achieving real competitive advantage by being first movers in the field. Often, these

organizations are not merely following the regulation. Instead, they take their cues from multilateral institutions like the United Nations and the OECD to guide their actions on issues such as climate change, bio-diversity loss or broader definitions of human rights, including the right to a healthy environment.

Regulatory certainty

Regulation also plays an important part in driving change. But these regulations take time to develop and are continuously evolving.

Since the Paris Climate Accord was adopted in 2015, the EU has focused regulation on financial institutions, seeing them as among the most powerful agents of change in private industry. These regulations challenge institutions to examine the sustainability of their loan or investment portfolios.

EU regulations on taxonomy, sustainable finance disclosure and benchmarking are all helping to drive change in this respect. More recently, we’ve seen the European Central Bank using stress tests to determine whether financial institutions are prepared for climate risks to their own operations and to their clients.

UK regulation is developing separately, with the government promising to publish an updated and more detailed version of its 2019 Green Finance Strategy later this year.

Other jurisdictions are much further behind, but we see increased action by authorities in some.

In the US, for instance, the Securities Exchange Commission has yet to finalize ESG disclosure rules for listed companies. But even without those rules, the SEC has been aggressively probing issuers over the past year on their approach to climate change in what looks to some like a back to front process.

That’s proving a challenge for large-cap companies in the US at a time when the federal government’s approach is diverging from that of some conservative states, whose legislators are pressuring companies to focus on delivering straight shareholder value rather than broader ESG outcomes.

But regulation can be a blunt tool and it takes time to develop and refine. Boards are thus often left to decide for themselves what action to take as part of a fiduciary duty to balance a wide range of different stakeholder interests.

Changes in prioritization of ESG issues since the start of COVID-19 pandemic

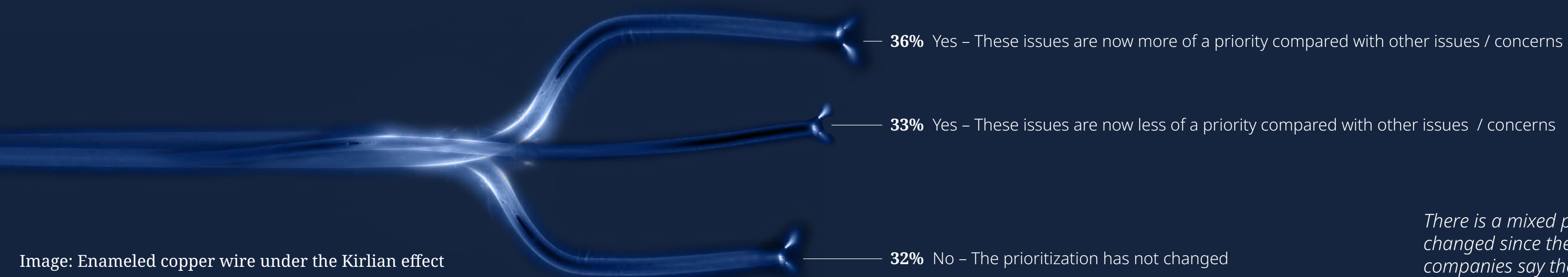


Image: Enameled copper wire under the Kirlian effect

There is a mixed picture in terms of the way the prioritization of ESG issues has changed since the start of the COVID-19 pandemic. While just over a third of companies say these issues have become more of a priority, a similar proportion have de-prioritized ESG in light of other issues / concerns.

Legal and reputational risk increase

Regulation is not the only source of ESG risk for businesses. With public pressure building for action from business on climate and other ESG matters, reputational risk is an increasingly important concern for many companies.

Litigation risk (which carries with it reputational risk) is mounting too, as illustrated by, to give one high profile example, the Hague District Court's 2021 decision that Shell must cut its emissions by 45% by 2030 (albeit that this decision is subject to appeal). The risk of businesses facing legal challenges relating to (and aimed at changing) their approach to ESG is increasing significantly.



Meeting challenges in the tech sector

It's clear from our survey that companies in Europe's tech sector are taking action to address sustainability concerns.

Demanding more accountability from suppliers and working towards carbon neutrality by 2030 continue to top the list of actions they are taking, with both increasing marginally in importance in 2022 compared with 2020.

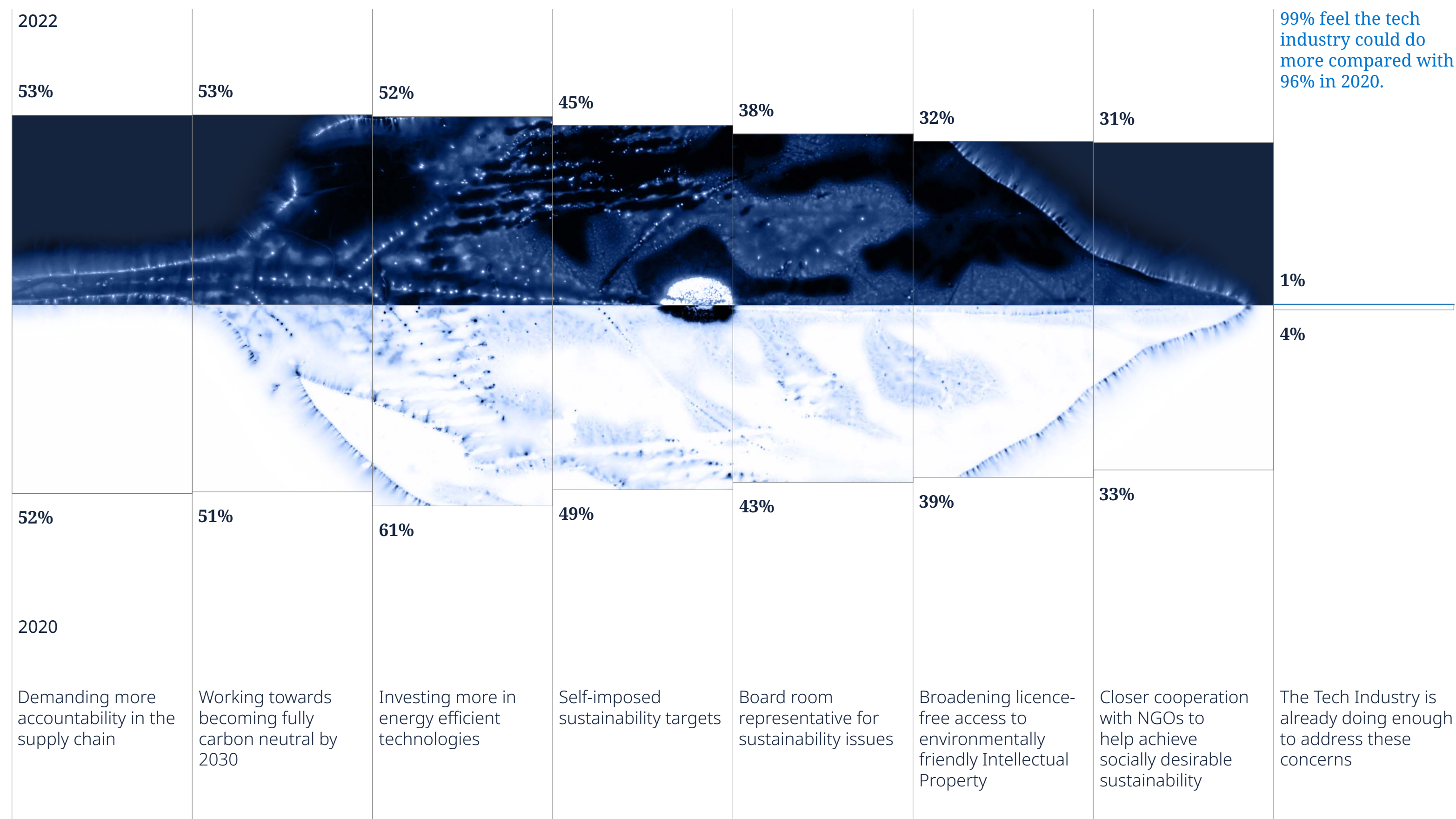
Investment in energy efficient technologies remains important but has slipped down the list of priorities, from 61% in 2020 to 52% in 2022.

Nearly all companies (98%) also say they have started taking action to address ESG concerns.

Having a board representative for sustainability issues, working with NGOs to achieve socially desirable sustainability, and working towards becoming fully carbon neutral by 2030 lead the list of actions companies are taking.

Around half of our respondents say they have put a comprehensive governance framework in place to manage ethical risks around the deployment of key technologies, covering areas such as privacy, cybersecurity, AI and freedom of expression. And nine out of ten companies say they have at least an emerging framework in place.

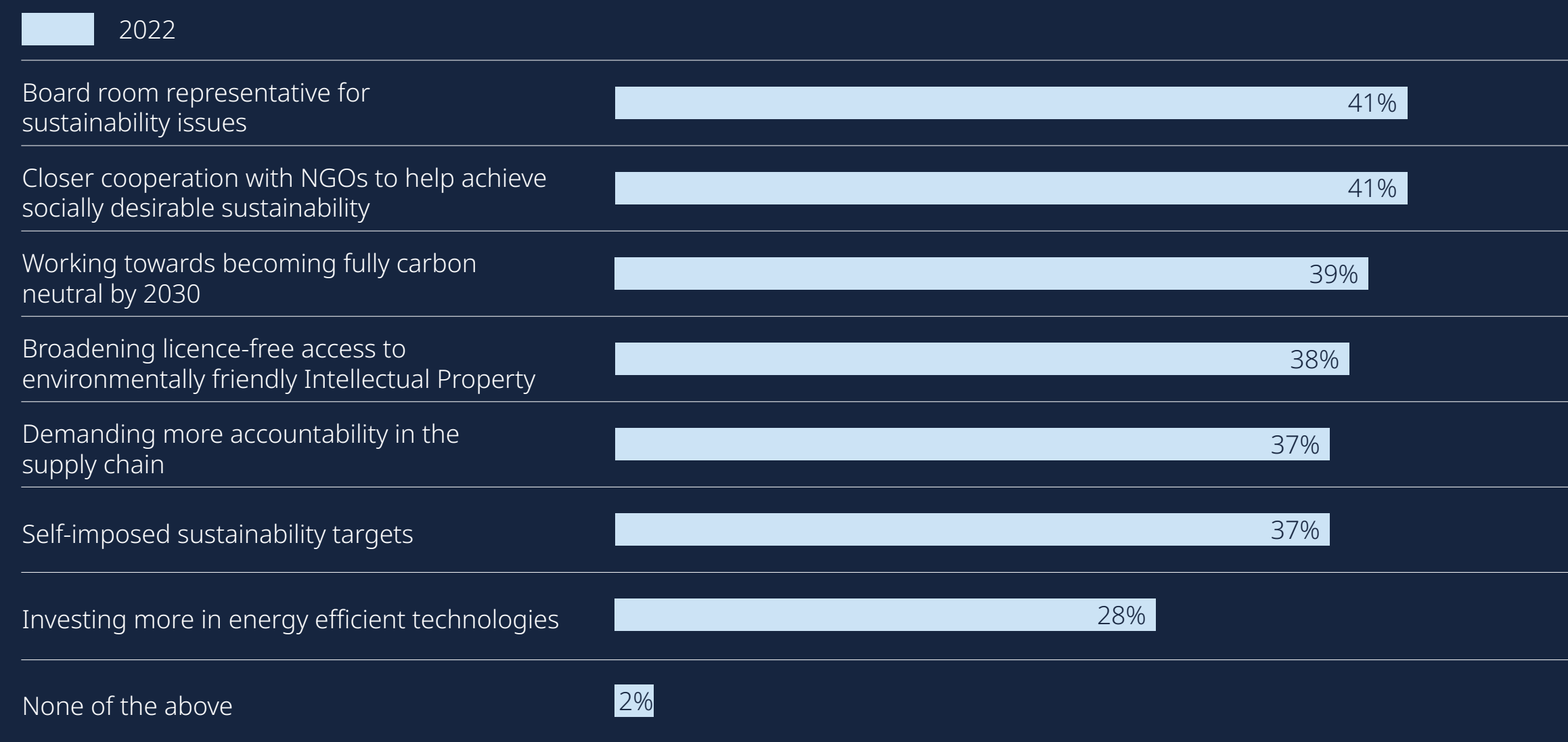
Actions the tech industry should be doing to address environmental sustainability



Almost all companies feel the tech industry should do more to address environmental sustainability concerns, with a slight increase vs 2020. As in 2020, key actions include supply chain accountability and working towards becoming carbon neutral. However, some areas of action are less likely to be identified, including investing more in energy efficient technologies.

Image: Leaf under the Kirlian effect

Actions already being implemented to address ESG concerns



Almost all companies have started to implement some actions within their own business to address ESG concerns. A diverse range of action is being undertaken, but investment in energy efficient technologies is less common than activity in other areas.

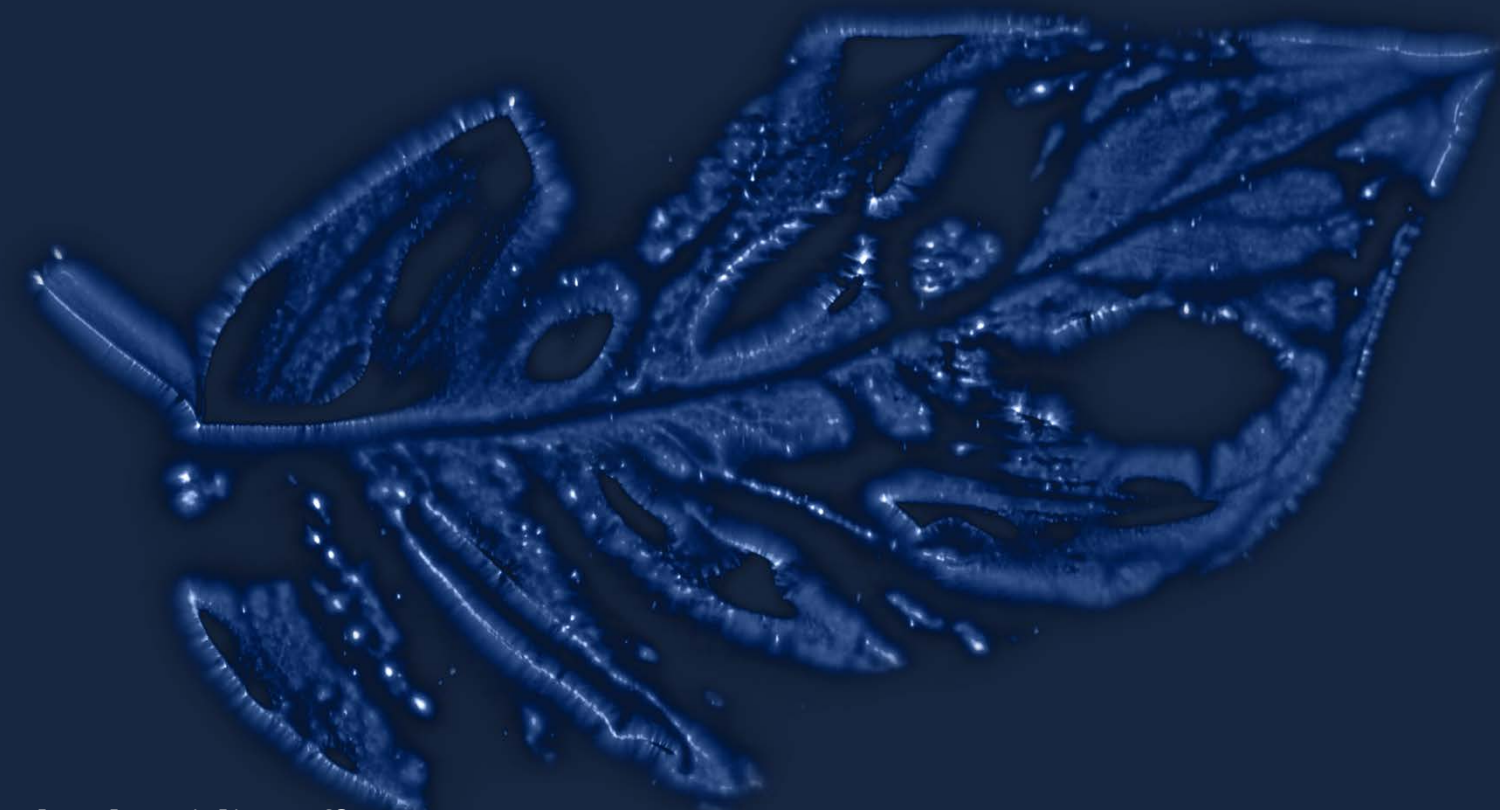


Image: Leaf under the Kirlian effect

Delivering additional benefits

The tech sector continues to face pressure over its own carbon footprint and some of the industry's largest players are being urged to play a bigger role in reducing emissions.

Tech giants like Google are among the biggest purchasers of renewable energy to power their data centers.

Given their financial strength, they are under pressure to pay more for their energy to help develop new wind and solar projects, and to demonstrate that, in doing so, they are creating benefits, not just for themselves, but for the wider community as well. Some are seizing this opportunity to improve their environmental credentials.

Environmental challenges are also significant in the cryptocurrency segment, particularly around bitcoin mining, which is highly energy intensive.

Climate change is having an immediate impact on this activity. In a prolonged heatwave this summer, many

bitcoin miners in Texas shut down their operations as the state's electricity grid struggled to meet a huge spike in demand. There were similar shutdowns in winter during unprecedented cold weather.

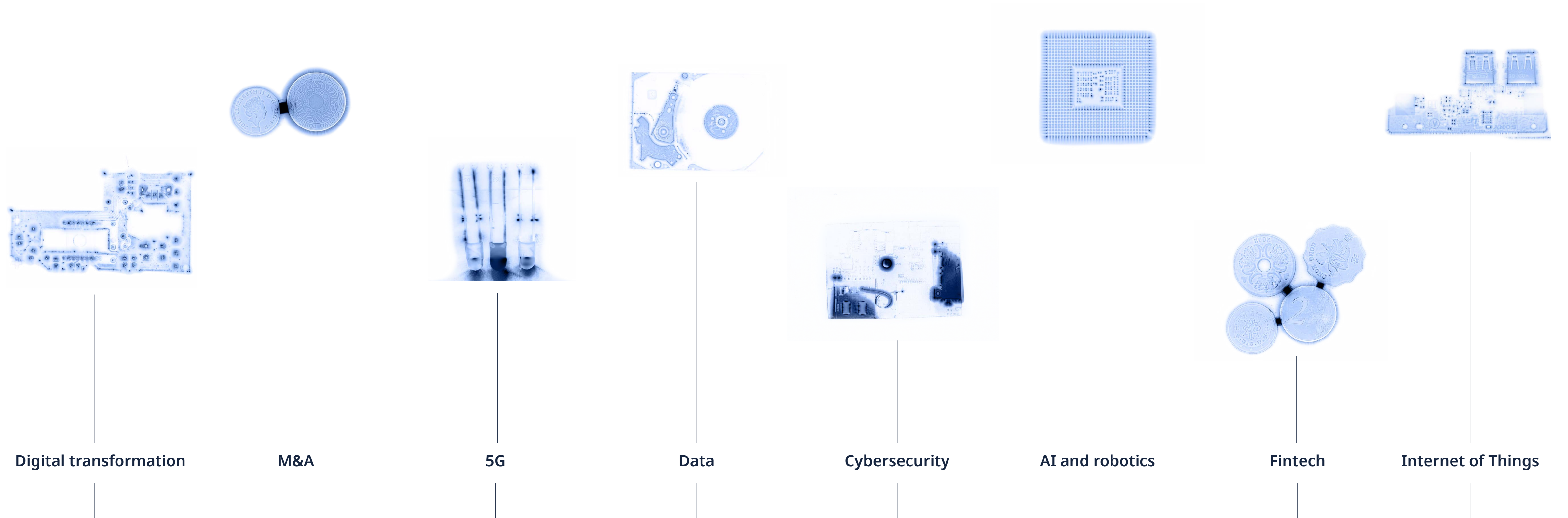
Concerns over bitcoin's carbon footprint are also making it hard for other, less energy intensive blockchain or token-based crypto asset systems to make a credible environmental case based on their own science-based net zero targets. But such systems are likely to prove very useful in helping companies meet ESG-related objectives, such as building green supply chains, not just as a cost, but based on a business case delivering a real and measurable return on investment.

Given the growing focus on ESG issues by regulators and market authorities, tech companies are likely to feel growing pressure to demonstrate they are taking this agenda seriously. And with technology likely to play a key role in tackling the climate crisis, we can expect ESG issues to continue climbing up boardroom agendas in the coming years.

Our survey suggests that companies are well aware of this. Almost all our respondents (99%) make it absolutely clear that the tech industry is not yet doing enough to tackle sustainability challenges, up from 96% in 2020.

Topical issues

For the Tech Index 2022, we've examined our traditional trend technologies and added digital transformation as a new topic this year.



[See the Appendix for details of the research sampling and methodology](#)

Digital transformation

Transformation requires real and radical change

Across almost every sector of the economy, organizations are talking with increased urgency about the need to transform their businesses by employing new and/or disruptive technologies. However, many businesses use the term “digital transformation” loosely, characterizing operational changes they’re making as transformative when what they are actually describing falls far short of what can and should be achieved.

A big bank, for example, that finally replaces an outdated platform may portray this as transformation when really it’s just making the transition to a more capable technology that’s well overdue.

If an organization shifts from storing data in capex-heavy data centers to an opex-based approach using the cloud, it may be doing something that is transformational if this opens the way to using customer data in more powerful ways. But if the main motivation is just to cut costs, however important those savings are, then it’s really a case of financial engineering rather than digital transformation.

True digital transformation is about using digital and Industry 4.0 technologies to fundamentally change business models. For example, when a bank is offering customers the chance to agree a mortgage using a smart phone rather than reams of hand-signed documents and multiple separate process steps, it has truly transformed its business model.

That’s especially true given the massive amount of work that goes on behind the scenes around handling data, meeting regulatory requirements and making financial checks to make the online service possible. It’s a completely new way of doing business.

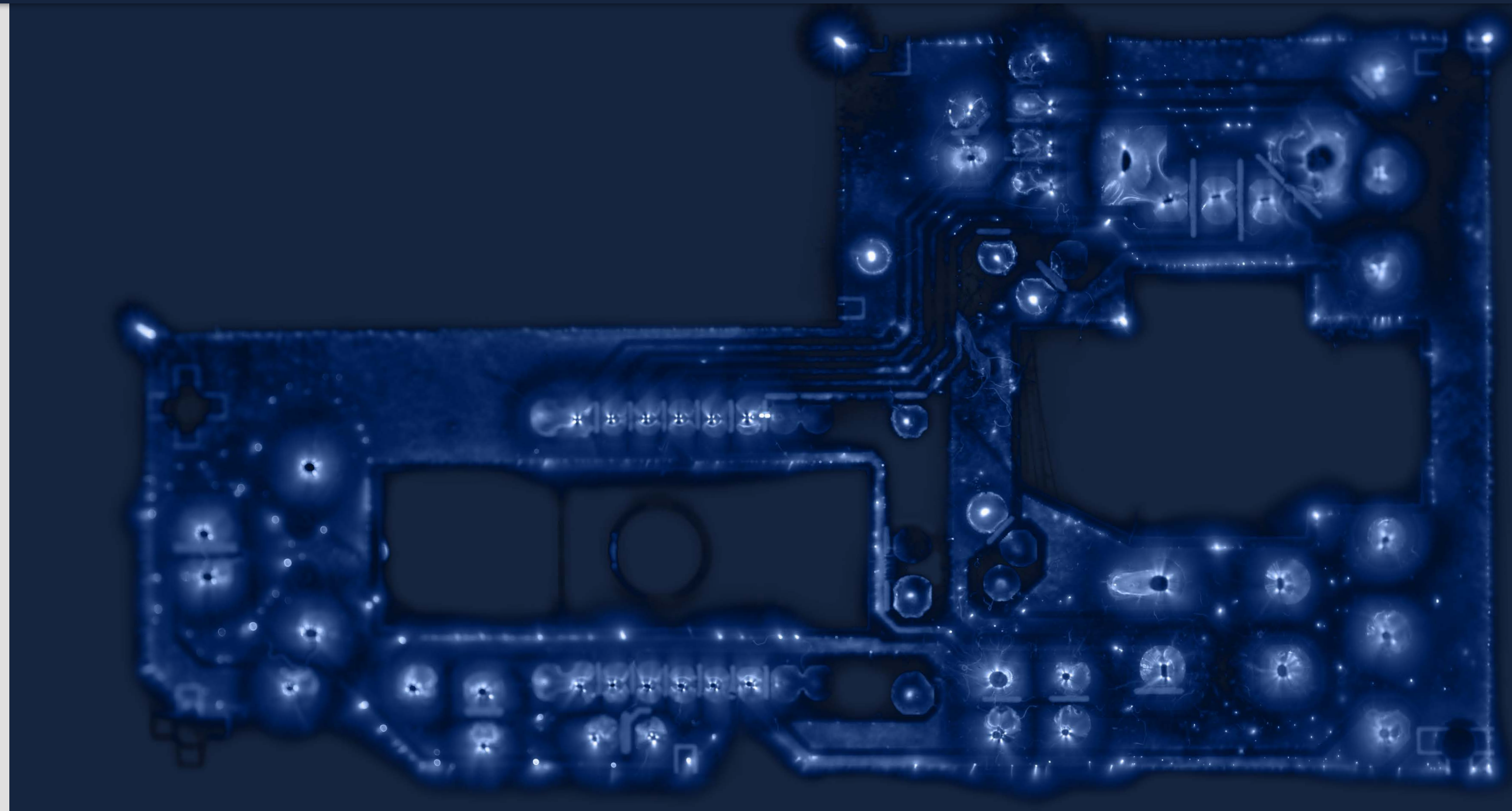


Image: Computer component under the Kirlian effect



Vinny Sanchez
Partner,
Chicago and
Los Angeles



Paul Allen
Partner, Dubai



Kit Burden
Partner, London



Mark O’Conor
Partner,
Global Co-Chair,
Technology Sector,
London

Who is driving change?

Although in past editions of our report we have surveyed opinions on many of the digital technologies companies are deploying to transform their businesses – internet of things, connectivity, AI and robotics and 5G, for example – this is the first time we’ve asked them about the overall process of digital transformation.

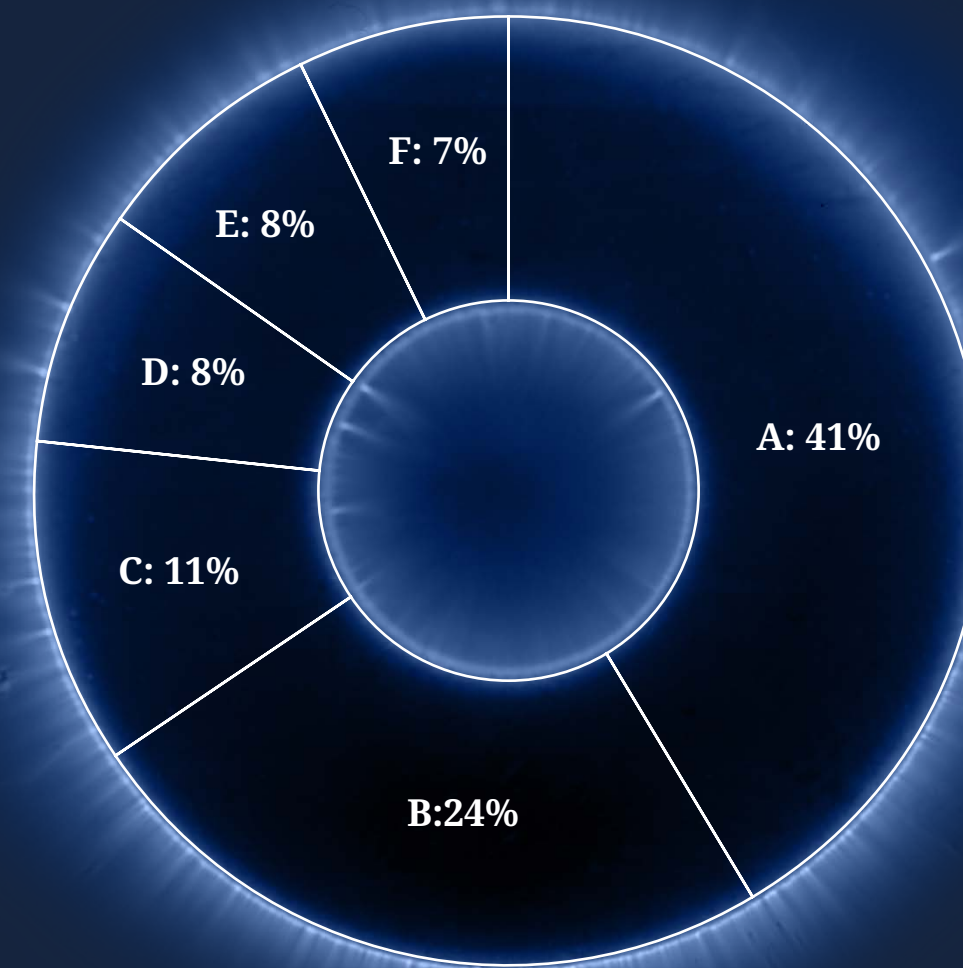
We wanted to find out what benefits and challenges they see in digital transformation and who they think is driving change in this important area. Some of the answers were surprising.

Digital transformation involves profound change and is, by its nature, highly strategic. Any initiative that fundamentally changes the business model requires sign-off from the management team. Executives should be right at the forefront of any major digital transformation.

So, it’s surprising that less than one in ten companies in our survey believe senior management are the main driving force behind it.

In many cases, transformation is all about meeting changing customer expectations in new, more compelling ways. So, once again, it’s curious that only 8% of our respondents say that customers are driving digital transformation, with the same small proportion saying that internal customer service teams are providing the impetus.

Source of drive for digital transformation



- A:** Internal IT teams
- B:** Third party suppliers
- C:** Internal marketing teams
- D:** Internal customer service teams
- E:** Customers
- F:** Senior management team

For around four in ten businesses, the drive for digital transformation is coming from internal IT teams. For around a quarter, this drive is coming from third party suppliers.

Instead, four in ten businesses believe that the IT function is driving change, while about a quarter say it is third party suppliers.

Customers do feature more prominently when respondents are asked to pinpoint the greatest benefits of digital transformation. Better communication with end customers, responding to customers changing needs in the digital age and achieving faster time to market for new products and services, all feature in the list of benefits.

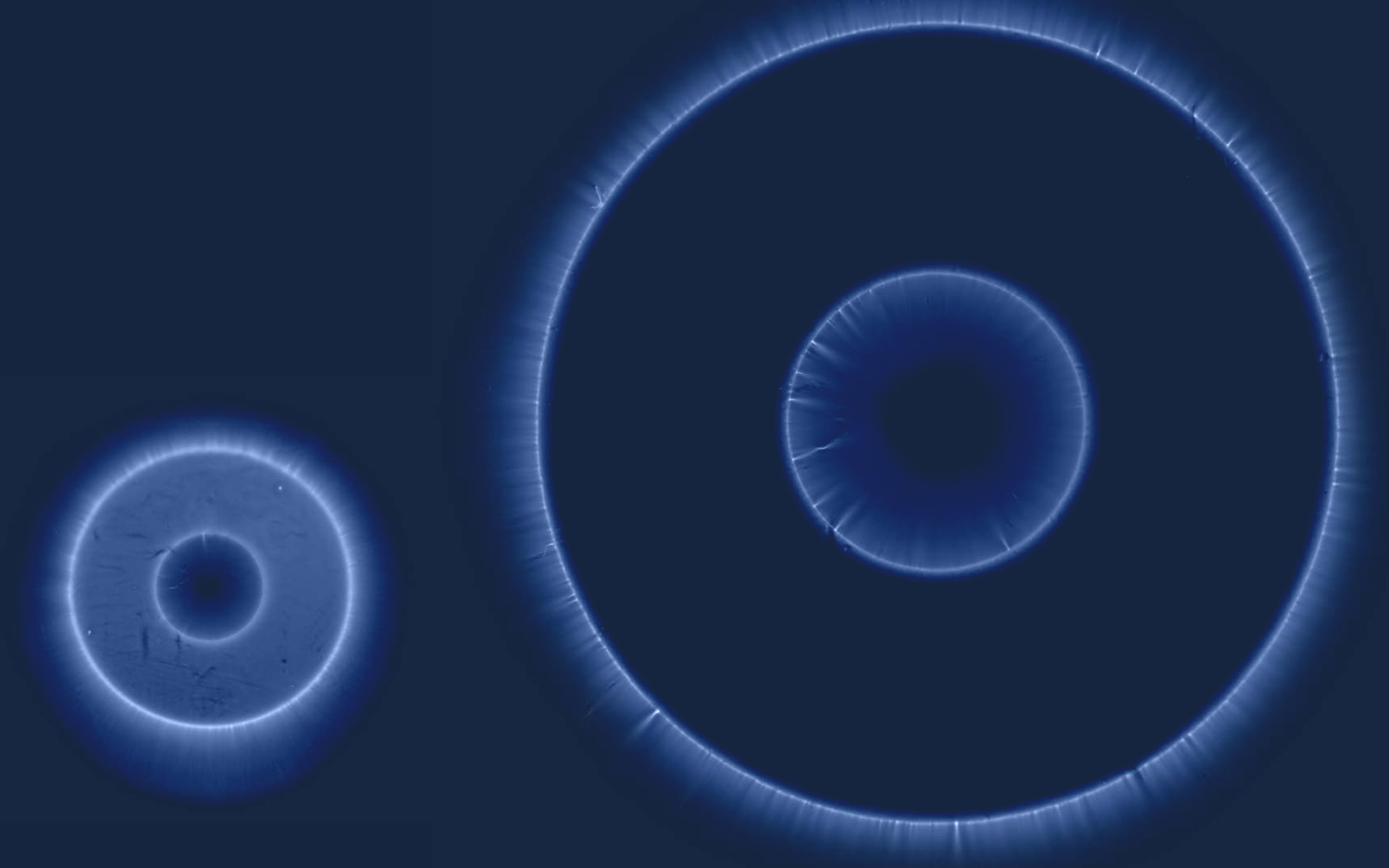
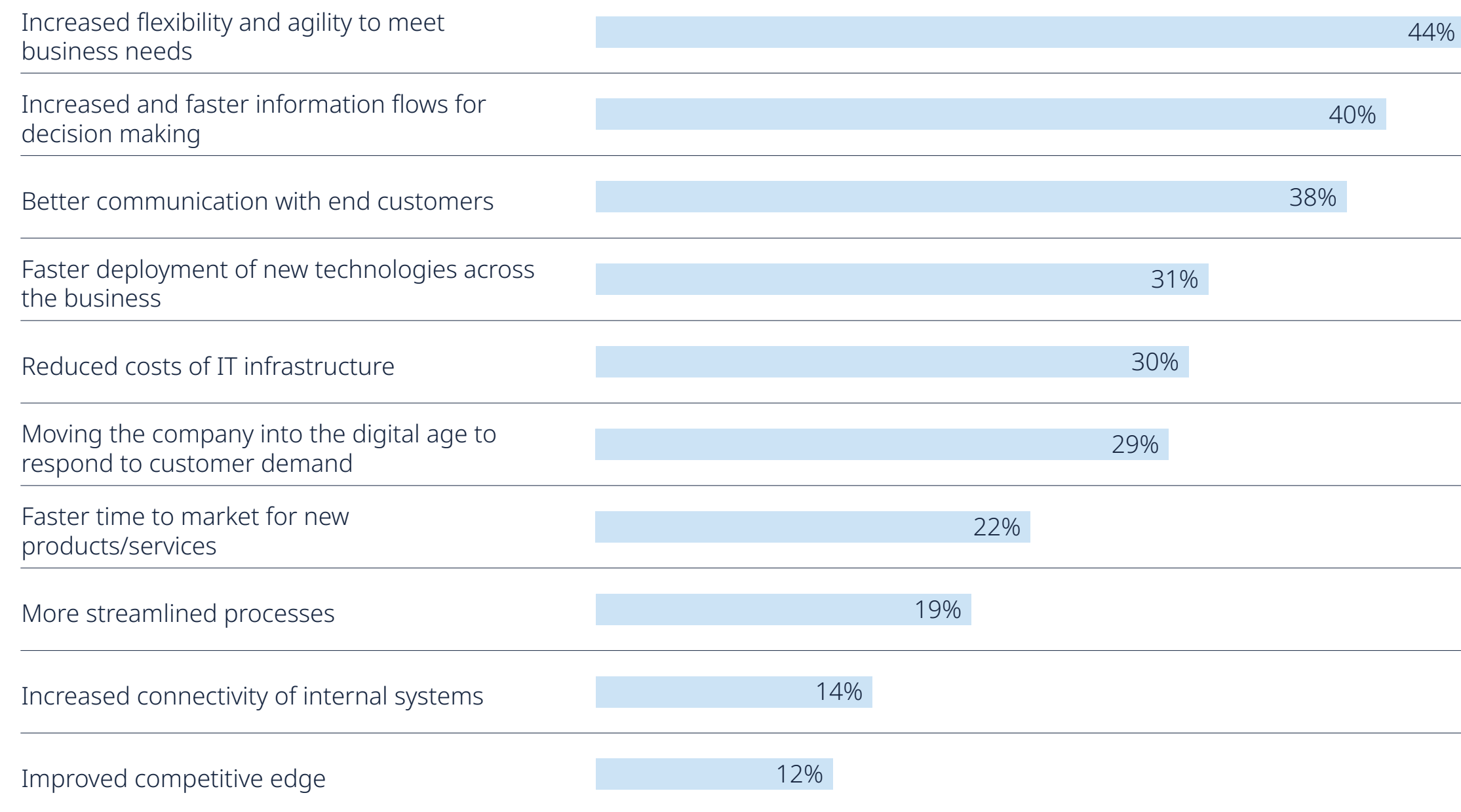


Image: Computer component under the Kirlian effect

Greatest benefits of digital transformation

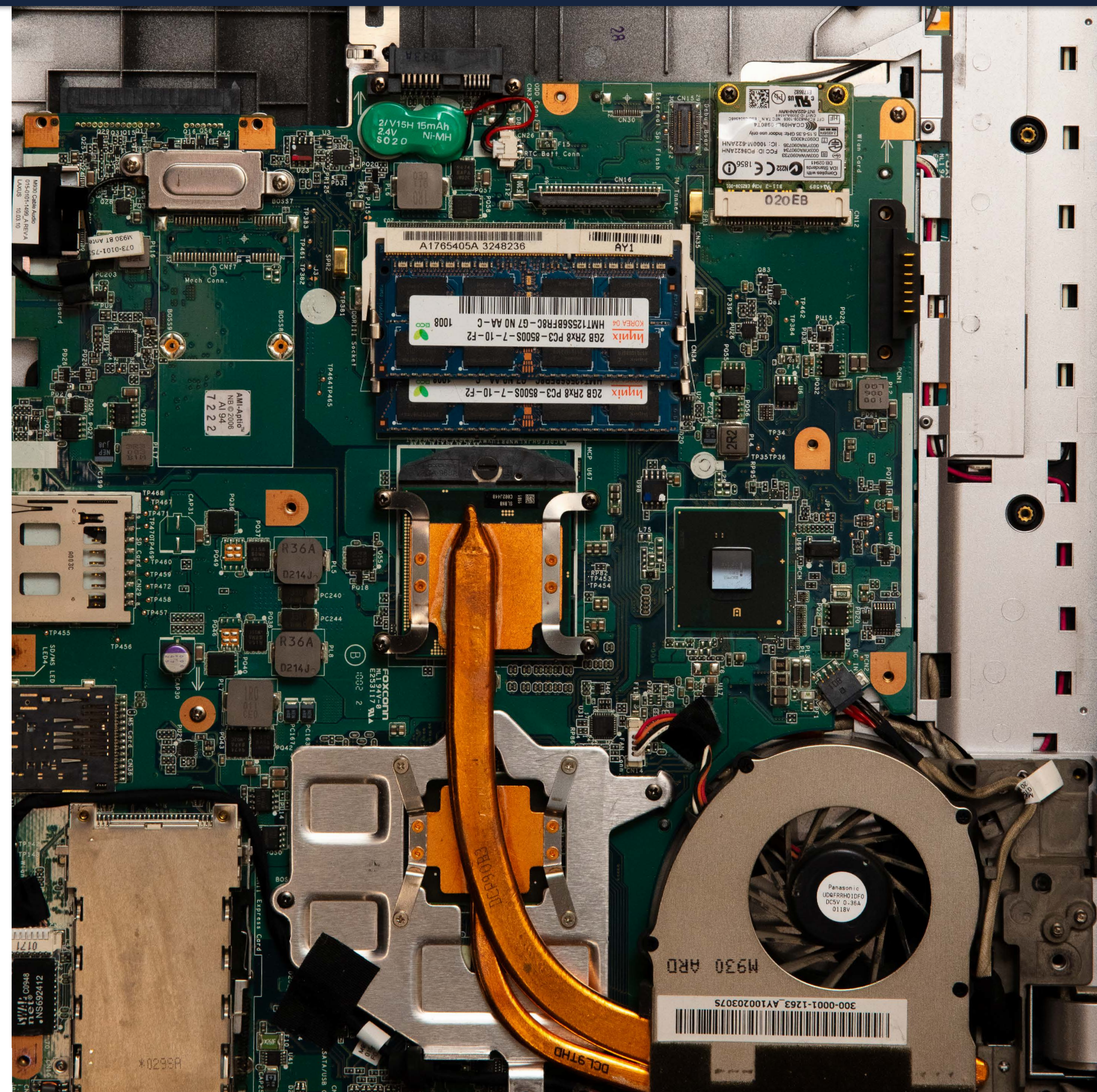


2022

The greatest benefits of digital transformation are seen to be increased flexibility / agility, better / faster information flows and better communication with customers.

Achieving competitive edge, often a key motivation for many of our clients embarking on a program of deep transformation, also comes low in the list of perceived benefits, identified by just 12% of businesses in our survey.

Instead, increased flexibility and agility to meet business needs and enhanced decision-making thanks to faster information flows are seen as the chief benefits, identified by around two-fifths of businesses. Clearly the ability to harness data is key in this regard. Not for nothing is data now often referred to as “the new oil.”

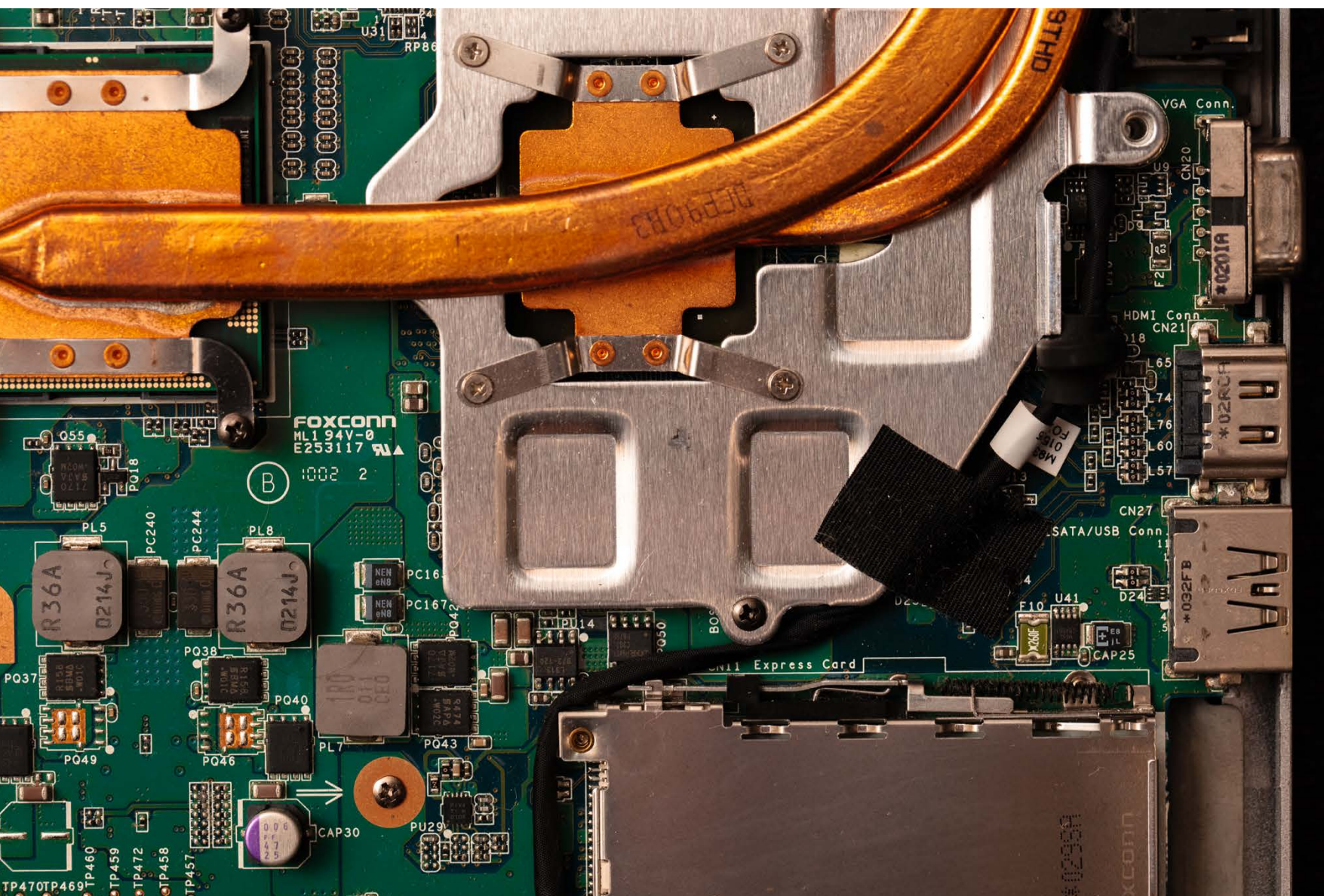


Security tops the main challenges

Exposure to greater security risks is identified as the most significant digital transformation challenge, and by quite a wide margin.

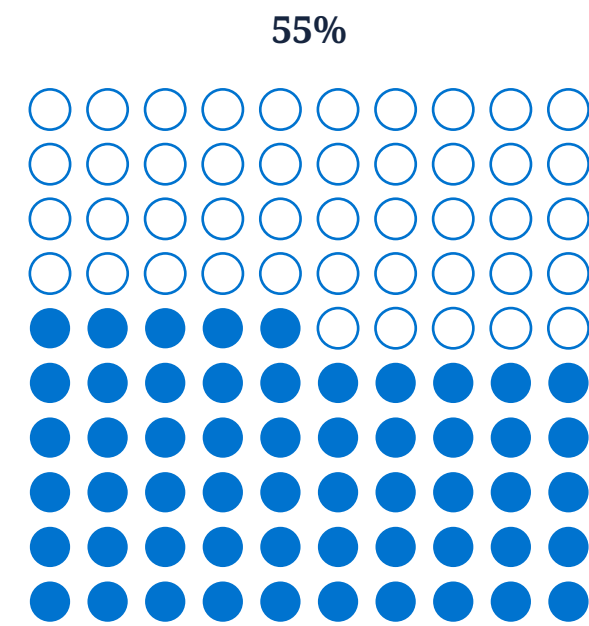
Over half of our respondents put this at the top of the list of challenges, ahead of the cost of disrupting the existing business (41%) and finding the right partner to work with (38%).

Given the intense war for talent we are seeing in the tech sector, it is not surprising to see lack of expertise and skilled staff featuring high up on the list of challenges. Two-fifths of our respondents pinpoint this as a concern.

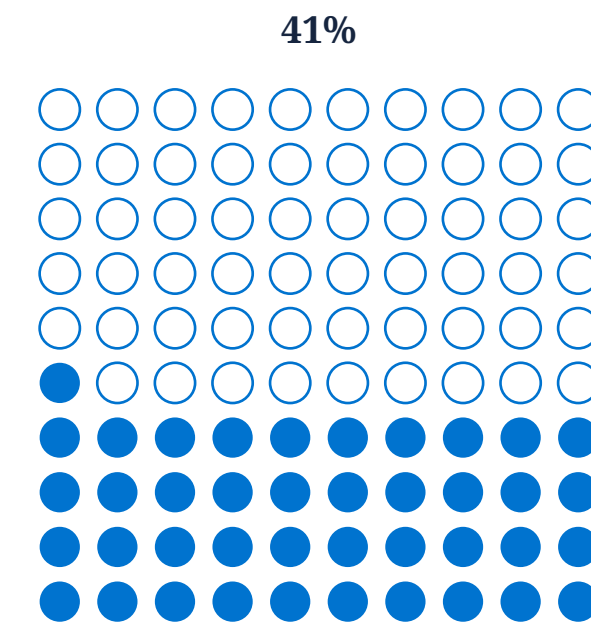


Key challenges to the implementation of digital transformation

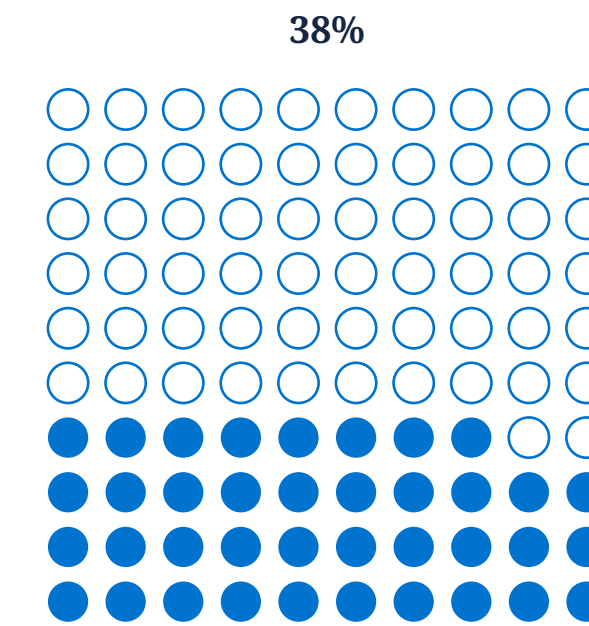
● 2022



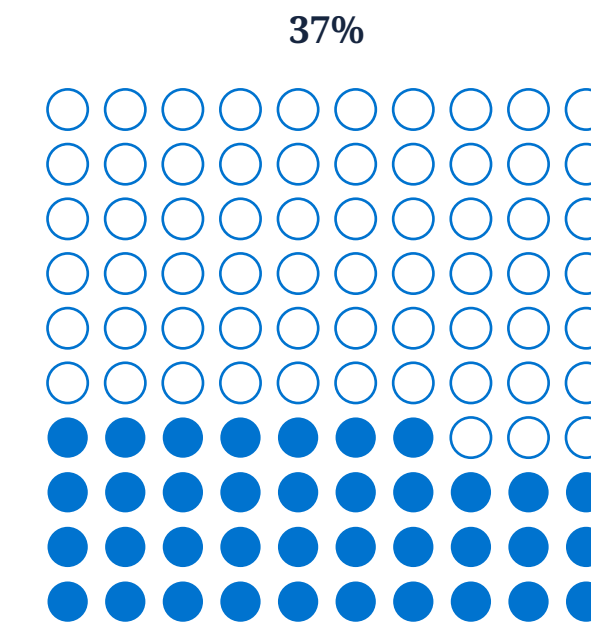
Exposure to greater security risks in a digital world



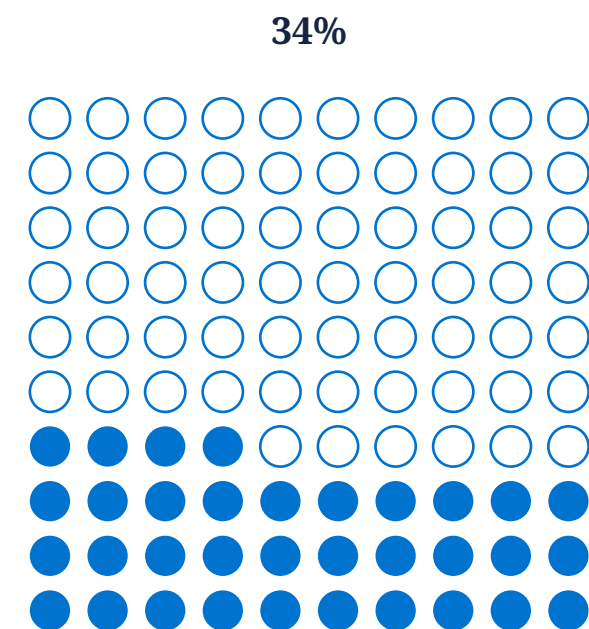
Cost of disruption to the business



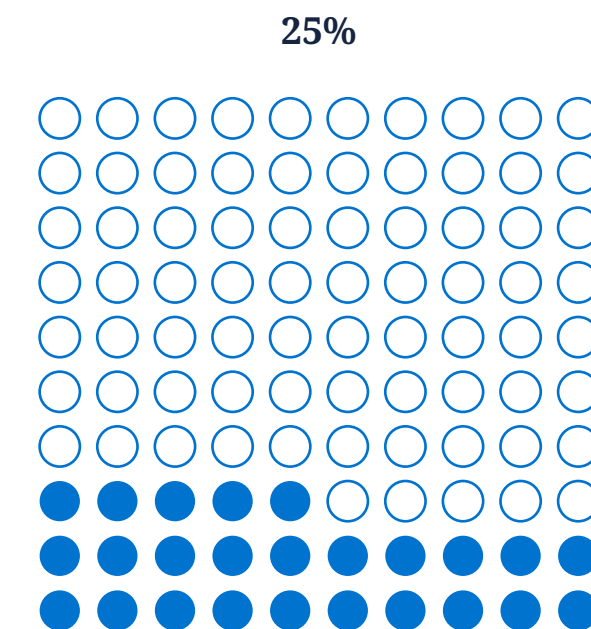
Finding the right partner



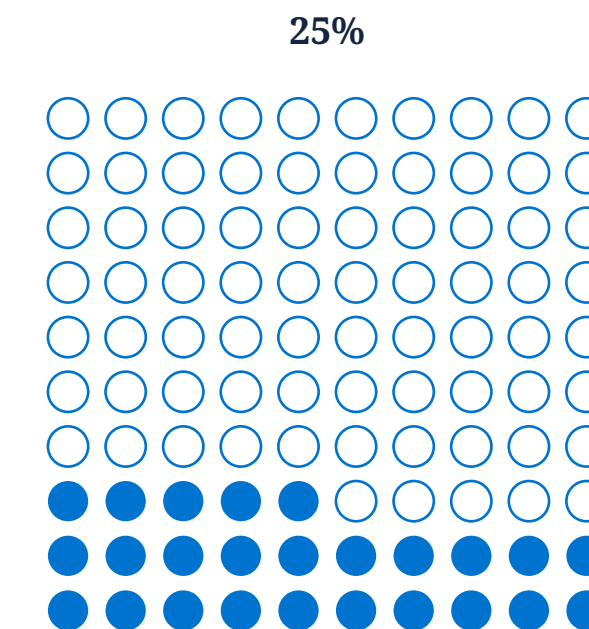
Lack of staff expertise/skills



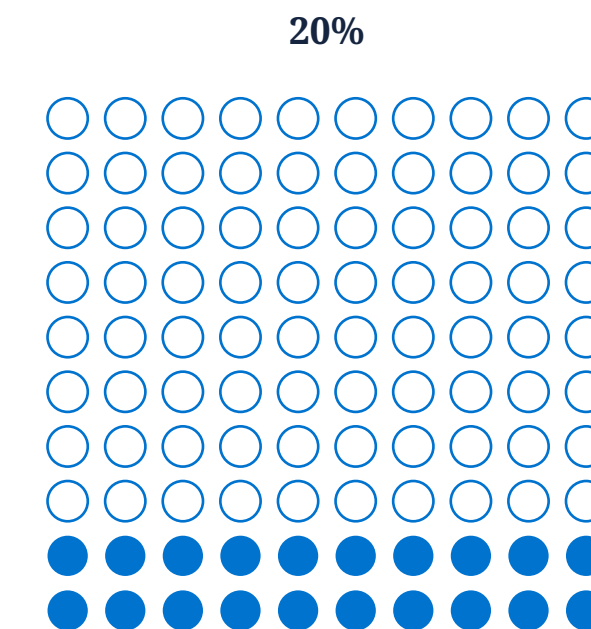
Difficulties integrating new and legacy systems



Level of investment required



Unforeseen downstream issues adding cost to implementations



Incompatibility of new technology

Exposure to digital security risks stands out as the key challenge to implementing digital transformation, followed by the cost of business disruption and issues around finding the right partner and lack of staff expertise.

Governments and regulators as enablers

Although companies across sectors are grappling with digital transformation, activity is particularly intense in key industries. Often that will depend on companies having the right political and regulatory environment to pursue fundamental change.

At key points in the development of the digital economy, action by governments and regulators has spurred companies to invest in emerging technologies and given consumers the confidence to use them.

We saw that in the late 1990s and early 2000s with the commercial advent of the internet. A raft of regulatory reforms – including early data protection laws, distance selling regulations, new rules around electronic transactions and cybersecurity – helped to engender trust in the online environment to allow ecommerce to fire into life.

Similar reforms have underpinned the transition from bricks and mortar to online digital commerce. However, we are now at another key moment, where government action and regulatory change will again prove critical. The advent of Web 3.0 technologies and the metaverse offers the potential for profound change in the next five to ten years, both socially and in the business environment.

Governments are just beginning to introduce regulatory reforms to unlock the potential of Web 3.0 and the metaverse and to address inevitable new challenges around security that they may unleash. At the same time new regulatory regimes are being built to support the development of AI and other technologies, like 5G, that will be important enablers as virtual and real worlds overlap.

Efforts to tackle climate change and speed up the development of green energy technologies is another area where we see huge potential for digital transformation. Here again government intervention will be vital in boosting innovation and speeding change. It's significant that new US legislation agreed in August this year has earmarked hundreds of billions of dollars to speed up the development of clean energy technologies and electric vehicles.

More immediate challenges have also forced some sectors to embrace transformative technologies that enable new business models. The COVID-19 pandemic has reshaped the retail landscape, massively accelerating the growth of online shopping as the traditional giants of the sector look for ways to hold off disruptive new players in the market.

Similarly, the airline industry is struggling to recover from the shutdown of travel during the pandemic, having laid off thousands of workers. Many carriers are seeing this as an opportune moment to look again at their business models, asking what role digital transformation can play in helping them achieve a sustainable recovery from the biggest crisis in the industry's history.

The lesson from businesses that have benefited most from digital transformation so far, or that are best placed to benefit in future is clear. For digital technology to be truly transformative, change needs to be real and radical.



M&A

Search for talent and technology powers M&A

Tech transactions dominated record-breaking global M&A activity in 2021 and continue to be a dominant theme in 2022, even though the market has cooled in the face of growing economic and political uncertainty.

Despite the current turbulence, companies continue to see important potential to create value and achieve growth through acquisitions.

We're seeing a sharp increase in "roll-up" transactions led by private equity investors and their portfolio companies, for example. Often this will involve making a series of bolt-on acquisitions where the acquired businesses can achieve an immediate boost in valuation if bought by a larger business trading at a much higher multiple.

Increasingly, tech companies are seeing this as an interesting route to take as they plot their M&A strategy.

Our survey provides clear evidence that the main motivation for acquiring external businesses continues to be access to new technology. Strangely, a differentiation is made in the data between accessing technology and IP, which comes much lower down the list of perceived benefits. In legal terms they are one and the same thing.



Image: Coins under the Kirlian effect



Trent Dykes
Partner,
Global Co-Chair,
Technology Sector,
Seattle



Daphne Bens
Partner, Amsterdam



Ed Griffiths
Partner, London



Omar Khabbaz
Senior Advisor,
DLA Piper
Business Advisory,
London

Most beneficial features from the acquisition of an external company

	50%	45%	44%	43%	36%	25%	22%	21%
2022								
2020								
	51%	44%	45%	40%	39%	22%	25%	22%
	Access to new technology	Defensive move to prevent competition acquiring asset	Establish a presence in a new / related market	Speedy acquisition of market share	Ability to scale at pace	Access to an additional talent pool	Opportunity to rationalize parent company cost base	Acquisition of Intellectual Property

The key areas of benefit from the acquisition of an external company are broadly in line with those identified in 2020. Speedy acquisition of market share has become slightly more important and ability to scale at pace slightly less important.

Image: Copper foil under the Kirlian effect

The war for talent intensifies

Speedy acquisition of market share and access to much needed talent are now seen to be of growing importance, with the latter moving from 22% in 2020 to 25%. It's worth noting that, when asked about the key technological challenges of acquiring an external company, respondents put mitigating gaps in skills and resources at the top of the list of their concerns.

The war for tech talent is intense and as a result we are seeing acquirors increasingly paying generous retention bonuses over several years to keep key technical staff on board.

But it's not all about money. Increasingly employees are concerned about corporate purpose and look to work for organizations that reflect their personal values on social and environmental issues.

Some sectors, notably fossil fuel companies, feel this most acutely as public pressure to tackle the climate crisis grows.

But employees are asking tech companies similar questions about their ESG and sustainability agendas. Employee activism is on the rise, with staff coming together and speaking with one voice when a business is perceived to have made a misstep on issues such as diversity or data use.

Defensive strategies?

One surprise in the findings is how highly respondents continue to rank making an acquisition for defensive purposes, up one point to 45% in 2022. As tech companies continue to expand their capabilities, defensive M&A has been used to safeguard markets and maintain competitive advantage. Potential defensive strategies include:

- M&A targeted at operational synergies to improve efficiency and unit cost reduction; and
- opportunistic deals which seek to protect the core business.

In some cases, large corporates may buy up several early-stage businesses, which can mitigate the risk of a credible competitor eventually emerging. With antitrust authorities increasingly alert to the risk that promising businesses being acquired larger players may dampen potential future competition, defensive M&A can give rise to particularly acute regulatory challenges.

Whilst boards may be more enthusiastic about M&A with a more obvious growth focus, it is clear that defensive M&A will be an ongoing feature in the sector and corporate development teams need to be able to articulate the pros and cons of such activity.

Elsewhere we continue to see acquisitions being made to gain access to a key technology which would otherwise have to be developed in house. And, in an environment where achieving organic growth is difficult, transactions can be the fastest way to gain market share and boost revenues.

Cultural integration, leadership and smaller deals are big challenges

The market shift towards smaller more frequent acquisitions has brought a unique set of challenges which tech companies will now need to navigate, or risk a reduction in their competitive edge. In overcoming these challenges, the odds of deal success improve when an acquirer is proactive with its integration strategy.

Nearly all the drawbacks to acquiring an external business identified in our survey relate, in one way or another, to the complexities of integration.

Integrating incompatible systems, achieving promised cost savings, diversion of funds from other projects and integrating working practices and culture all rank highest in the list of drawbacks.

Tech companies internal teams are under time pressure to assess the benefits of numerous targets and strategies and then complete multiple acquisitions within a short time span. With limited time available for due diligence

and necessary planning for the successful integration of capabilities this in-turn can cause issues realizing synergies.

Acquirers are increasingly seeking external expertise to aid with thorough pre-deal, integration and post-deal due diligence. In our experience acquirers who have:

- a clear strategic plan and adopt a relatively rigid deal thesis and costed integration plan are most likely to ensure optimal use of finances and other resources; and
- a detailed M&A review system can help with identifying areas for improvement for transaction planning and integration as the acquirer evolves.

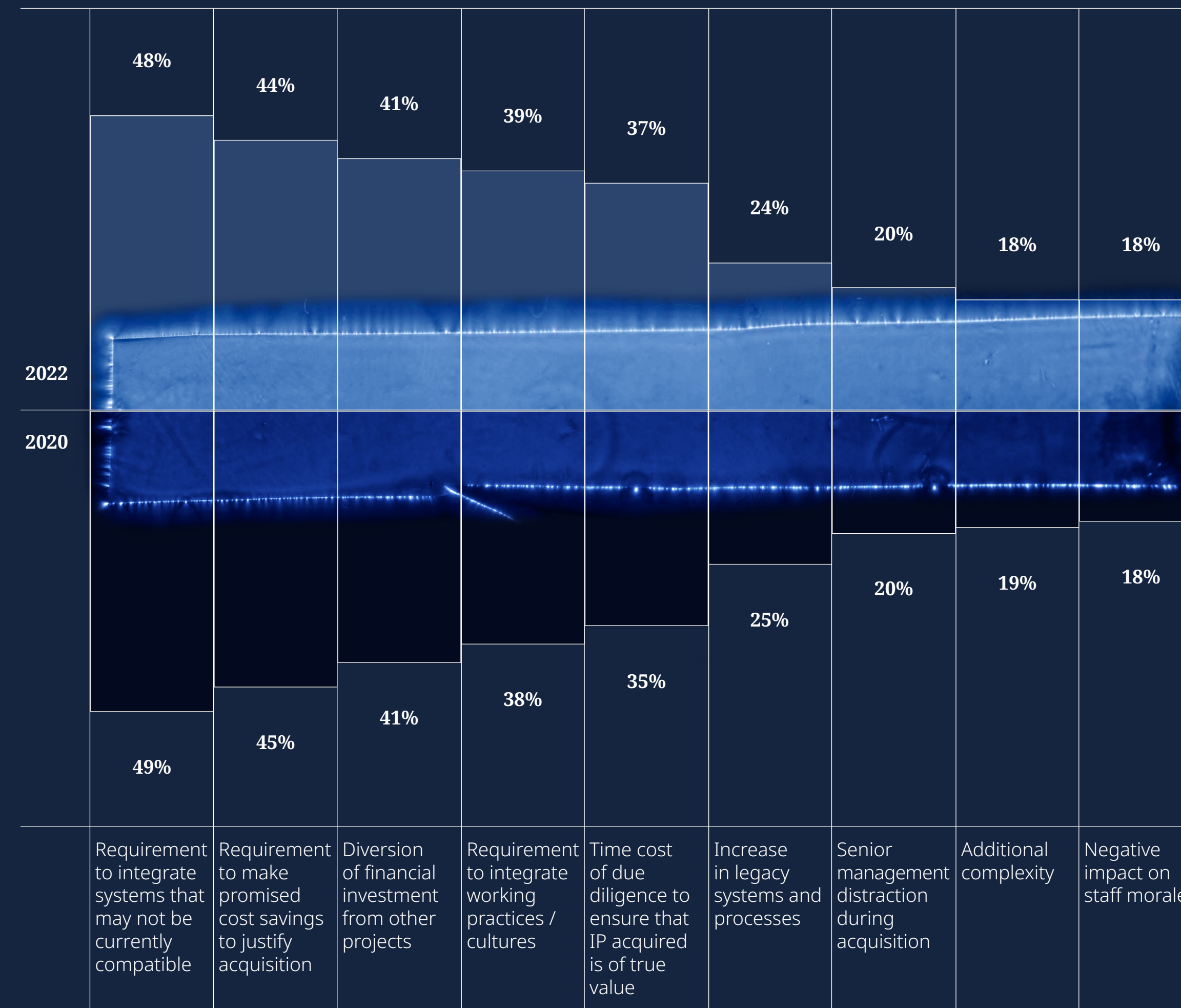
Culture clashes between large, well-established and sometimes slow-moving companies and the nimble young companies they are buying are often a major hurdle to successful integration.

Key staff may well leave the merged business as these differences in culture manifest themselves, and even those offered incentives to stay will often be counting the days until their contractual obligation to remain expires.

That's not always the case, of course. Many young businesses see rewards from being part of a larger business and relish the opportunity to continue developing in a new and better resourced environment.

There are leadership challenges on both the buy and sell sides of a deal. For small companies being sold, a deal will inevitably be a major distraction. If successful, that

Biggest drawbacks from acquisition of an external company



The biggest drawbacks of acquiring an external company remain the requirements to integrate systems and to make cost savings and the diversion of investment from other projects.

Image: Copper foil under the Kirlian effect

distraction can be easily justified. But if the deal falls through, important sales targets can be missed at a critical point in the company’s development, simply because management have taken their eye off the ball to focus on the transaction.

From the buy side it’s important that the integration process continues to be led by the executive who initially sponsored the deal. If a CEO who had the initial vision subsequently leaves the business, the integration can easily go off-course and even fail if the new leader is focused on other priorities.

Often difficult integration issues only become evident when the deal has been completed, especially in the context of carve out deals. In such deals, carefully constructed transitional services agreements (TSAs) can really help to surface such issues ahead of time.

Sitting alongside the sale and purchase agreement, the TSA can assist with the integration process by providing a schedule of tasks that need to be done, particularly around some of the key technological challenges identified in our survey, such as managing data and integrating working practices or cybersecurity protocols.

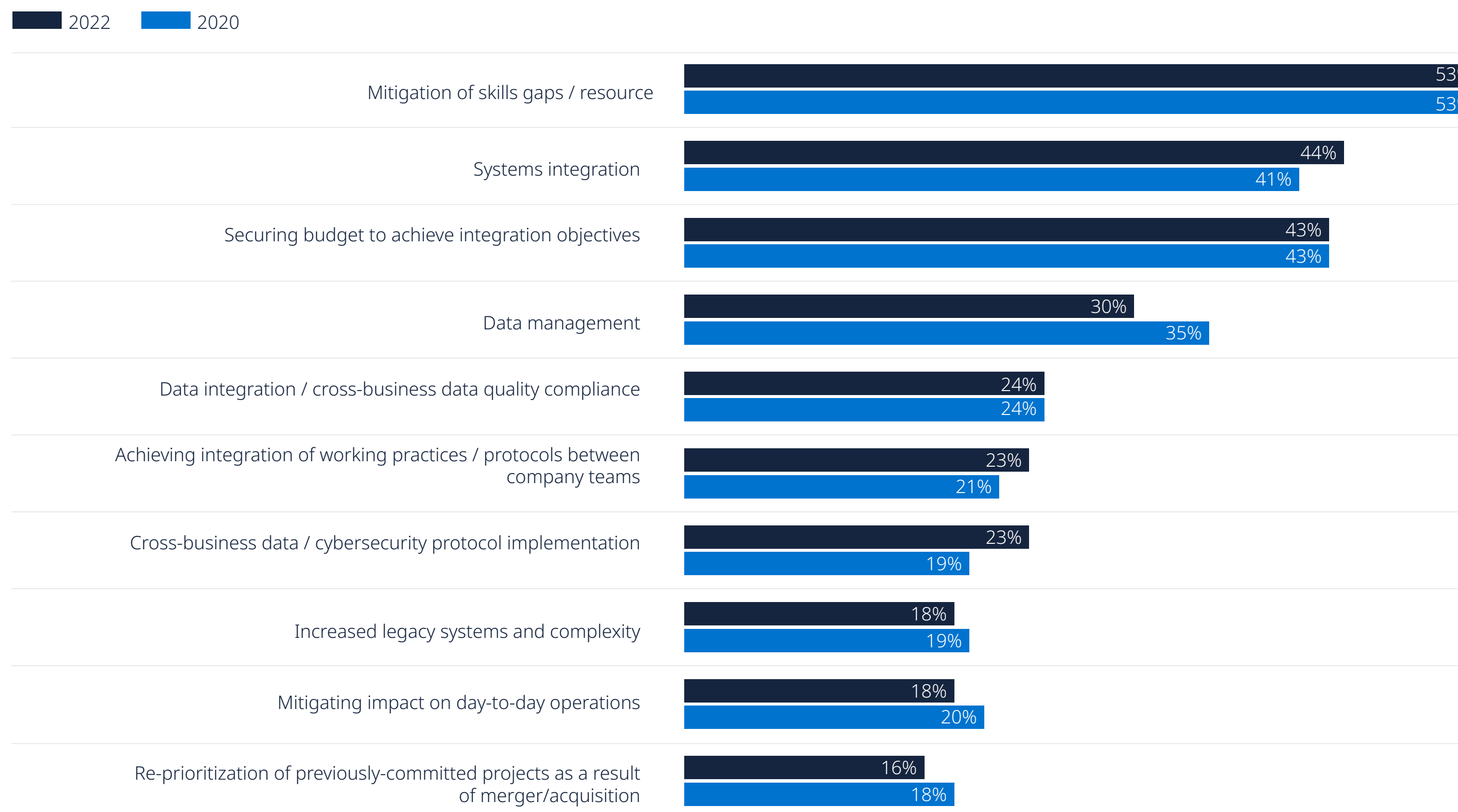
National security controls

Although respondents to our survey express increased confidence in the overall regulatory environment, this belies the growing regulatory complexity dealmakers are facing around foreign direct investment on national security grounds.

Across the globe controls are being tightened dramatically, including in the US, Australia, the UK and in most EU Member States. Dealmakers are having to interpret the different approaches being taken at a national level to make sure they comply with often stringent, but sometimes conflicting, FDI controls.

Technology companies are often in the firing line of these ever-stricter regimes, since their products and services are easily categorized as vital infrastructure or as highly sensitive from a national security perspective. Navigating these complexities is far from impossible – deals still go through having passed national security checks. But the task has certainly become a great deal more difficult.

Key technological challenges when acquiring an external company



Key technological challenges related to acquiring an external company include mitigation of skills gaps, systems integration and securing budget. Data management is now seen as less of a challenge than in 2020.

5G

National security concerns dominate

Despite all the benefits promised by more capable 5G networks, the headlines around this technology have, in the last few years, been dominated by another issue – national security.

Security concerns around telecoms infrastructure are nothing new in the international arena, but these have escalated surprisingly quickly, becoming a major issue in many markets.

Proactively limiting investment from some foreign economies was by no means a new mechanism in the US when the Trump administration intervened in 5G equipment supply from China, a policy that has continued, so far, into the Biden administration's tenure.

Severe restrictions remain in place and a federally funded program to remove Chinese technology from existing networks and replace it with “approved” technology continues apace.

In Europe, some countries, like the UK, have also opted for outright bans and are pursuing “rip and replace” programs too. Such programs reimburse service providers for the cost of replacing equipment and services that pose a national security threat. Others are using broader national security provisions to effectively close off their 5G networks to Chinese vendors.



Mike Conradi

Partner, London



Eric DeSilva

Partner,
Washington, DC

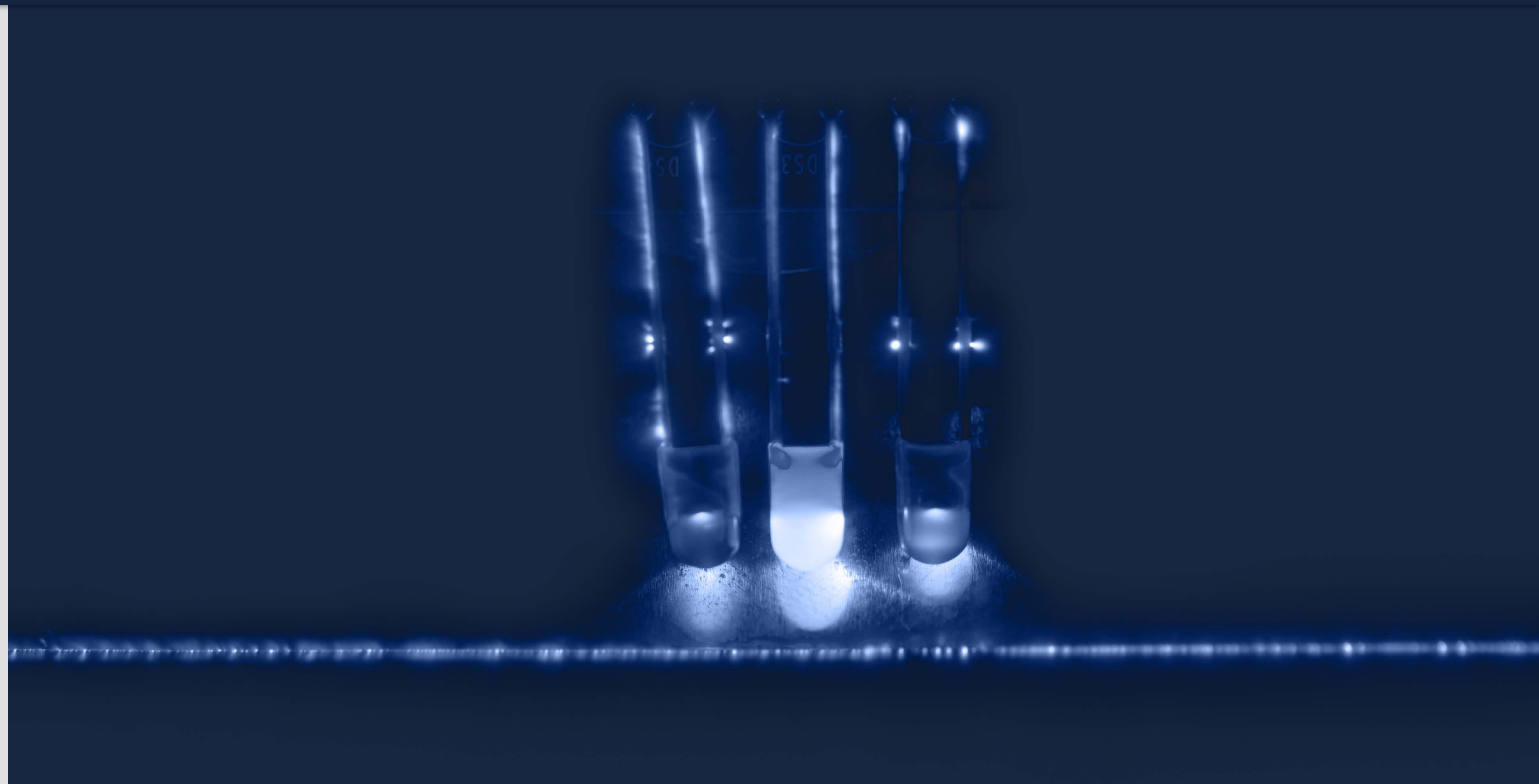
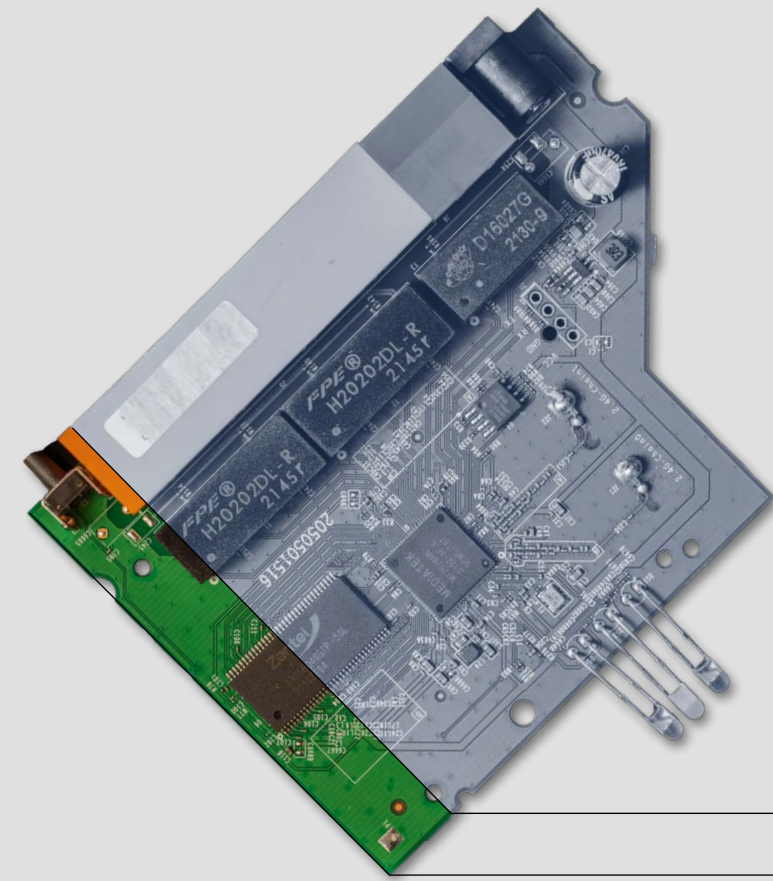
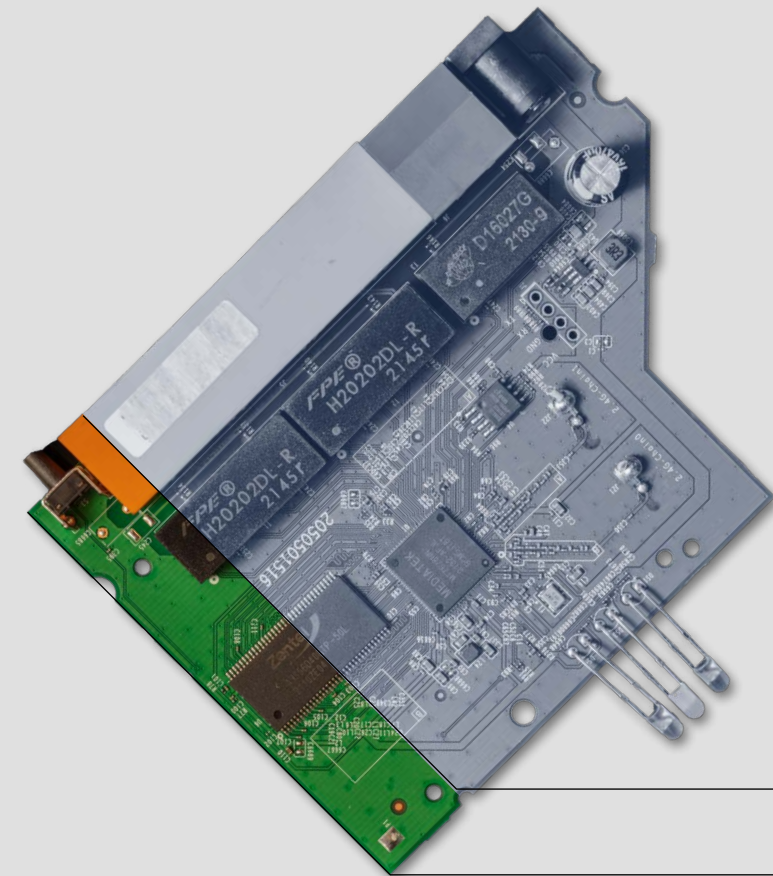


Image: Component from 5G router under the Kirlian effect

Is there enough provision for protection of national security in your country for the introduction of 5G?



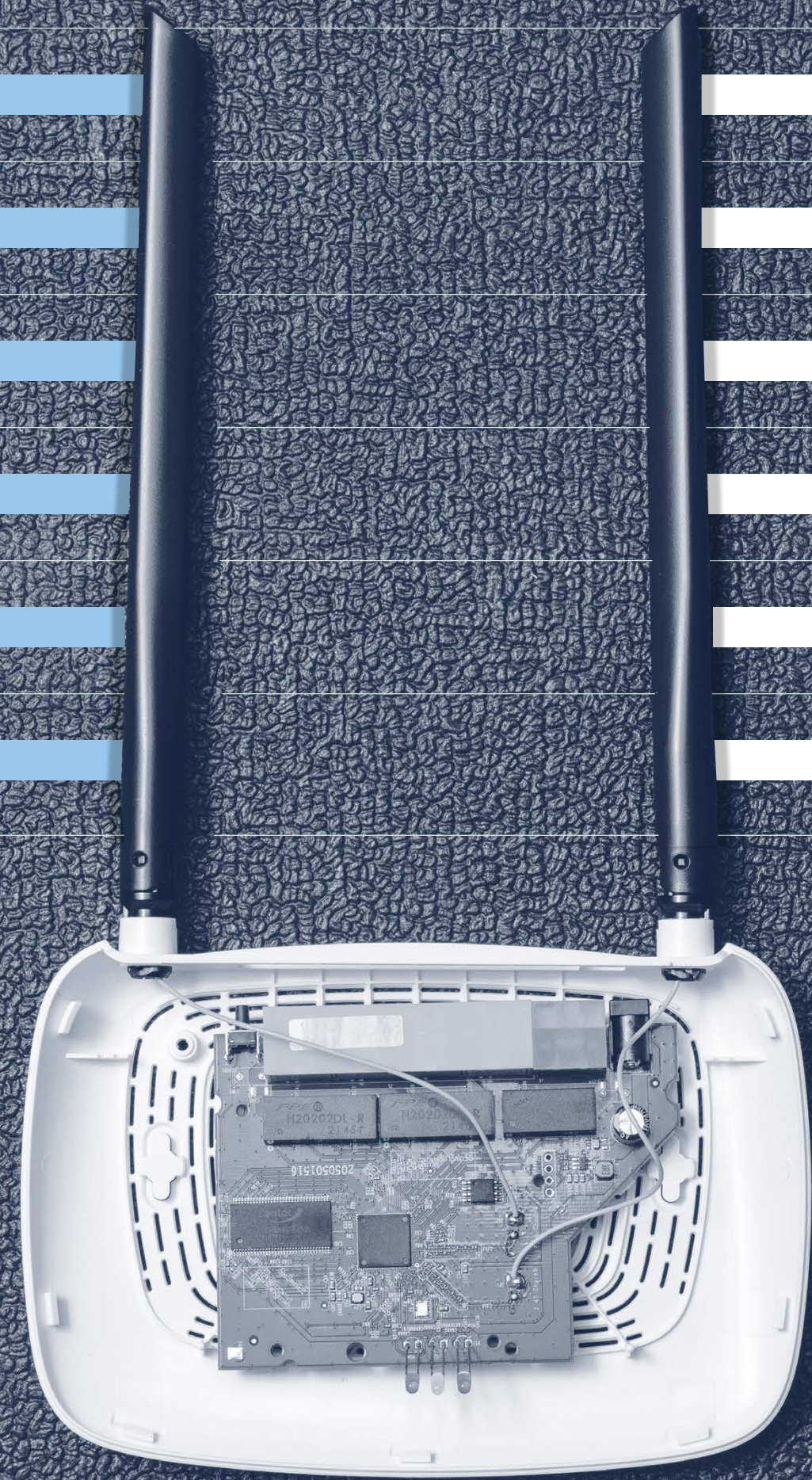
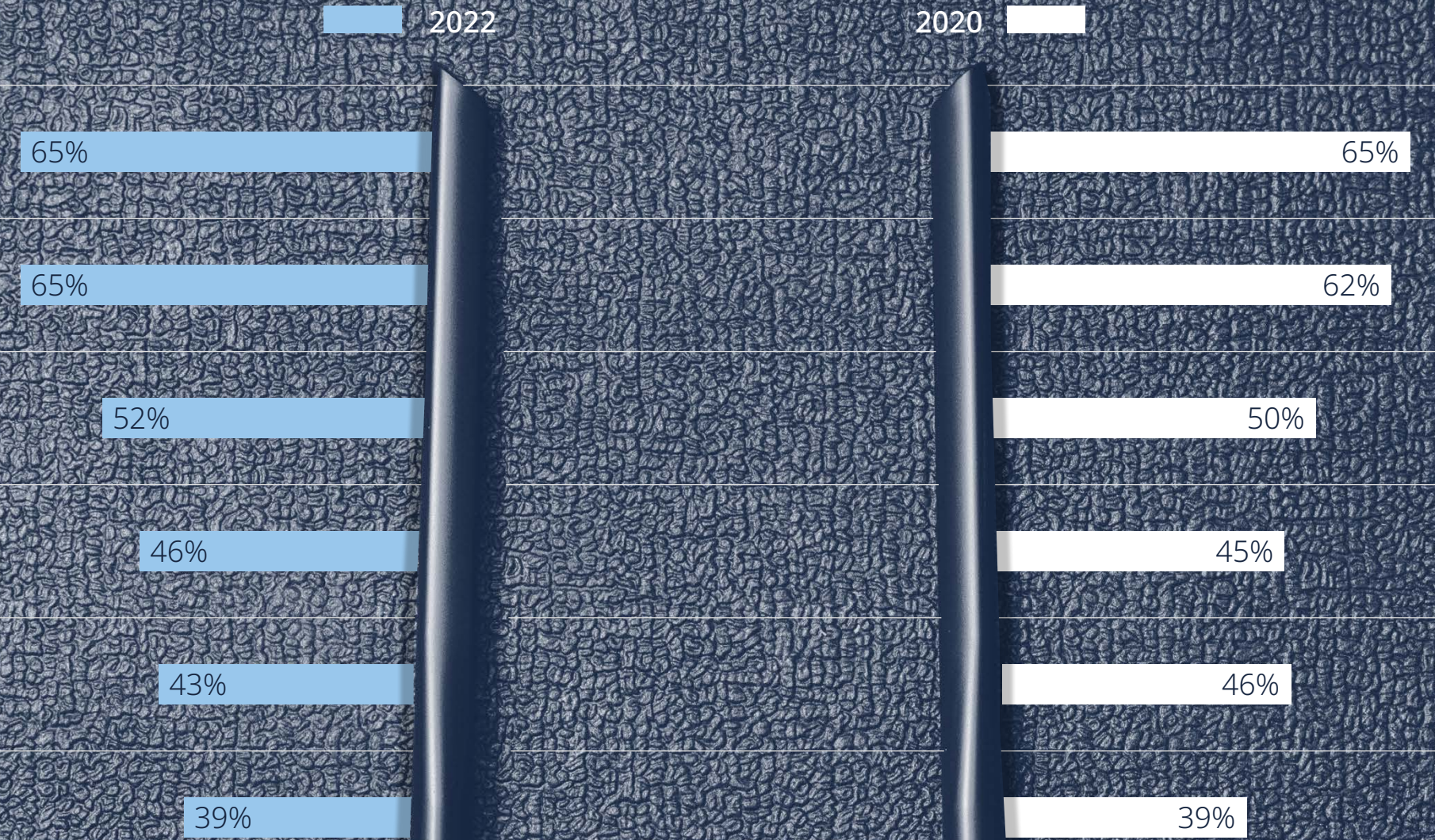
2022
Yes - **80%**
No - **20%**



2020
Yes - **77%**
No - **23%**

Additional measures that should be implemented

- Tighter regulatory controls in infrastructure development / implementation
- Tighter monitoring of supplier risk profiles
- Increased state investment in European / home country infrastructure manufacturers & software providers
- Impose market share cap on non-European providers?
- A ban on Chinese manufacturers providing 5G 'core services'
- A total ban of the involvement of Chinese manufacturers



Market impact

It's not surprising that in our survey some 80% of respondents felt that current restrictions were sufficient to protect national security, up from 77% in our last survey in 2020, given the severity of some countries' current restrictions.

Of the 20% that thought further restrictions were needed, most called for even tighter regulatory controls and more effective monitoring of supplier risk profiles. Over half argued for increased state funding of domestic equipment makers and software providers.

Some non-Chinese vendors see a competitive advantage now that capable and often less costly Chinese equipment is being squeezed out of many markets.

We see no evidence that controls have slowed down the roll-out of 5G, although other supply chain issues have caused delays. The US "rip and replace" program has tended to affect smaller regional and local operators rather than the major telcos and Dish who are leading the 5G charge. But the controls have undoubtedly made the transition to 5G more expensive.

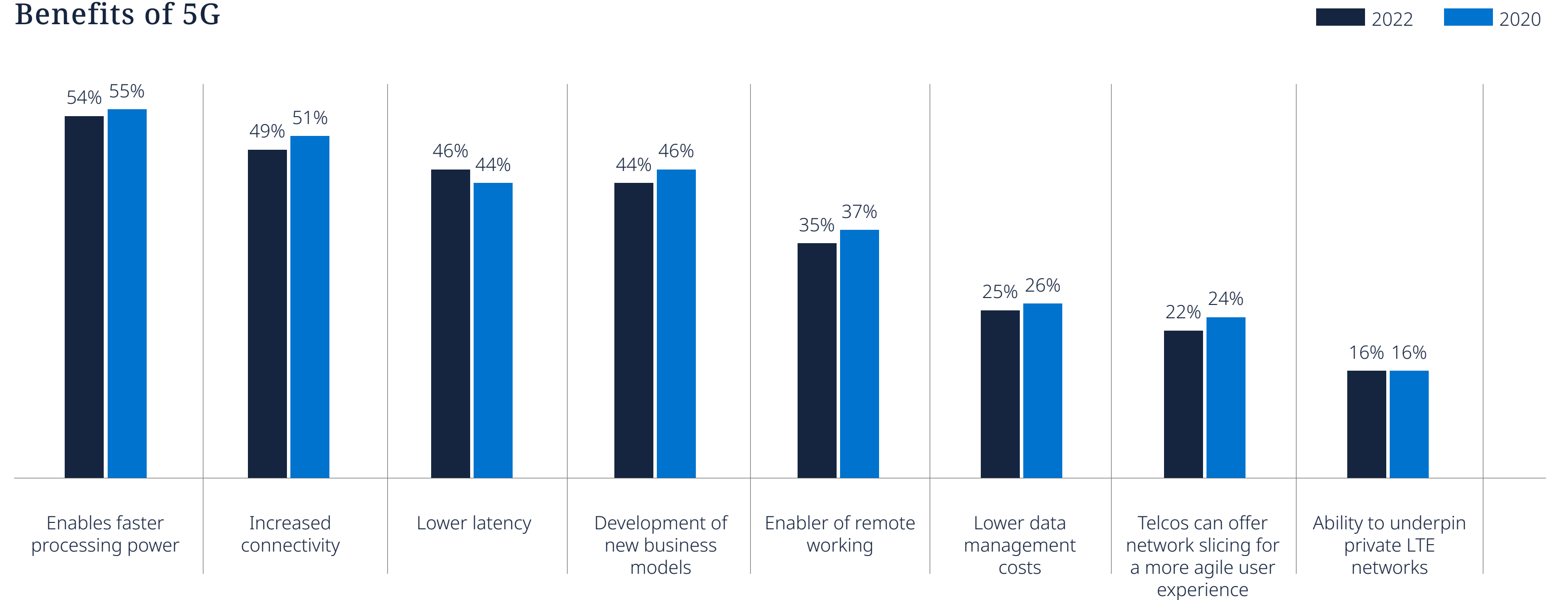
Developing credible use cases

Respondents to our survey continue to see real benefits from adopting 5G technology, including faster processing power, increased connectivity, reduced latency and the ability to develop more efficient business models.

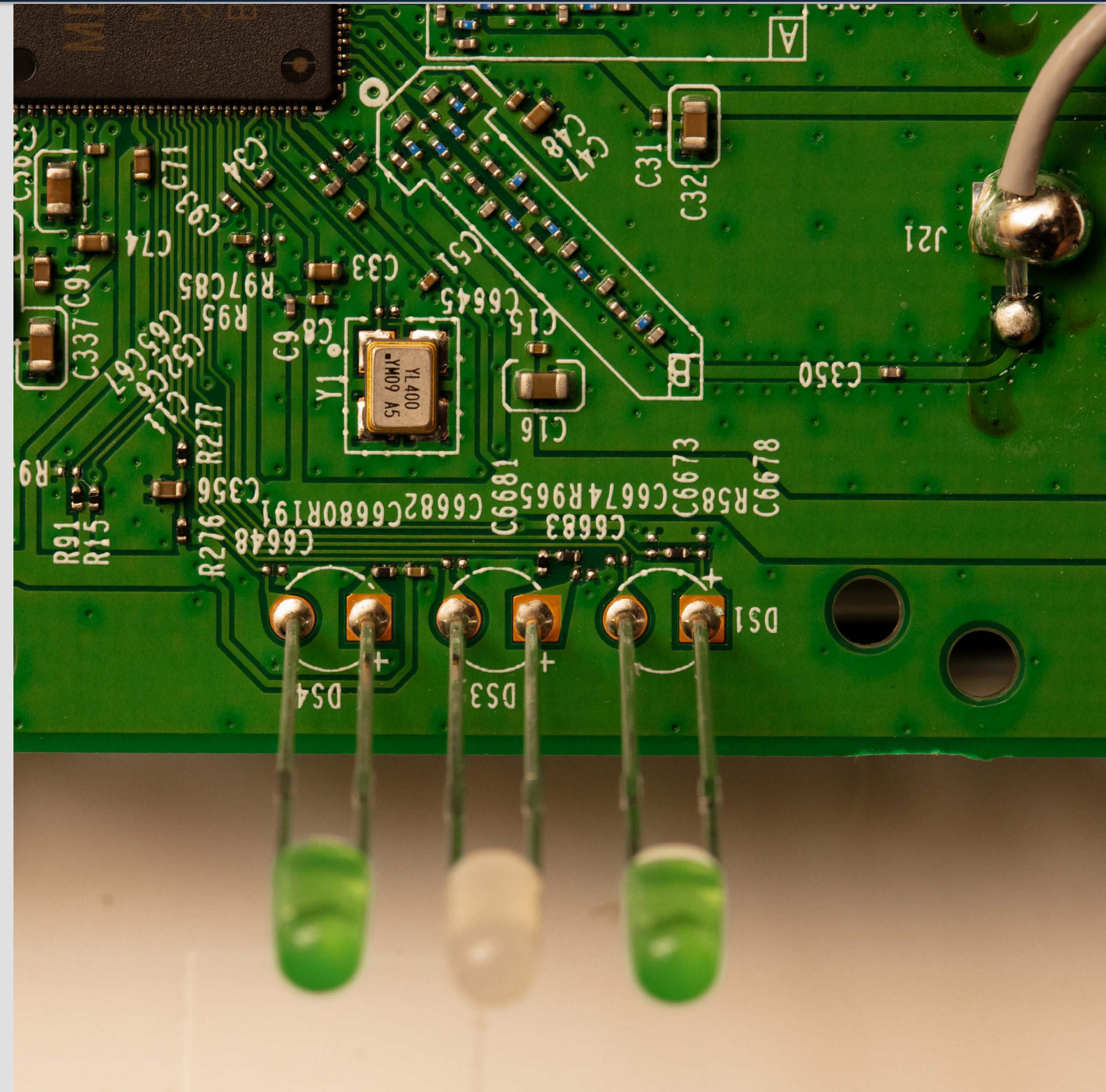
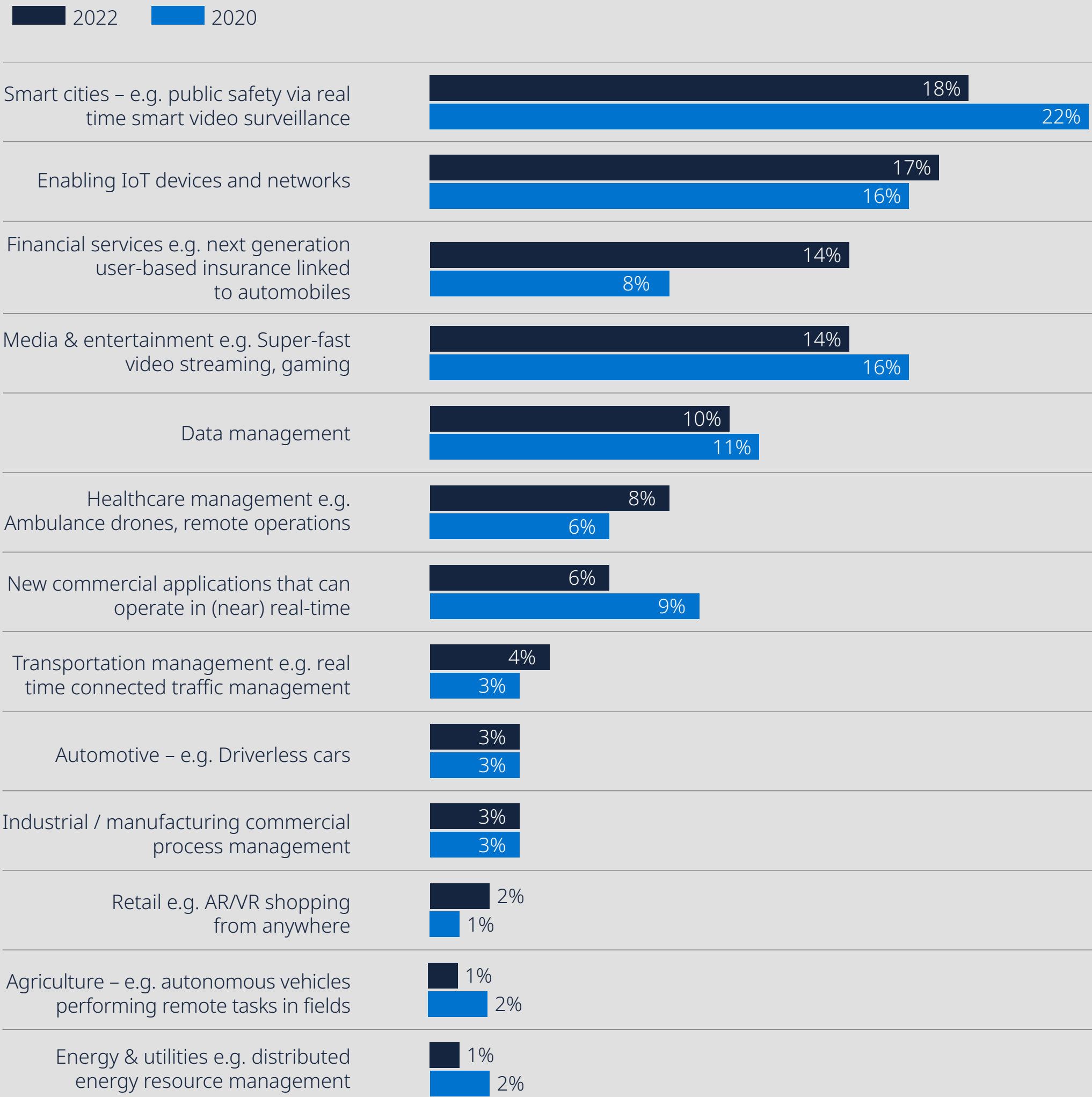
The financial services market is increasingly seen as fertile ground for 5G, with 14% seeing this as a growth area in 2022 compared with just 8% in 2020. That's not surprising given how quickly consumers adapted to using smart phones for payments and online banking during the pandemic.

By contrast, fewer now see smart cities as a key use case (18% in 2022 against 22% two years ago), but 5G does continue to be seen as a key enabler of Internet of Things devices and networks.

Benefits of 5G



Cases where 5G offers most growth potential



Cases where 5G offers most growth potential

One 5G capability where we see most potential and progress is so-called “network slicing,” allowing companies to set up specific, stand-alone enterprise networks. Deployed in a port or factory, such networks allow an operator to run a fleet of automated vehicles and processes via a reliable, centrally supervised network, with obvious efficiency gains.

5G is also having a significant impact in replacing fixed broadband networks, serving remote homes and businesses that couldn't previously be served economically by wired connections. In the US, both T-Mobile and Verizon have introduced services to compete with traditional broadband connections.

But some of the use cases being developed for 5G seem less credible. Some doubt that 5G genuinely has many value-enhancing applications in the driverless car field because of the need to keep key technology within the vehicle itself.

Similarly, while the case for automating agriculture is strong, many of the systems that would be useful on farms might just as easily be run on 4G networks.

Spelling out the benefits

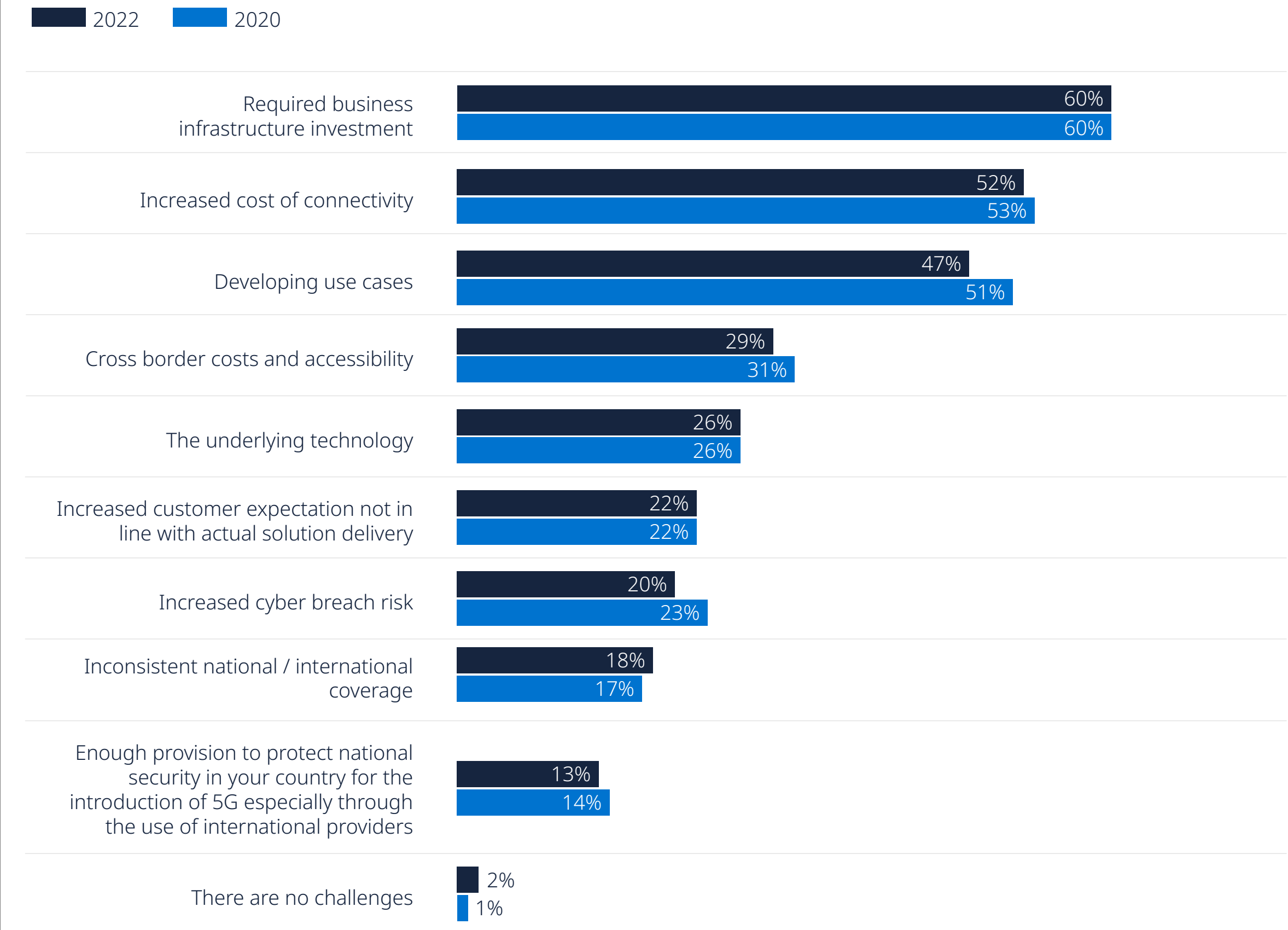
Consumers are often eager to adopt technology offering them faster, bigger, better services but only if the benefits are obvious.

One reason why the transition from 3G to 4G was so quick was the fact that operators produced clear rate plans allowing users to see what they were getting for their money.

That hasn't happened yet with 5G and it is interesting that our survey reveals a continuing concern that customer expectations are at odds with the actual solution delivered.

More widely the biggest challenges identified are around infrastructure investment and connectivity costs – consistently the overriding concerns in 2022 and 2020. Nevertheless, the impetus to roll out 5G networks has not diminished.

Challenges of 5G technology



Infrastructure investment and cost of connectivity remain key challenges associated with 5G. Developing use cases is slightly less likely to be seen as a challenge than in 2020.

Data monetization

Realizing maximum value from data

There are many ways to maximize the value of data, but organizations often define data monetization in a relatively narrow way.

Through this restricted lens, they see data monetization being all about taking a data set, licensing it to a third party and charging a fee for that license.

This definition is blunt and it's one that, from a legal perspective, quickly runs up against a consistent barrier. Mention data transactions of this kind and many will immediately assume this means selling personal data, with the danger of falling foul of data protection regulations.

But increasingly, our clients are looking at a whole range of other ways to extract value from data, both within their own operations and externally in the marketplace, using a host of non-personal data that can be monetized with minimal regulatory risk. Alternatively, they are finding ways to comply with privacy by design requirements from the outset so they can tap the value of personal data in a compliant way.

Their definition of data monetization covers any effort to take data collected for one purpose and putting it to work in a separate context to increase efficiency and competitiveness.

It's possible that this blurring of definitions may explain why less than a quarter of respondents to our survey say they are now making full use of data monetization opportunities. And it may be the reason why 65% continue to say they are making only limited use of data monetization, as they did in 2020.

More importantly, it may explain why just over one in ten say they are not currently monetizing data or have no plan to do so in future – a surprising finding in world that is increasingly data-driven.

We believe data monetization is going on much more widely than these numbers suggest, and that this is a trend that's only likely to intensify as methods for collecting and analyzing data become more sophisticated.

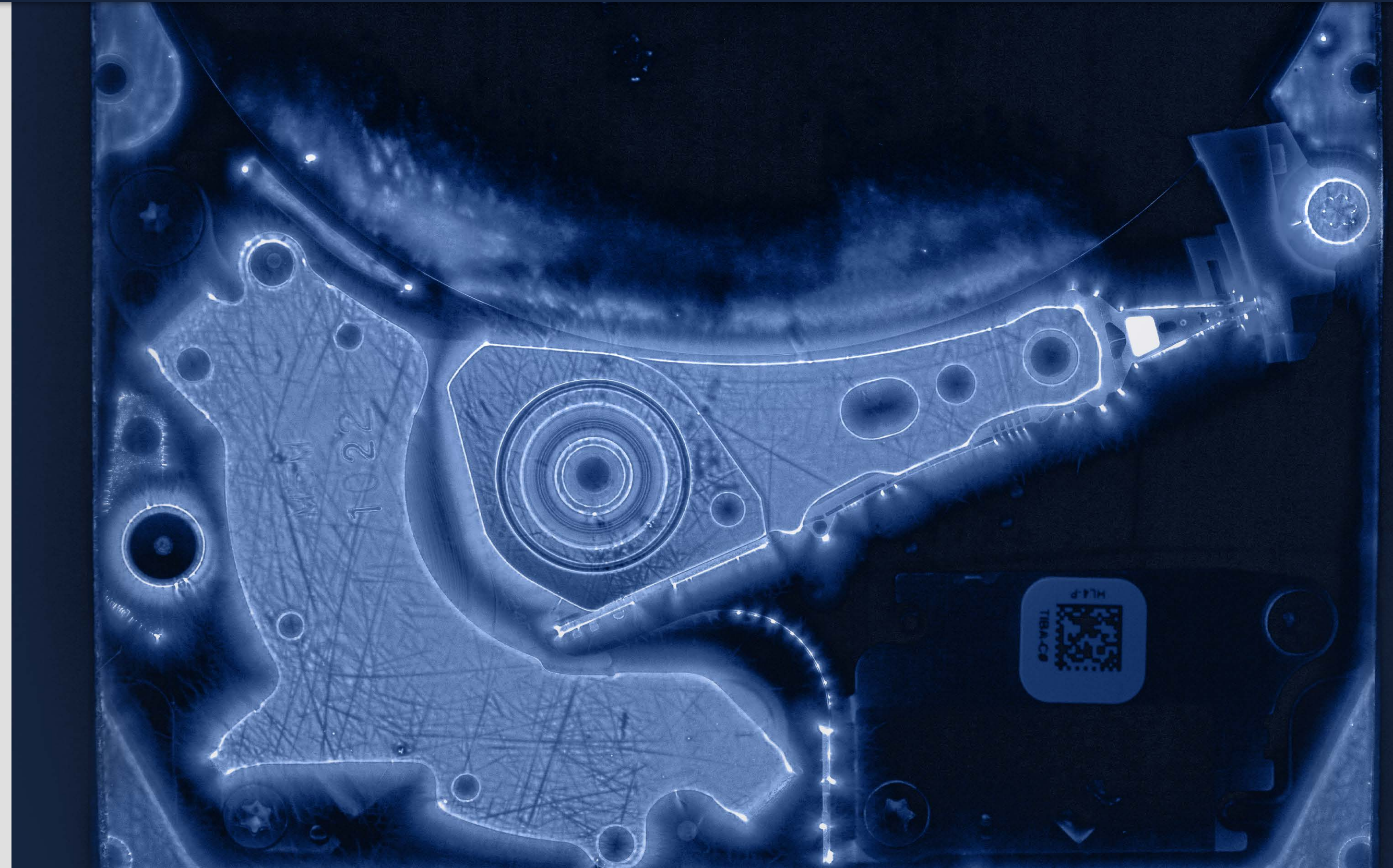


Image: Laptop hard drive under Kirlian effect



Gareth Stokes
Partner, Birmingham



Anthony Lloyd
Partner, Sydney



Andrew Dyson
Partner, Leeds

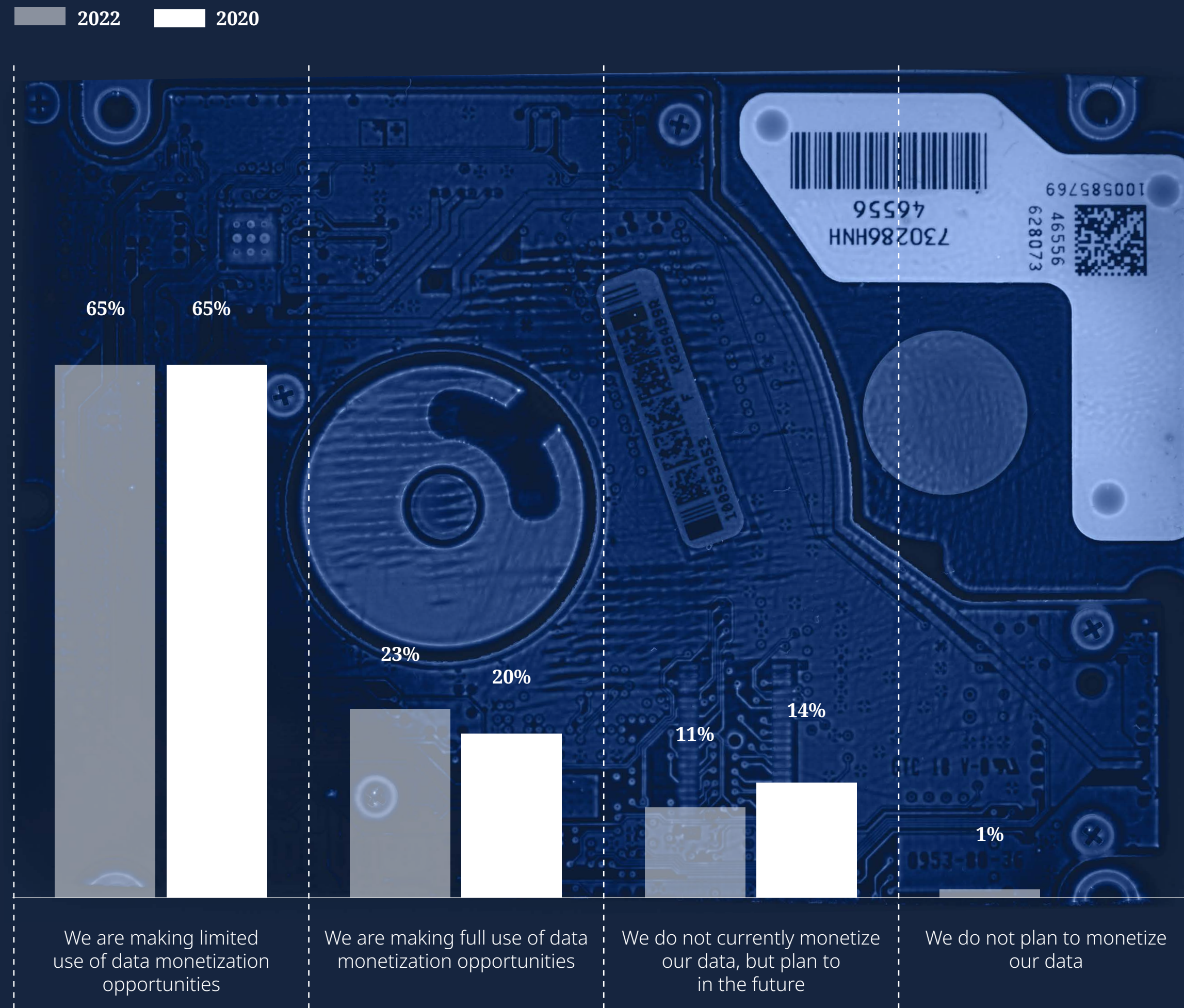


Diego Ramos
Partner, Madrid



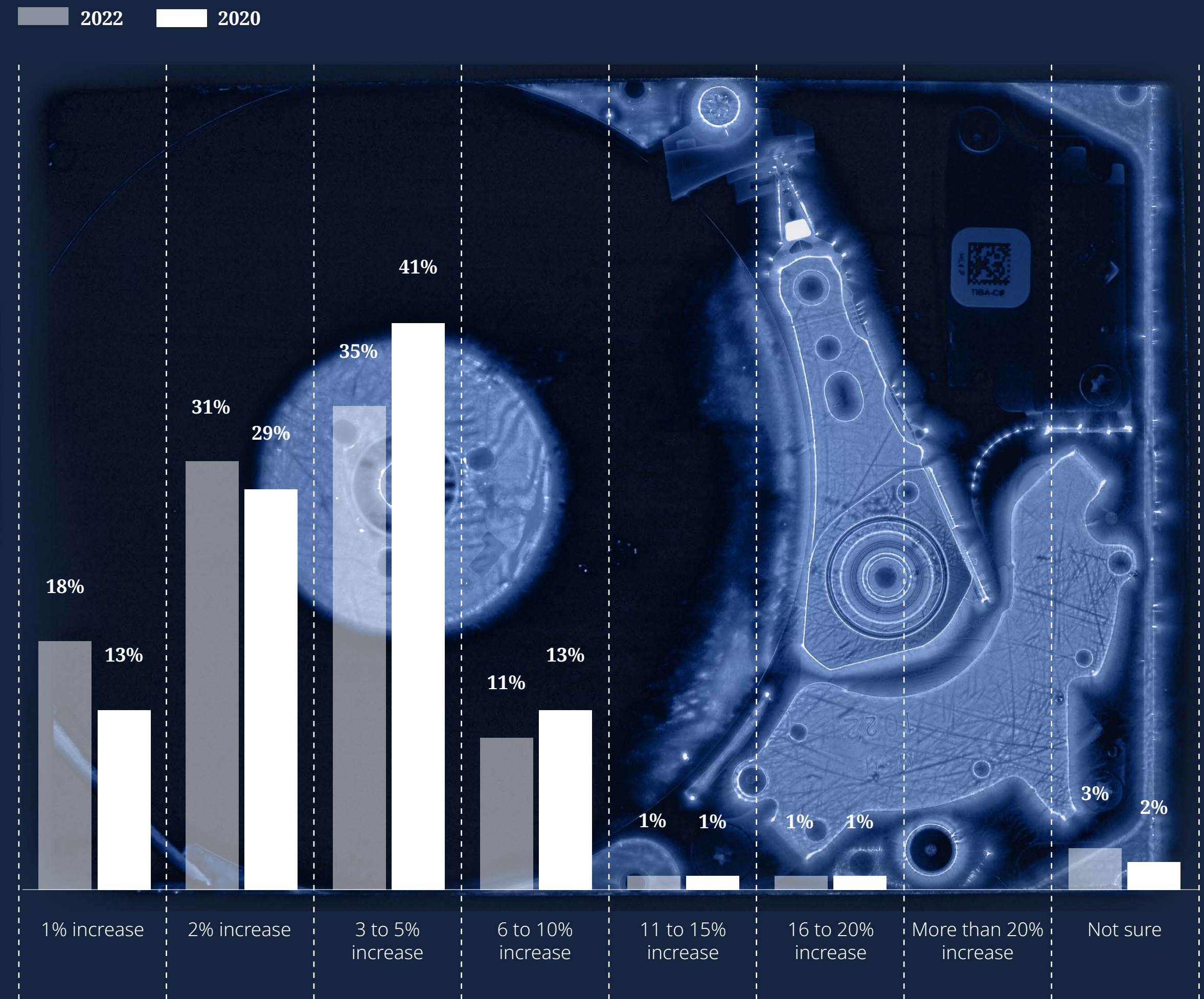
Linzi Penman
Senior Associate, Edinburgh

Use of data monetization in your company



Almost nine in ten of those who see growth opportunities from data monetization are already making at least limited use of these opportunities. However, less than a quarter are currently exploiting these opportunities to the full.

Expected revenue increase from a focus on data monetization



Those seeing opportunities from data monetization feel that a focus on this area could increase their revenues by 3% on average and more than one in ten believe this could increase revenues by 6% or more.

Image: Laptop hard drive under Kirlian effect

Identifying opportunities

So where do the opportunities for data monetization lie?

We are seeing data used to increase operational efficiency and reduce cost across a wide range of sectors.

In manufacturing, companies transitioning to the Industry 4.0 model are increasingly using sensors, Internet of Things devices, enhanced connectivity, AI and data analytics to diagnose and quickly correct inefficiencies in their production processes.

In civil aviation, sensors are being used to capture real-time, in-flight data measuring the efficiency of aircraft systems and engines. If the aircraft is performing at 98% efficiency the data will be sent on to its destination so the right engineers are ready to reset and fine-tune systems for a speedy turnaround.

In the mining industry operators are using both live and historic data to analyze the performance of heavy machinery to schedule maintenance and repair programs more efficiently.

In healthcare, we're seeing data related to the treatment of individual patients being aggregated to find more efficient ways to deliver overall services and to improve software used to manage medical practices.

Data is also helping to improve customer responsiveness and drive brand loyalty in many fields.

Sometimes organizations are carrying out the data analysis themselves. But many clients opt to supply their data to an external broker who can then blend it with other data sets, including those of competitors, to get a much richer insight into customer trends in key markets. This is fed back to the

original company to help it identify where it is meeting customer expectations and where it is falling short, and to identify where to invest money to maximize profits.

In some jurisdictions authorities are trying to unlock the huge stockpile of public sector data, some of which goes back many decades. The hope is that by making it publicly available to researchers, new ways can be found to make local and national economies more resilient. The EU's Data Governance Act, for example, addresses access to public data and there have been similar attempts to improve access in the UK. If successfully coupled with the creation of common standards and interfaces, this could be an area of huge opportunity.

Specialist skills still a key concern

Our survey finds that only about 30% of companies who see opportunities in data monetization have specialist data scientists working in this area, roughly consistent with our findings in 2020.

Around half our respondents said they planned to hire specialists in the future and the number saying they have no plans to recruit data scientists has declined slightly from 20% in 2020 to 17% today.

Access to talent remains an issue across the tech sector. However, we see a wider educational problem where data monetization is concerned.

Many IT and computer science graduates are leaving European and UK universities with first-rate data processing skills, but with little knowledge or experience of how to commercialize the data they are working with. Universities need to widen the curriculum to encompass commercial applications of data if they want to prepare students properly for work in the digital economy.

It's a lesson that has been learned in other jurisdictions. Israel, for instance, is producing many data science graduates who are absolutely focused on data monetization. They are really making their mark in the country's rich array of tech startups.

The search for returns

Investing in data monetization must be supported by a business case clearly focused on delivering a real return on investment rather than just becoming an added cost.

Those of our respondents who see opportunities in monetizing data continue to believe it will have a positive impact on revenues, although the average expected revenue increase has fallen from 4% in 2020 to 3% in 2022. Despite that, one in ten think revenues could increase by up to 6%.

If those expectations look relatively modest, it's worth remembering that, for the very biggest companies we surveyed, whose revenues run to billions of euros, a 3% increase is still a very big number.

More importantly the impact on the bottom line can be significant for companies of any size. If, as is very possible, they can find ways to monetize data at relatively low cost, they could potentially see a huge improvement in profit margin.

Cybersecurity

No respite in struggle to stay cyber secure

Businesses are caught in an uncomfortable pincer movement as they battle to stay cyber secure.

On one side they face ever more sophisticated threats from criminal and state-sponsored hackers using increasingly sophisticated technology to exfiltrate data.

The move to remote working during the pandemic has exposed new vulnerabilities in cyber defences that few organizations anticipated in their pre-COVID-19 incident response planning.

Hackers have been quick to exploit these weaknesses and we've seen a huge spike in ransomware attacks. Once the tactic was to lock up corporate networks to extort a ransom. These days, with value of data rising rapidly, they are more likely to suck data out of corporate networks, threatening to sell it on to third parties or to publish it on the dark web.

For every advance in cybersecurity systems, there is an equally speedy development in attack technology – a vicious arms race that shows no sign of abating.

At the same time, businesses are facing increasingly tough regulatory sanctions if they fall victim to an attack or suffer a breach.

Data Protection regulators have found their teeth and are imposing increasingly punishing fines. In addition, they continue to tighten up rules within existing regulatory regimes.

The EU's General Data Protection Regulation (GDPR) gives businesses a 72-hour window to report breaches. But in a recent decision, Ireland's Data Protection Commission indicated that the 72-hour notification period should start not from when the breach was discovered, but when it ought to have been discovered.

One of the strictest conditions of GDPR has suddenly got stricter.

The conflict in Ukraine has also raised new regulatory issues. The threat of state-sponsored cyber-attacks has obviously risen, but regulators are also taking a very hard stand if they uncover evidence that ransoms have been paid to sanctioned organizations.



Image: Computer component under the Kirlian effect



John Magee
Partner, Dublin



Eilís McDonald
Associate, Dublin



Yaël Hirsch
Associate, Paris

Confidence high, despite threat levels

Given these twin challenges, our survey results are in some ways surprising. Companies express increasing confidence that EU and national regulation are having a positive impact on growth, (65% and 71%, respectively).

That is perhaps an indication that companies are getting used to operating in this highly regulated environment.

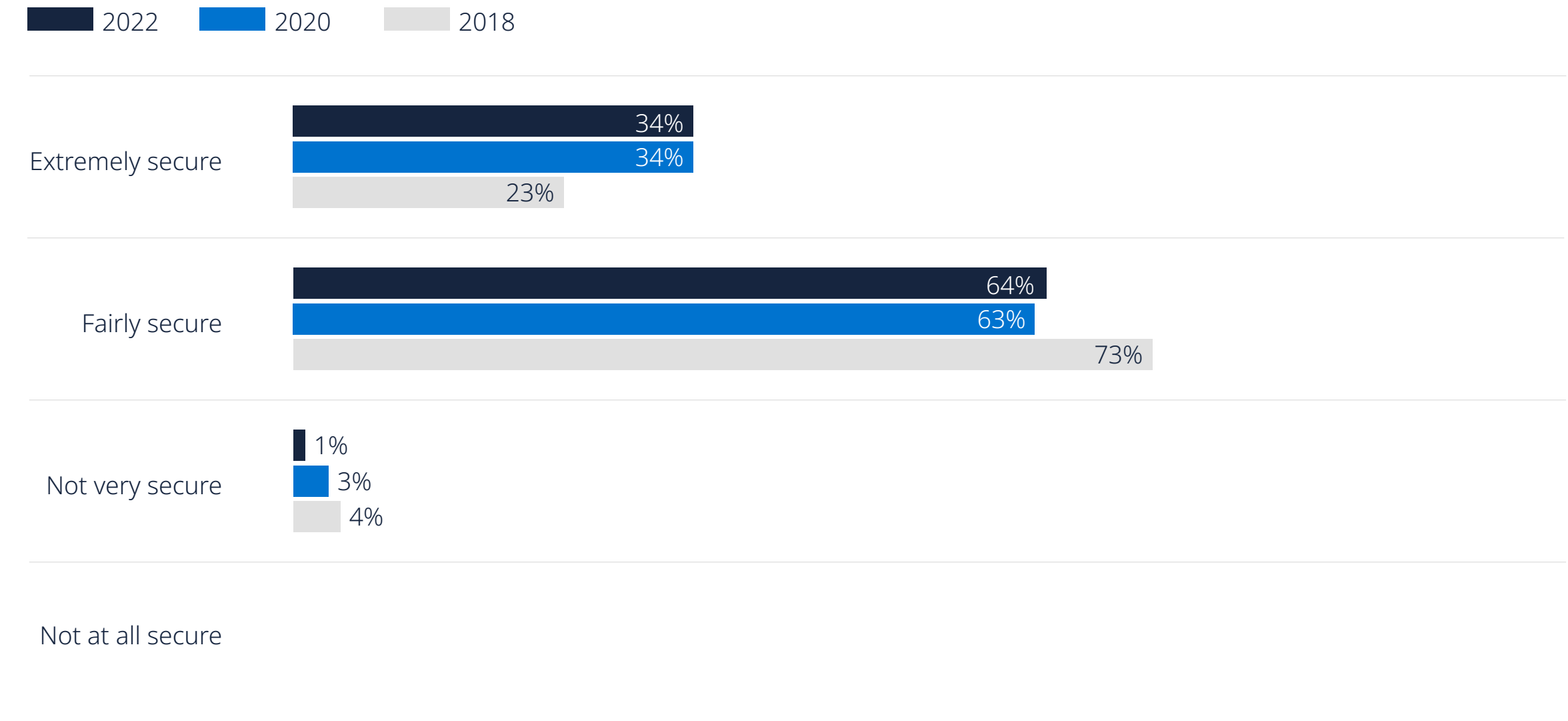
And we are seeing evidence that some are restructuring their businesses in a positive way to draw benefits from being part of what is a tough but relatively stable regime. For instance, some companies are headquartering in the EU to take advantage of the GDPR one-stop-shop mechanism.

Companies in our survey are also remarkably confident that they are cyber secure. A third say their systems are “extremely” secure, with 64% ranking them as “fairly” secure, roughly on a par with 2020.

Not that fears of being hacked have gone away. The proportion of companies saying they are extremely worried about falling victim to an attack or a breach has risen from 34% in 2020 to 37% in our latest survey, although this is lower than in 2018 (44%).

These findings match what we are seeing in our own practice. For many of our clients, cybersecurity is an ever-present and growing concern.

Level of security against a cyber attack



Guarding against complacency

But the findings are, in other ways, at odds with what we are seeing in the marketplace.

It is perhaps worrying that companies in our survey seem to be relying most heavily on technology to keep them safe. While it is important to stay up with the state of the art in this respect, it's essential that companies continue to do the hard graft of basic governance as well.

Yet our survey suggests some are taking their foot off the pedal on governance.

For example, the proportion doing regular risk assessments has fallen quite sharply from 90% in 2020 down to 86% in 2022. Those regularly updating software has also dropped off, and there are still 23% who say they have no response plan in place.

This could indicate that a degree of complacency is creeping in. Alternatively, it could reflect cost-cutting as tougher economic conditions take hold.

Either way, it's a very dangerous game, not least as attack threats are just one of the vulnerabilities companies must take account of. A high proportion of data breaches are still coming from inside the organization, whether that is a result of deliberate malpractice or purely accidental.

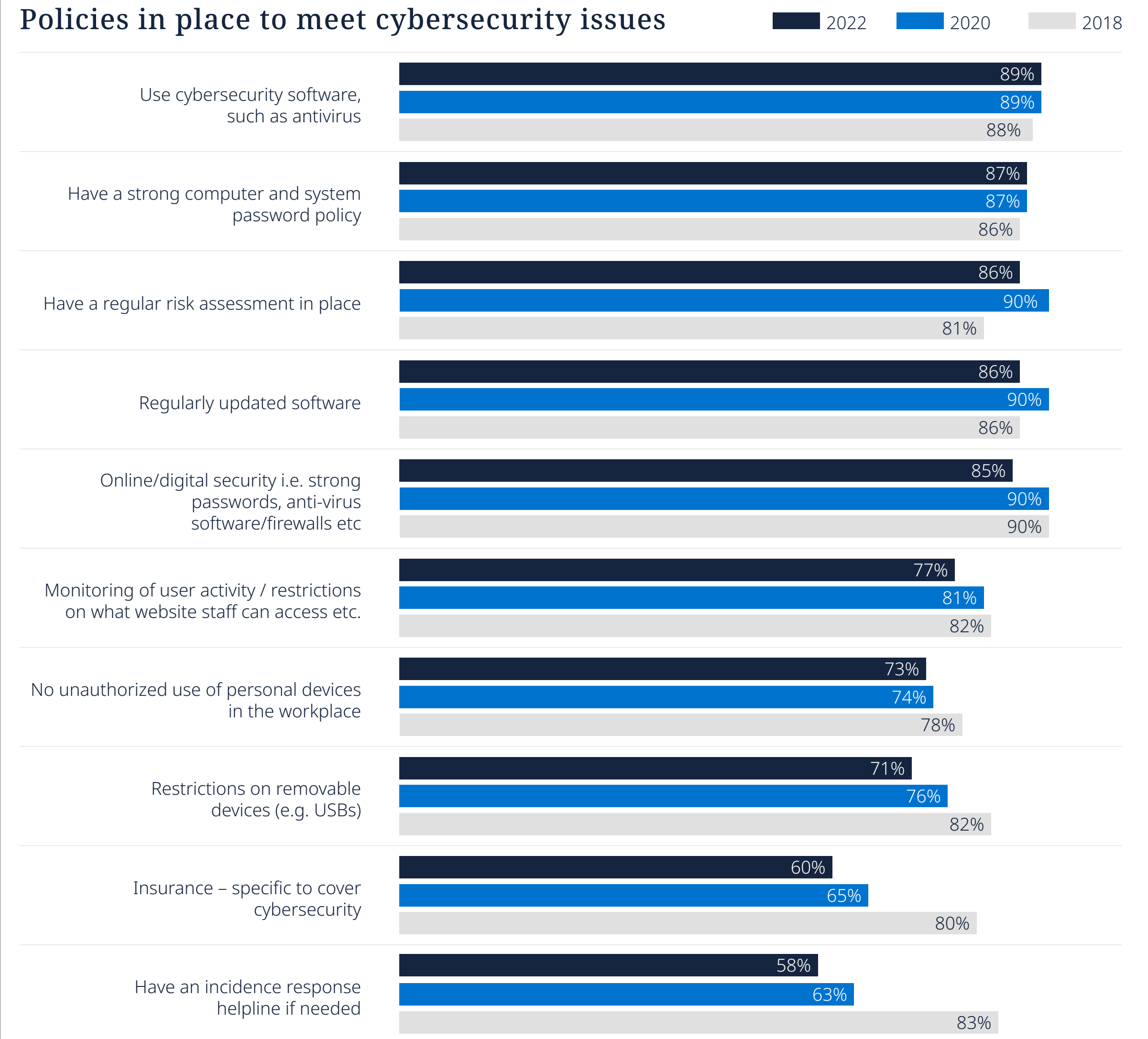
It's vital that companies keep getting the simple things right. That includes proper training of staff to recognize suspicious phishing emails, efficient reporting systems to quickly escalate threats, regular risk assessments and proper risk management resourcing.

Defensive technologies, such as algorithms that can red flag suspicious emails, have a part to play, but can have unintended consequences.

Many financial services companies, for example, are deploying data loss prevention (DLP) technology and insisting that suppliers incorporate it into their own systems too. But DLP relies on close monitoring of content and individual emails and so may solve a cyber problem only to raise other privacy concerns.

It's important that businesses seeking to cure one legal headache don't end up giving themselves an entirely different one.

Policies in place to meet cybersecurity issues



As in 2020 and 2018, companies have a range of policies in place to meet basic cybersecurity issues including software and passwords. The use of some tools such as regular risk assessments has declined slightly since 2020.

AI and robotics

The business case builds

Increasingly capable algorithms, the proliferation of data and huge increases in computer power mean that the benefits of AI/robotics are no longer theoretical but a reality.

Recent analysis of patent filings shows that between Q2 2018 and 2022, the biggest growth in patented technologies was in AI. There were nearly 20,000 AI filings in that time, an increase of 25%, ahead of 5G, which increased by 17%.

It's clear evidence of just how fast new ideas are coming to the market.

As a result, businesses of all types – from retail to aerospace, the life sciences, financial services and fast-moving consumer goods, as well as tech companies – are looking to embrace these technologies to create competitive advantage, or for fear of being left behind.

In our survey, companies rank AI/robotics second only to the Internet of Things and connectivity as a key area for potential growth.

And they continue to see a range of benefits from AI/robotics, including greater flexibility, improved efficiency, faster processes and increased competitiveness.

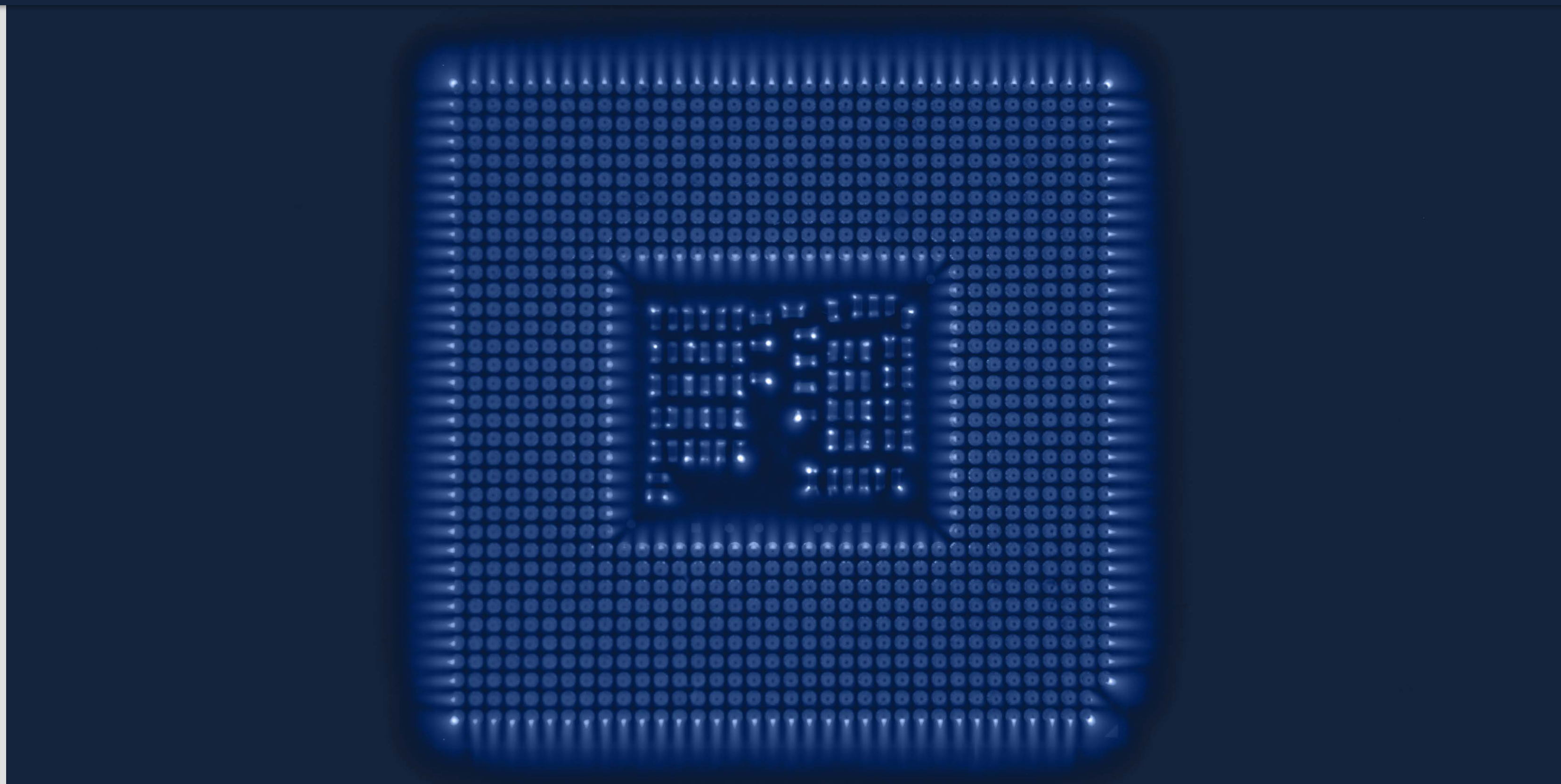


Image: Processor chip under the Kirlian effect



Pilar Menor
Senior Partner,
Madrid



Deborah Bould
Partner, London



Imran Syed
Partner, London

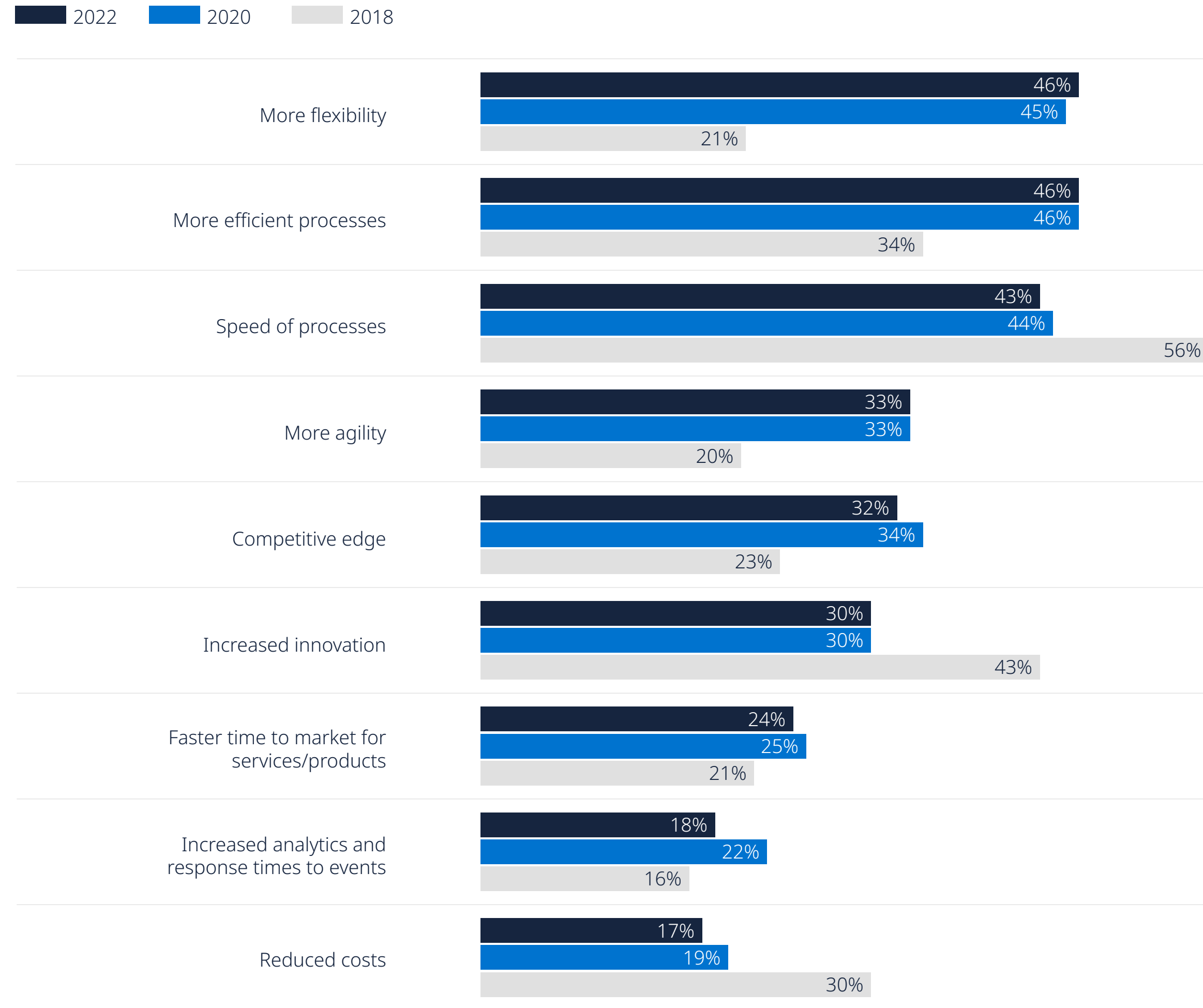


Gareth Stokes
Partner, Birmingham



Mark O'Connor
Partner,
Global Co-Chair,
Technology Sector,
London

Benefits of artificial intelligence / robotics



Cost and skills remain a concern

Some concerns persist, however, with the level of investment required, cost of implementation and proving how AI will provide a return on investment all continuing to be seen as potential drawbacks.

Lack of skilled staff also features high on the list of concerns – and this may link to perceived skills gaps in related areas like data science (see the section on Data monetization). However, each of these appear slightly less important in 2022 than in 2020, perhaps suggesting that the market is maturing.

Making sense of regulation

One significant concern for many of our clients, but not one highlighted in the survey, is regulation, which is still under development and likely to continue evolving as AI technology advances.

Until recently, the regulatory landscape has been shrouded in fog and it's been a real challenge for companies to get a handle on the likely shape and scope of regulation in this area. But the fog is now beginning to lift, with the overall approach to regulating AI in different jurisdictions, at least, becoming clearer.

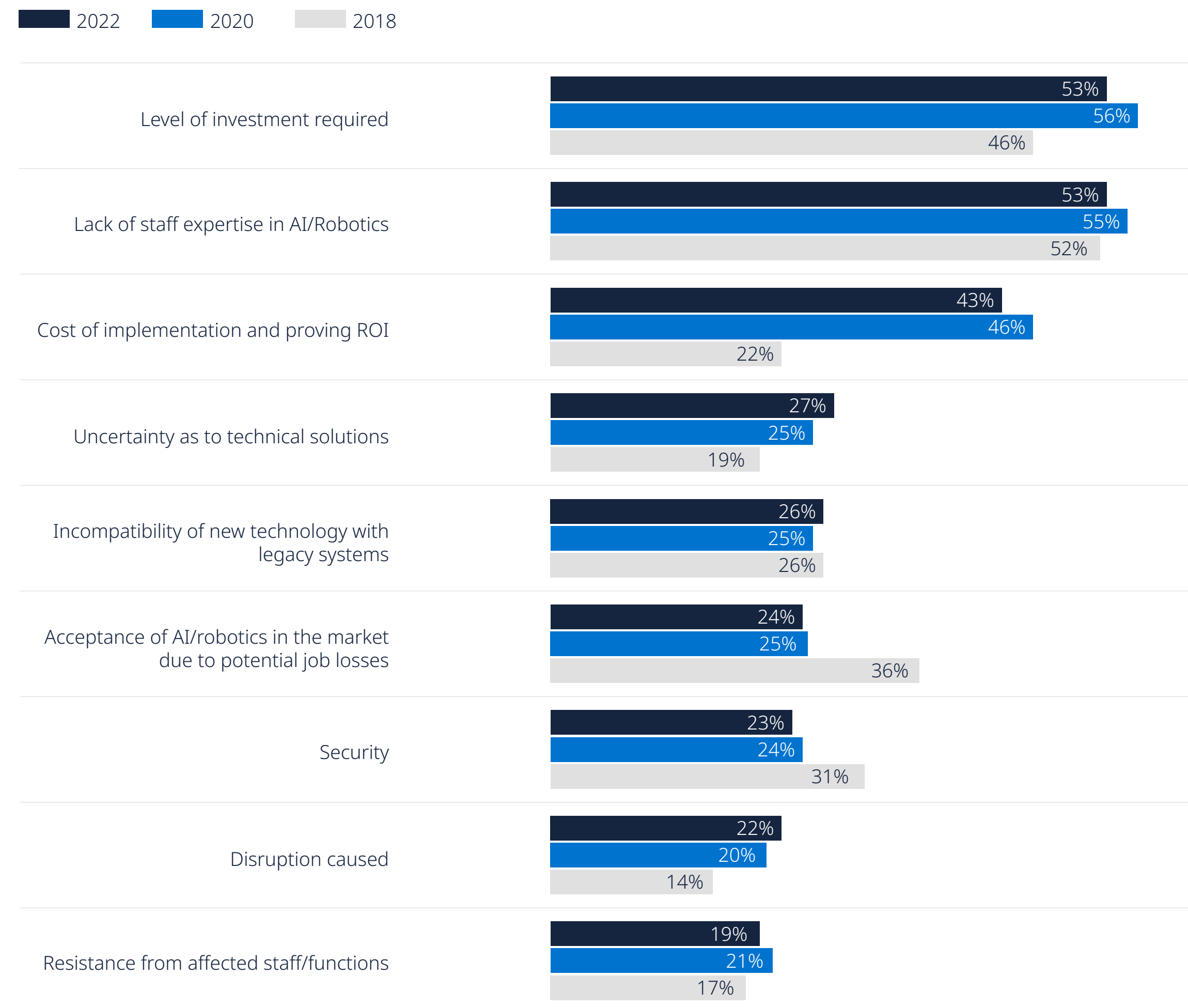
The EU has, for instance, indicated that it favors creating a single, cover-all AI regulatory regime. By contrast, the UK and the US look set to take a sector-by-sector approach.

Many of our clients are now wrestling with how to take account of these differing approaches in their compliance processes.

A priority for many is to put solid foundations in place now in terms of compliance structures, ethics, ways of working, policies and processes that will stand the test of time.

Above all they want to avoid having to rewrite contracts and supply chain agreements in a few years' time as the fine detail of AI regulation becomes apparent. The memory of adjusting to the EU's GDPR data protection regime is still fresh, where many were late to implement compliance programs, and paid the price with extensive remediation exercises later.

Drawbacks of artificial intelligence / robotics



Some are taking a bolder approach, however. AstraZeneca, for example, has not only publicly declared how important AI is to its drug discovery and development work, but has set out how the use of AI will be governed within an ethical framework, linked to its approach to ESG and sustainability.

There are real benefits from making the business case so clearly. It empowers people within the business to explore, invest and implement these technologies with a clear focus on achieving a significant return on investment.

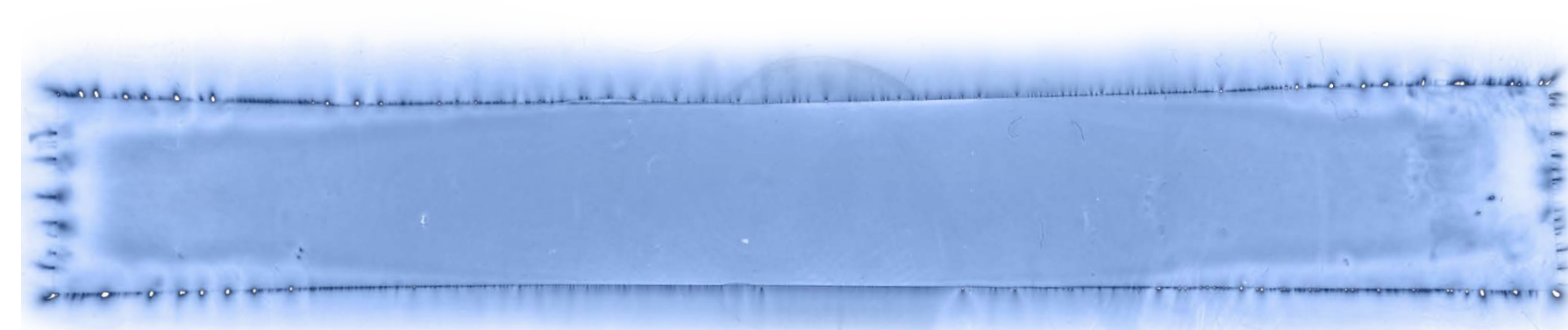
Where AI is having most impact

Our survey reveals that IT, customer services and product development continue to be seen as the areas of the business most likely to benefit most from deploying AI/Robotics.

HR is seen as the area least likely to benefit by our respondents. This is surprising finding given that we are seeing significant use of AI in this area, for instance in recruitment and talent management systems.

It is also an area that legislators are focusing on intently given the potential ethical issues around unintended bias in algorithms used to profile individuals and given widespread worries that AI could lead to significant job losses.

Spain, for example, has already introduced legislation giving employee representatives rights to be informed about AI implementation where it may affect work conditions, hiring or job security. The new legislation also sets some parameters around how algorithms are trained when they are used to profile employees.



Areas that would benefit most from artificial intelligence / robotics



Image: Copper foil under the Kirlian effect

External advisors

The split between companies relying on in-house teams to push forward the adoption of AI/robotics and those turning to external advisors for help, remains pretty consistent between 2020 and 2022, although the number looking in-house only has declined slightly from 23% to 20%. Almost half are using a mix of both, compared with 70% in 2018.

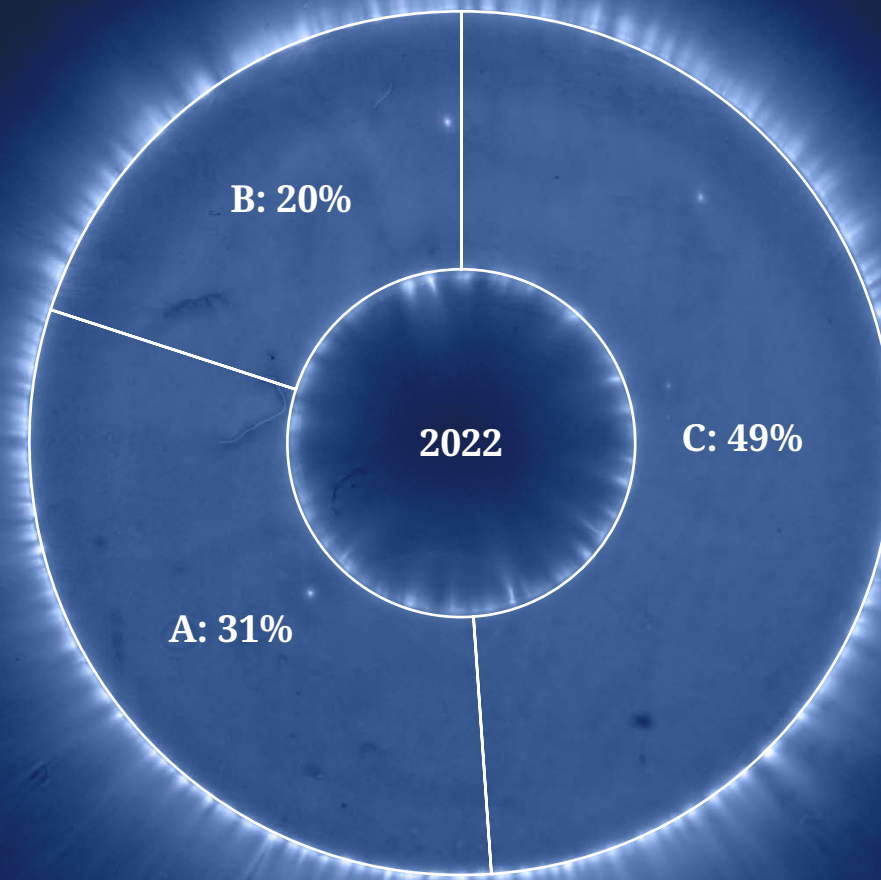
In general, the companies that are taking greatest advantage of AI/robotics are those that are working with specialist external providers.

Understanding the deep computer and data science behind these technologies is no mean feat, especially some of the transformative ideas coming out of organizations like OpenAI and Google DeepMind. Even with a high proportion of the technology in this area being released on open-source terms, it is difficult for all but the most expert to keep up with what is currently state of the art.

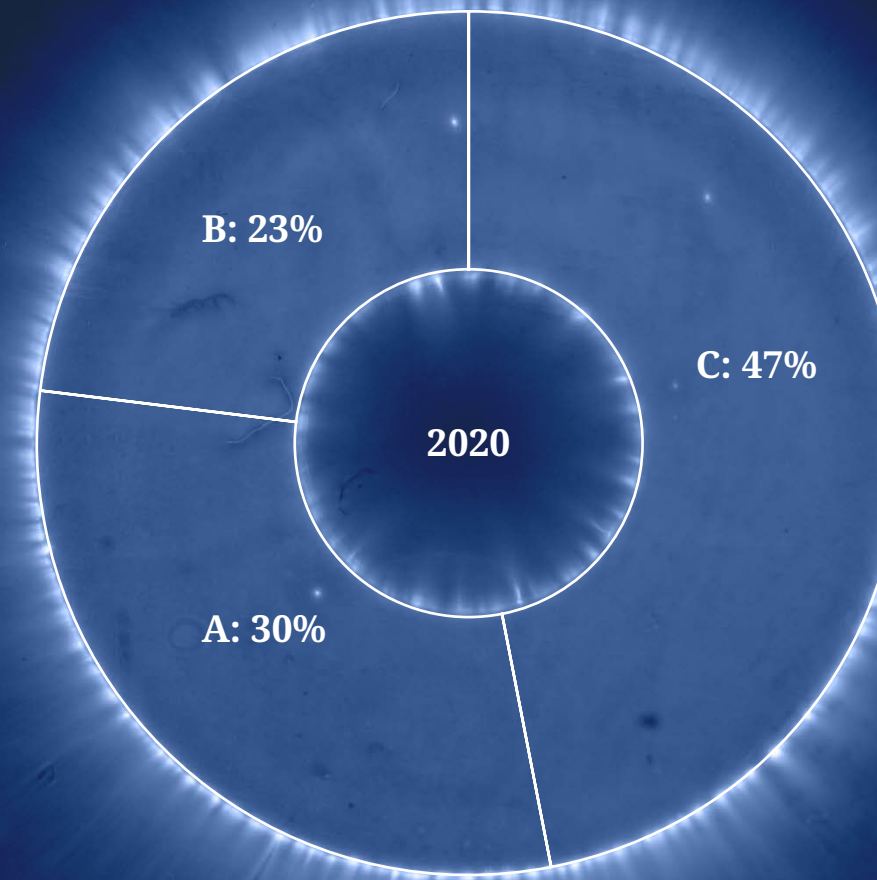
Companies continue to sign partnership agreements with external suppliers, reserving the right to acquire the business to bring the expertise in-house further down the road.

Only an extraordinarily large organization would have the resources to attract and retain the sort of talent needed to deploy cutting-edge AI properly all by itself.

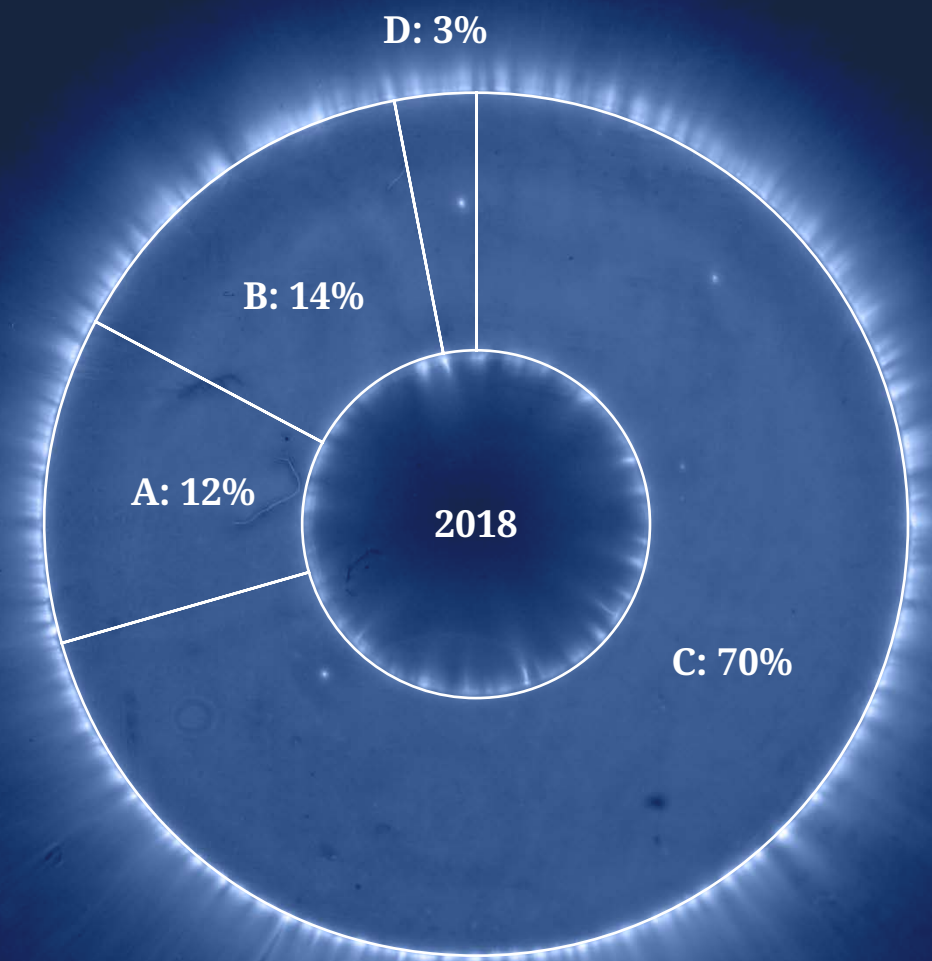
Management of AI / robotics



A: Outside vendor/supplier only
B: In-house only
C: Mix of both



A: Outside vendor/supplier only
B: In-house only
C: Mix of both



A: Outside vendor/supplier only
B: In-house only
C: Mix of both
D: Don't know

The split between companies where AI / robotics adoption is being driven by in-house teams vs external providers remains broadly in line with the situation in 2020.

Image: Computer component under the Kirlian effect

Fintech

Funding and regulatory challenges mount

After the massive boom in fintech investment of recent years, the market has entered much choppier waters in 2022, with growing uncertainty over the financing of young and more mature startups and over the future shape of regulation.

It's a significant change in market sentiment and one which clearly comes through in our survey.

Respondents do still see fintech as an area of potential growth. Although it comes well down the list of growth areas, the proportion seeing growth opportunities in fintech, even in a more challenging environment, has grown from 33% in 2020 to 38% in 2022.

But perhaps the most telling finding comes when respondents are asked to identify the biggest drawbacks in fintech investing.

By far the fastest growing concern is around the financial strength of fintech providers. Here the proportion of respondents ranking this as a worry has shot up from 23% in 2020 to 45% in 2022.



Image: Coins under the Kirlian effect



Mark Radcliffe

Partner,
San Francisco



Andy Gastwirth

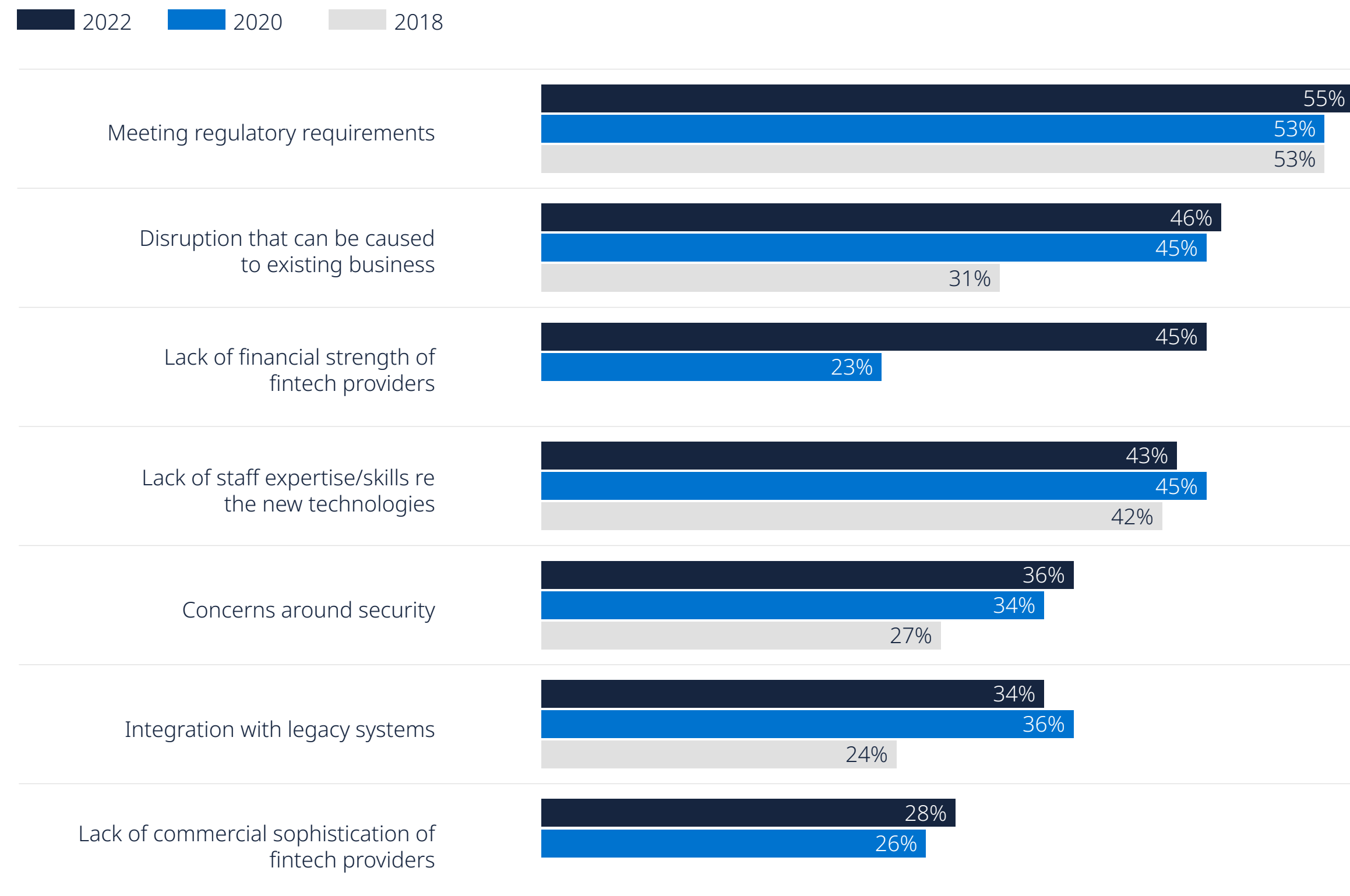
Chief Information
Officer,
Washington, DC



Kristi Swartz

Partner, Hong Kong

Drawbacks of fintech



Key drawbacks of fintech include meeting regulatory requirements and the possibility of disruption, alongside a lack of financial strength of fintech providers, which has significantly increased as a concern since 2020.

It's easy to see why this should be so big a concern.

Traditional banks and other financial institutions rely heavily on innovative fintech providers to help them make their digital transformation journeys. Many of these providers are at an early stage in their development and hungry for investment.

But, after a record-breaking year in 2021 when many fintechs achieved sky-high (and sometimes unsustainable) valuations, the financing of fintech companies has come under significant pressure in the first half of the year.

Amid concerns that rapidly rising inflation and interest rate hikes will make it hard for some early-stage companies to meet their profit projections, venture capital funds are less willing to write large cheques.

Instead, they are putting portfolio companies under pressure to focus on profitability, cut costs, reduce headcount and extend the runway between funding rounds.

Some fintech startups have struggled to raise capital. Others have been forced into down rounds where they are financed on a much-reduced valuation compared to previous funding rounds.

Europe's largest and arguably most successful fintech, the "buy now, pay later" lender Klarna, did manage to raise new finance in 2022, but only on a valuation of USD6.56 billion, 85% below the USD46.5 billion valuation it achieved in its last funding round in 2021.

In the volatile crypto-lending space in the US some have failed to raise capital at all, despite taking a huge haircut on their valuation.

Financing appears to have held up relatively well in Asia although the expectation is that capital might get harder to come by later this year and in early 2023 as the threat of recession builds.

In some Asian markets funding is being supported by direct government investment in the sector. For example, an HKD5 billion fund has been set up to support young fintech companies and encourage inward investment in the Greater Bay Area covering southern China, Hong Kong and Macau.

Separately, and in another example of how China sees fintech as a key element in the economic integration of Hong Kong and China, eight virtual banks have been set up, many backed by China's biggest financial institutions, and are beginning to make inroads in the market.

Evolving regulation still a concern

Meeting regulatory requirements remains the top concern for respondents, rising from 53% to 55% over the last two years.

Regulation in this area is already complex and still evolving, especially where it relates to some of the most progressive technologies.

However, Europe is forging ahead of other markets in developing regulatory frameworks in one key area – crypto assets.

After several years of debate, the European Commission, the European Parliament and Member States finally agreed the Markets in Crypto Assets (MiCA) reform package in June that represents the first attempt to regulate this sector.

The overall aim is to build a stable cryptocurrency sector in Europe, encouraging growth and innovation while protecting consumers and investors. With big environmental concerns around crypto, operators will be obliged to account for their energy consumption and the impact of digital assets on the environment.

It's still early days and fine details are yet to be agreed, but new rules could come into force in 2024, well ahead of the UK and the US.

A question of timing

As fintech regulation takes shape more widely, many traditional institutions are playing a waiting game.

They want to see how regulation settles before making the huge investment needed to transition to, and fully integrate, these new technologies. That's not surprising given the avalanche of regulation institutions have faced since the financial crisis.

In the meantime, many financial institutions are opting to make small investments in promising fintech companies to help nurture their growth, often with a view to acquiring them later if their technology proves successful and is compliant.

But a long game can become a dangerous one. Competitive pressures are building swiftly, with banks facing competition not just from their traditional rivals but from a new breed of disruptive, internet-only challengers, able to establish themselves on a much lower cost base.

Another major concern remains the fear that deploying fintech solutions will disrupt the existing business.

Banks have a patchy record when it comes to integrating new technologies with legacy systems and on making the necessary changes in culture and branding when merging with another business.

We see examples of institutions that have opted to overlay new technology on top of legacy systems rather than carrying out a deep process of integration. There are obvious risks in doing this. Instead of achieving hoped for efficiencies, they can end up with a complex hodgepodge of technologies.



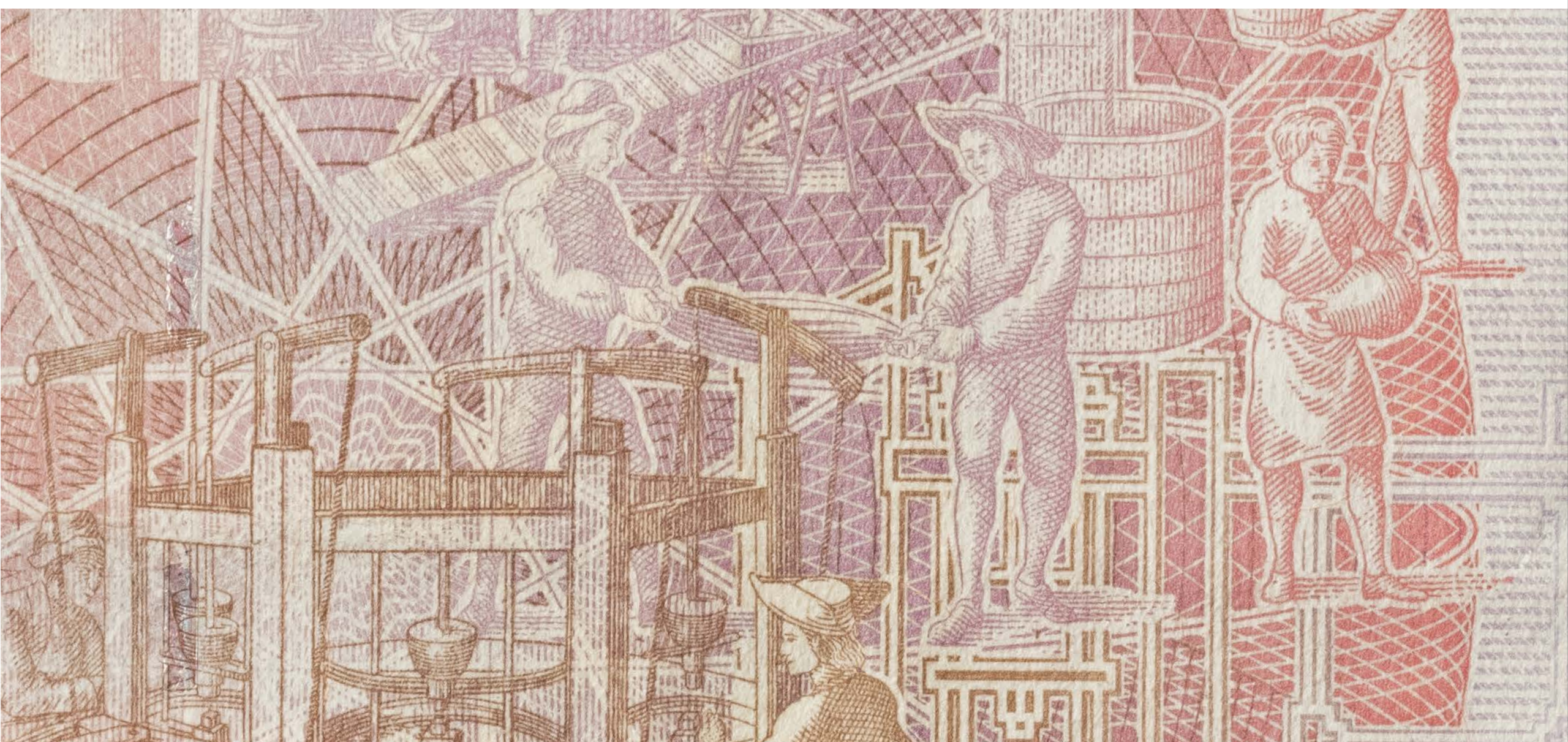
Image: Coins under the Kirlian effect

Clear benefits

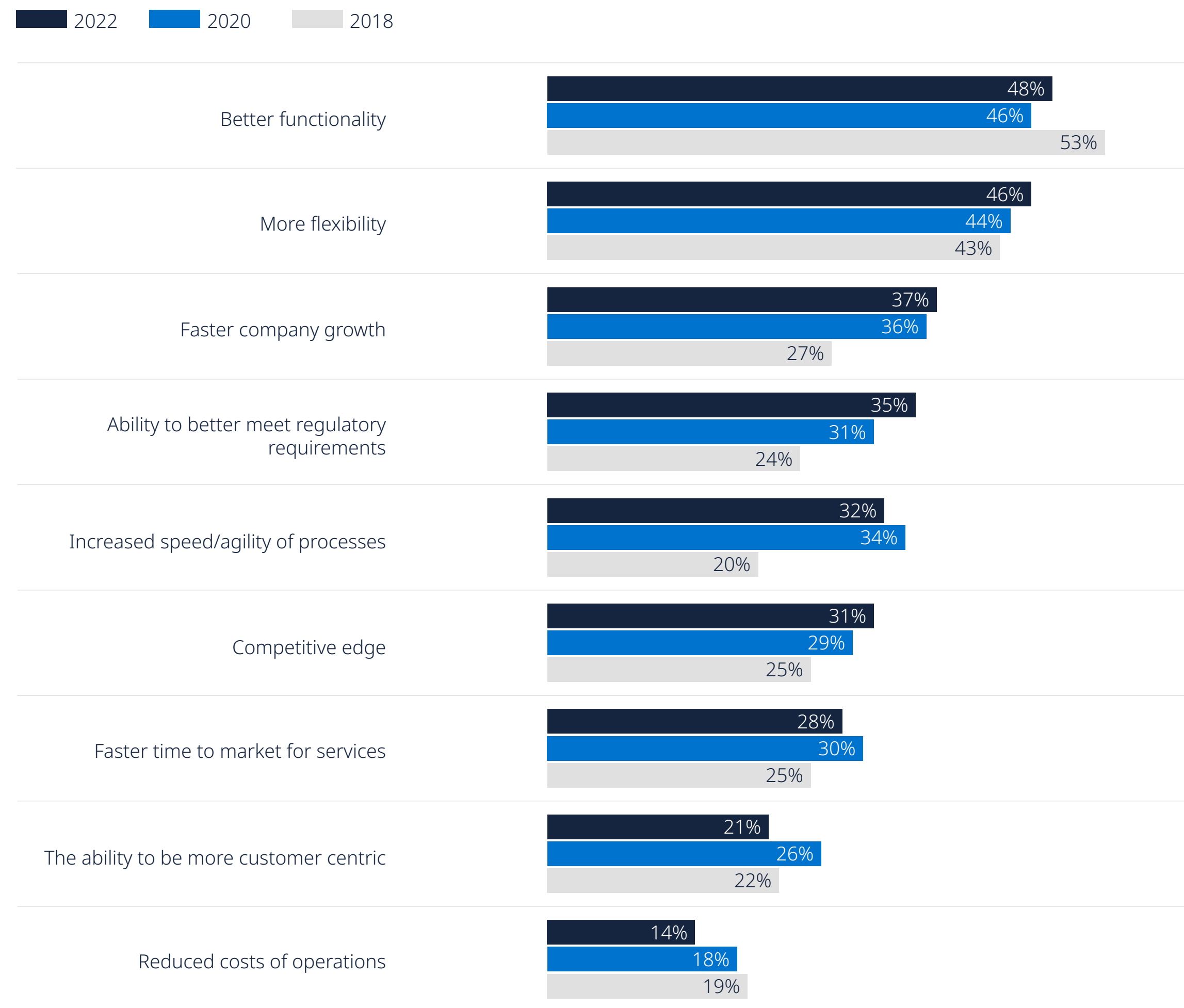
Respondents still identify some clear benefits from investing in fintech. Better functionality, more flexibility, faster growth and improved ability to meet regulatory requirements continue to be seen as the top benefits and all of them are showing slight increases in 2022 compared with 2020.

Curiously, benefits that relate to customers are showing slight decreases. Those saying that fintech will help them get services to market more quickly has fallen from 30% to 28%. The ability to be more customer-centric is down even more sharply, from 26% to 21%.

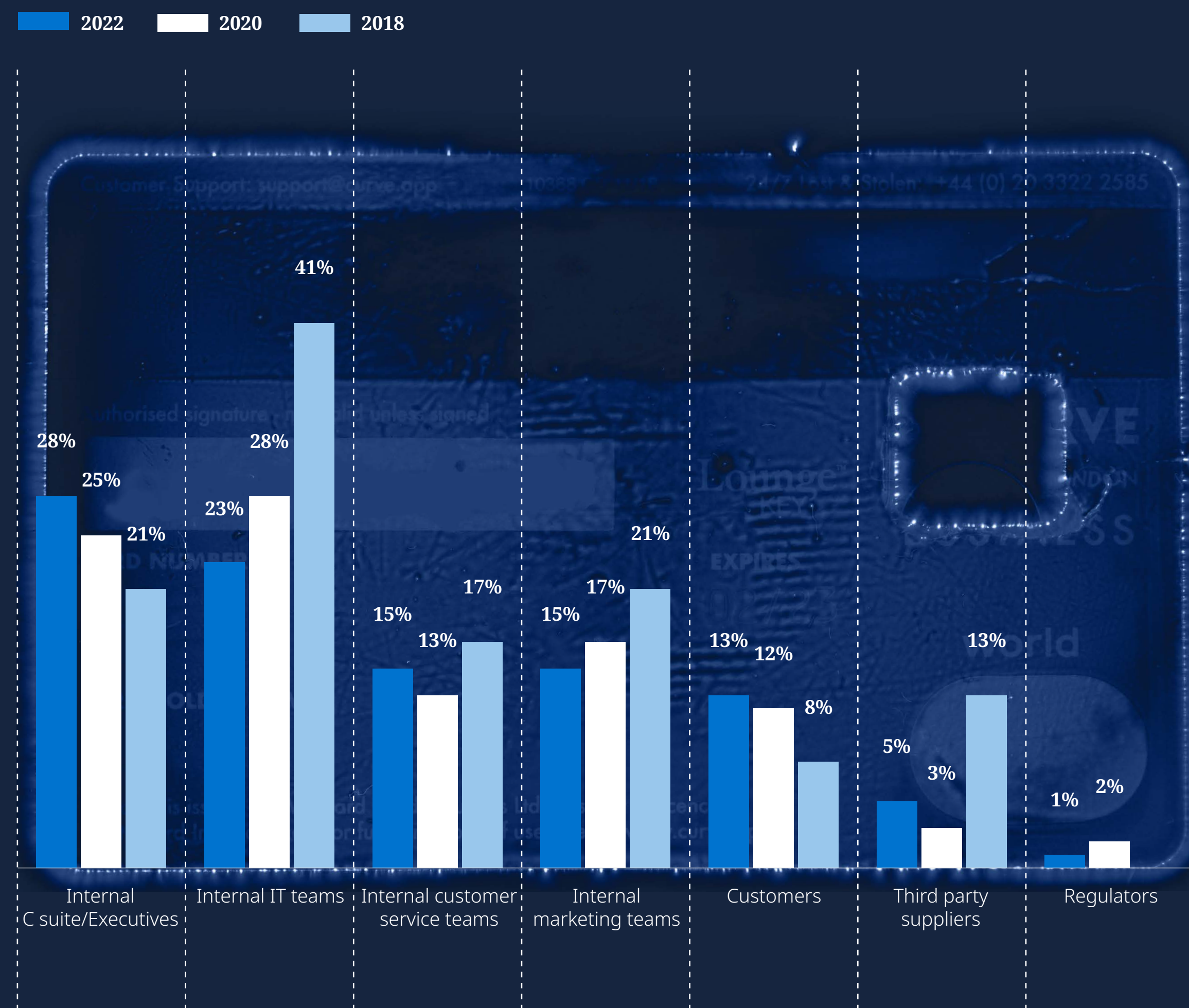
By contrast, the drive to implement fintech solutions is now coming increasingly from C-suite executives and internal customer service departments, rather than from IT teams as was the overriding case in the last two surveys in 2020 and 2018. Given that, it's a surprise not to see a greater focus on the customer.



Benefits of fintech



Source of drive to implement fintech



The C-suite now represents the top driver, with IT in second place.

Image: Credit card under the Kirlian effect

Where fintech can add most value

Digital banking, improved cybersecurity and payment systems remain among the areas where respondents see greatest potential for fintech to add value. Each of these is slightly more likely to be identified as areas where value can be added in 2022 compared with 2020.

Fintech solutions using blockchain technology also remains an important area of focus, although slightly fewer identify blockchain technology as an area of potential value in our latest survey. Slightly more see potential value in cryptocurrencies, perhaps a surprising result given the high degree of turbulence in the cryptocurrency sector in some markets recently.

Payment solutions are a particularly important solution in key regions, notably Asia, where we have seen some of the world's most sophisticated systems being rolled out.

Rather than a nice-to-have, these systems have come on stream driven by strong customer demand for ways to make payments at home and abroad when dealing in multiple currencies, many of which are not fully convertible.

Insurtech is another area where respondents see a growing potential to add value, up from 11% in 2020 to 14% in the latest survey.

It remains relatively low on the overall list of potentially valuable applications, perhaps reflecting the fact that the insurance sector is widely seen to be about five years behind the big banks in adopting new technologies.

However, it's clear many traditional insurance companies fully expect their sector to be as significantly disrupted as banking, over time. Future surveys could see insurtech ranked much higher as an area of potential value creation.

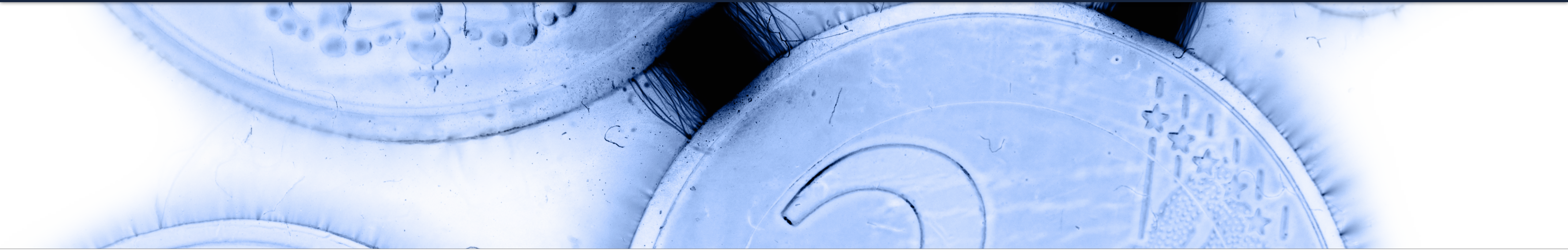
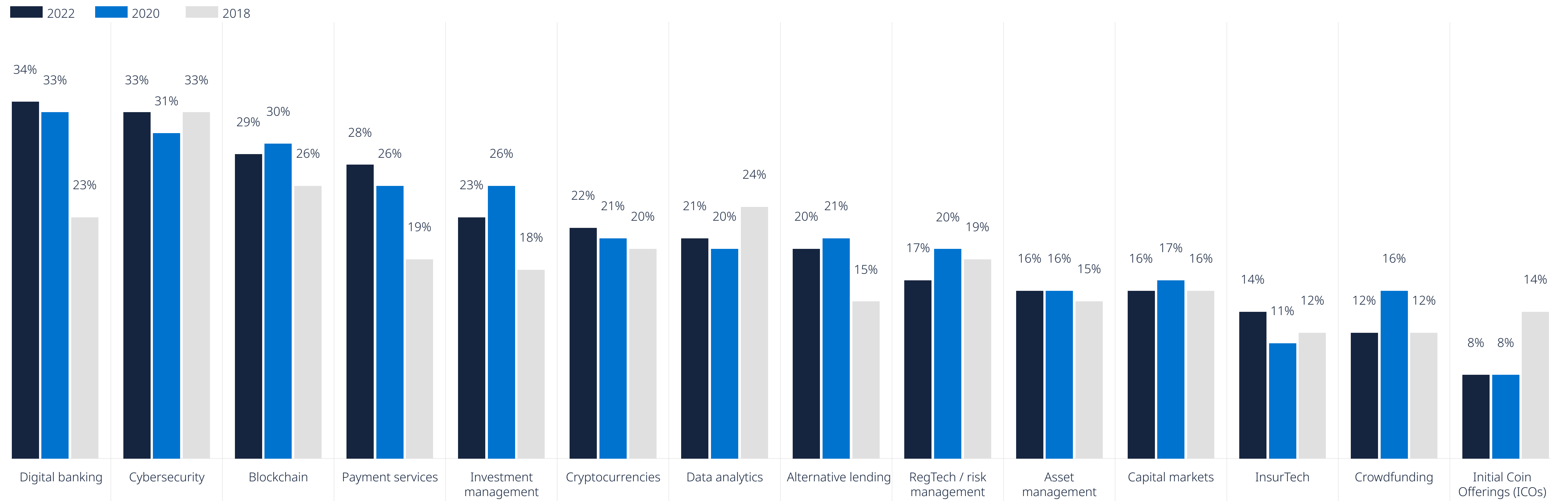


Image: Coins under the Kirlian effect

Area with most potential across the fintech ecosystem



Internet of Things

Investment intensifies

Faced with multiple crises – Ukraine, the continuing impact of COVID-19, supply chain disruption, inflation and the threat of recession – businesses have hard choices to make about technology investment.

Some projects, seen as desirable for the future but not immediately essential to digital transformation, are being put on the back burner. For some that includes monetizing data.

But where the Internet of things (IoT) and connectivity is concerned we've seen no sign of investment slowing. Advances in technology and changes in customer preferences, accelerated by the pandemic, are driving adoption.

Our survey shows that both consumer and industrial businesses continue to see IoT/connectivity as key to increasing efficiency and competitiveness.

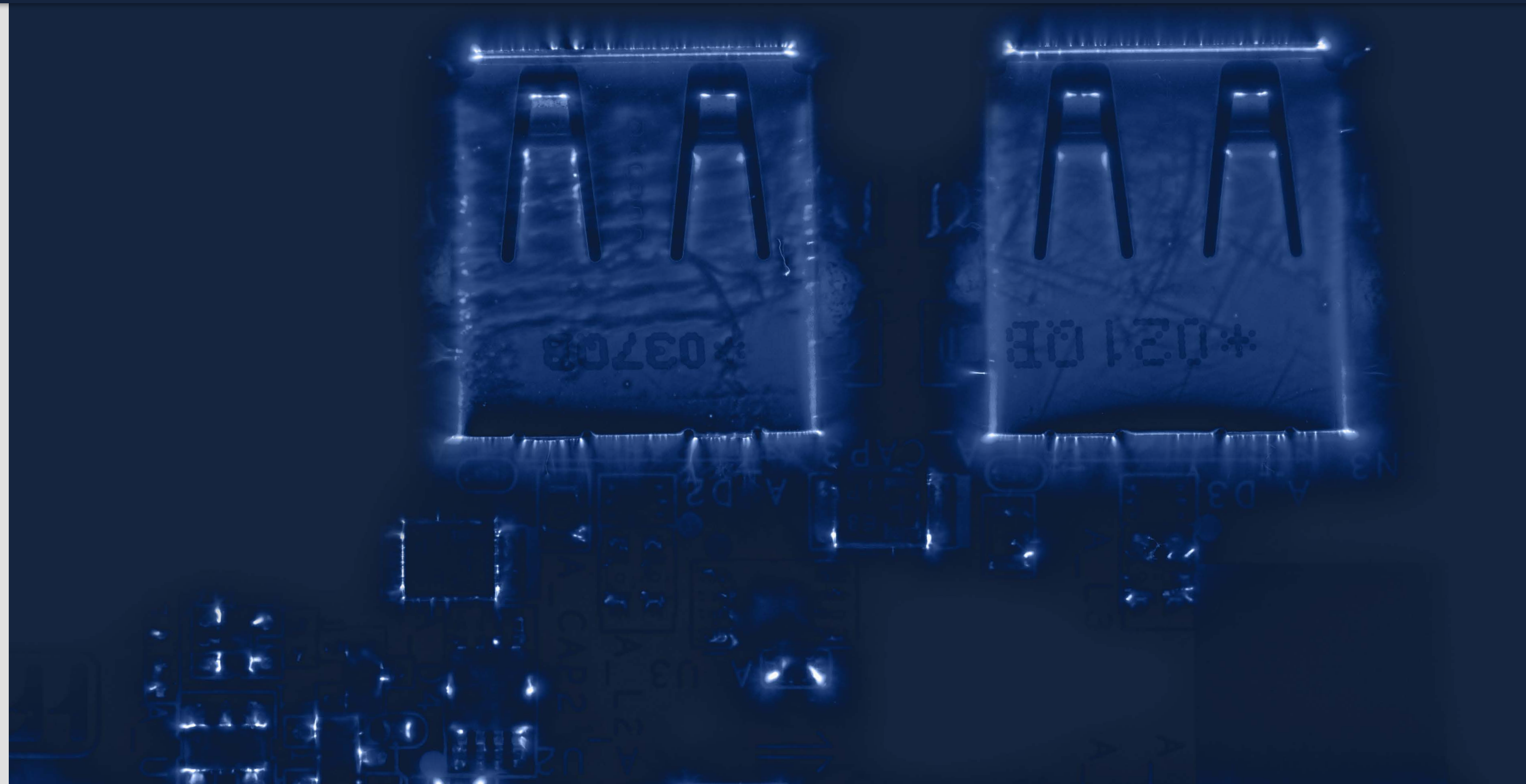


Image: Computer component under the Kirlian effect



Nicholas Boyle
Partner, Sydney



Giulio Coraggio
Partner, Milan



Michael Stead
Senior Associate,
Birmingham



Sylvia Ebersberger
Partner, Munich

Why IoT?

Rapid advances in network and connectivity technologies, cloud services, and hardware and software improvements have all come together to boost uptake of IoT technologies. As a result, we're seeing an increasingly wide range of credible use cases being developed across many sectors.

Changing consumer appetites are also forcing traditional manufacturers to reinvent their business models as products incorporate more and more digital technology.

In the automotive sector we are seeing a shift away from outright car ownership to lease and subscription models. Carmakers are becoming providers of mobility as a service, with customers booking specific features of the car for a specific time period and with connectivity increasingly seen as a must have.

US and Chinese carmakers breaking into the European market are particularly pushing this model and it is forcing domestic players to reposition themselves as technology companies, often in collaboration with external vendors. This is a fundamental a shift in strategy.

With the growing dependence on data, new privacy and data protection concerns are being raised.

Carmakers face significant new regulatory challenges complying with both cross-border regulations like the EU directive on digital content and new national laws. Germany's proposed new regulation on autonomous vehicles has provisions on cybersecurity and data transfer, which put the industry on a steep learning curve.

With satellite connectivity systems providing a credible alternative to traditional mobile networks, we are also seeing the growth of low cost/high volume products and services in diverse markets that were previously unreachable.

In Australia, Gasbot has developed smart, connected sensors that, through a combination of hardware, software and network connectivity can measure, monitor and provide notifications about LPG (propane) levels in tanks and cylinders, of which there are an estimated two billion in circulation globally. Markets for its technology are now opening up in Europe, the US and the Middle East.

Agriculture is another sector seen as ripe for such cloud-based services and as the transition to 5G gathers pace, parts of the spectrum are being freed up for low power, low bandwidth services, enabling a whole range of new use cases.

The pandemic effect

The pandemic has undoubtedly accelerated innovation in connectivity. But it has also raised new, complex challenges for businesses to address.

Many of the systems being deployed, in both the consumer and industrial sectors, are enriched by AI and predictive analytics. Now that customers are often more remote, technologies that help businesses predict customer preferences offer a competitive edge.

But new consumer protection regulations seek to allocate liability for any failures along the supply chain. For a business looking to integrate rapidly evolving IoT technology into an established product with a longer life span, such as a dishwasher, allocating liability can be difficult.

Focus on cybersecurity has also become intense in the wake of the pandemic where we saw a massive wave of ransomware attacks. Many businesses fell victim to these attacks and were forced to shut down their online systems during important trading periods such as Christmas with the loss of tens of millions in revenue.

The task of balancing the desire to monetize data with the need to protect against escalating cyber threats is far from easy.

Ways round supply disruptions

While disruptions in the supply of semiconductors over the last 18 months are easing, we've seen big tech companies increasingly taking matters into their own hands.

Apple is now designing and developing its own chips for some of its new AI systems, phones, tablets and desktops and Google is following suit.

It's the first time in 30 years we've seen silicon being produced in a proprietary way for consumer goods, reducing reliance on volume chipmakers in Taiwan and South Korea and promising improved performance.

Great leaps forward in connectivity have already been made. Because consumer grade connectivity products are so good these days, we're seeing even relatively large retail businesses relying on them to connect an estate of some 300-400 shops. We expect to see continued rapid advances in IoT technologies and connectivity in the rest of this decade.

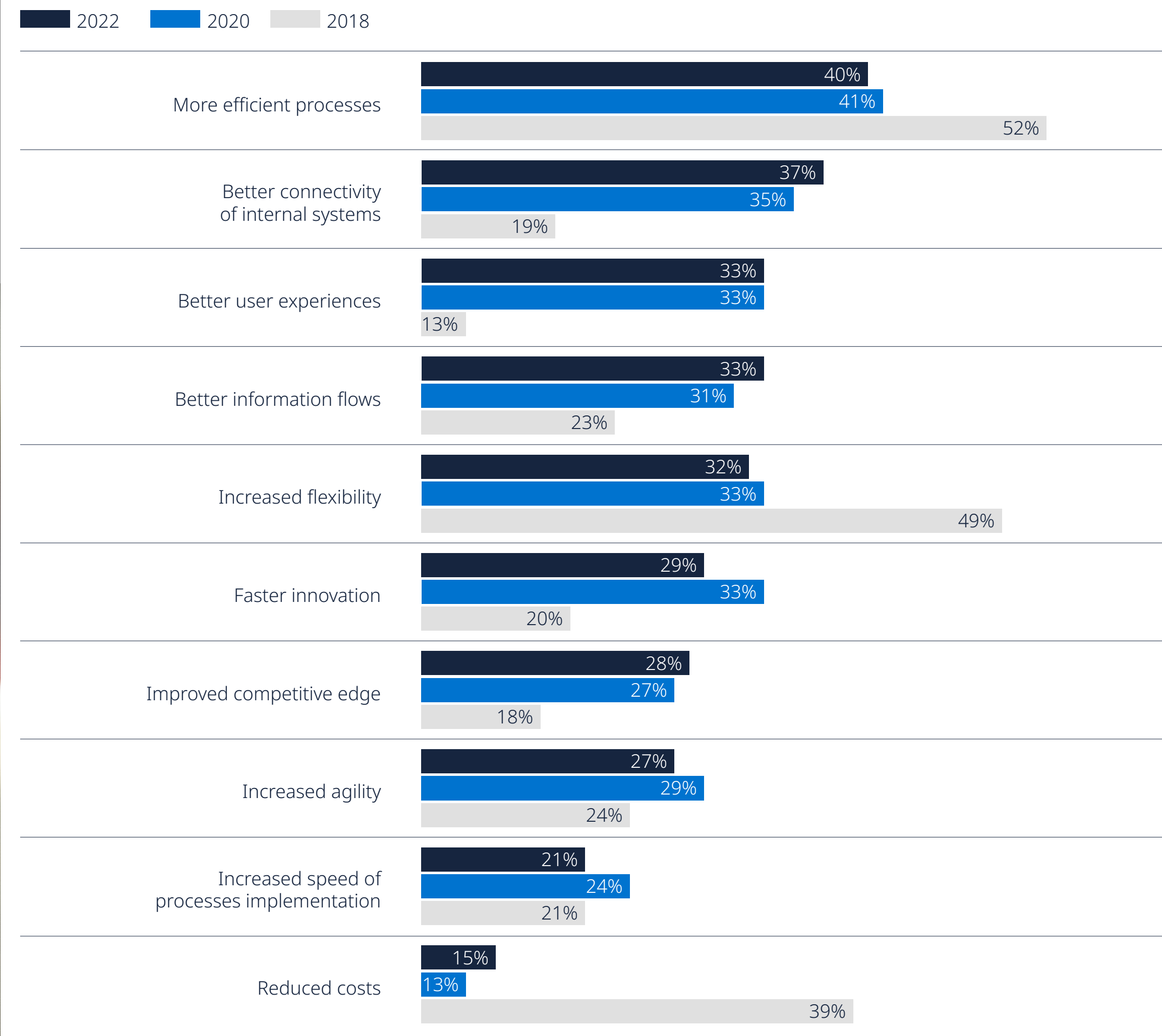
Competitive edge

Businesses say improved efficiency is the main benefit of embracing the Internet of Things and better connectivity, as was the case in our last survey in 2020.

But in 2022 we're seeing a slight increase in the number of businesses talking about other important benefits. These include better-connected internet systems, improved information flows and a boost to competitiveness.



Benefits of IoT / connectivity

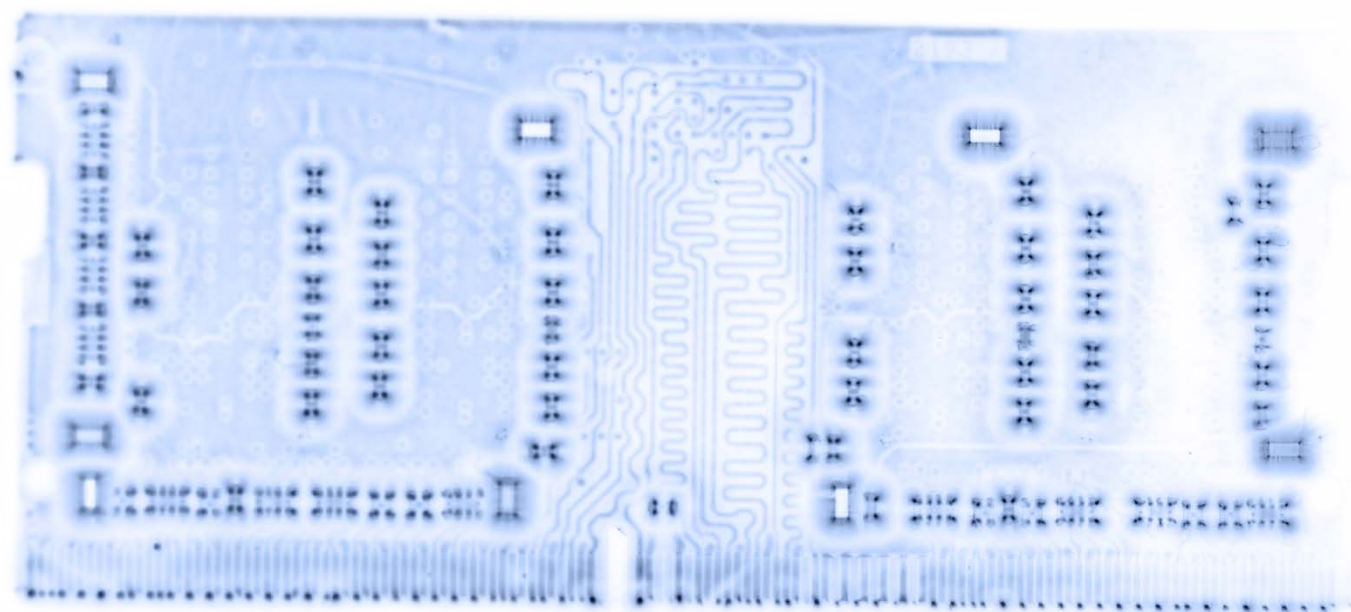


Cyber and business disruption worries grow

Businesses continue to see potential draw backs in embracing IoT technologies and improved connectivity.

Lack of skilled staff remains a strong concern as in 2020, as does the level of investment required to adopt these new technologies, although slightly fewer expressed worries about investment this year.

There's slightly less concern about regulatory and privacy risks – although both remain high on the list of worries. But other anxieties are growing for instance around new and old technologies being incompatible and the potential for business to be disrupted as new systems are introduced.



Drawbacks of IoT / connectivity

2022 2020 2018

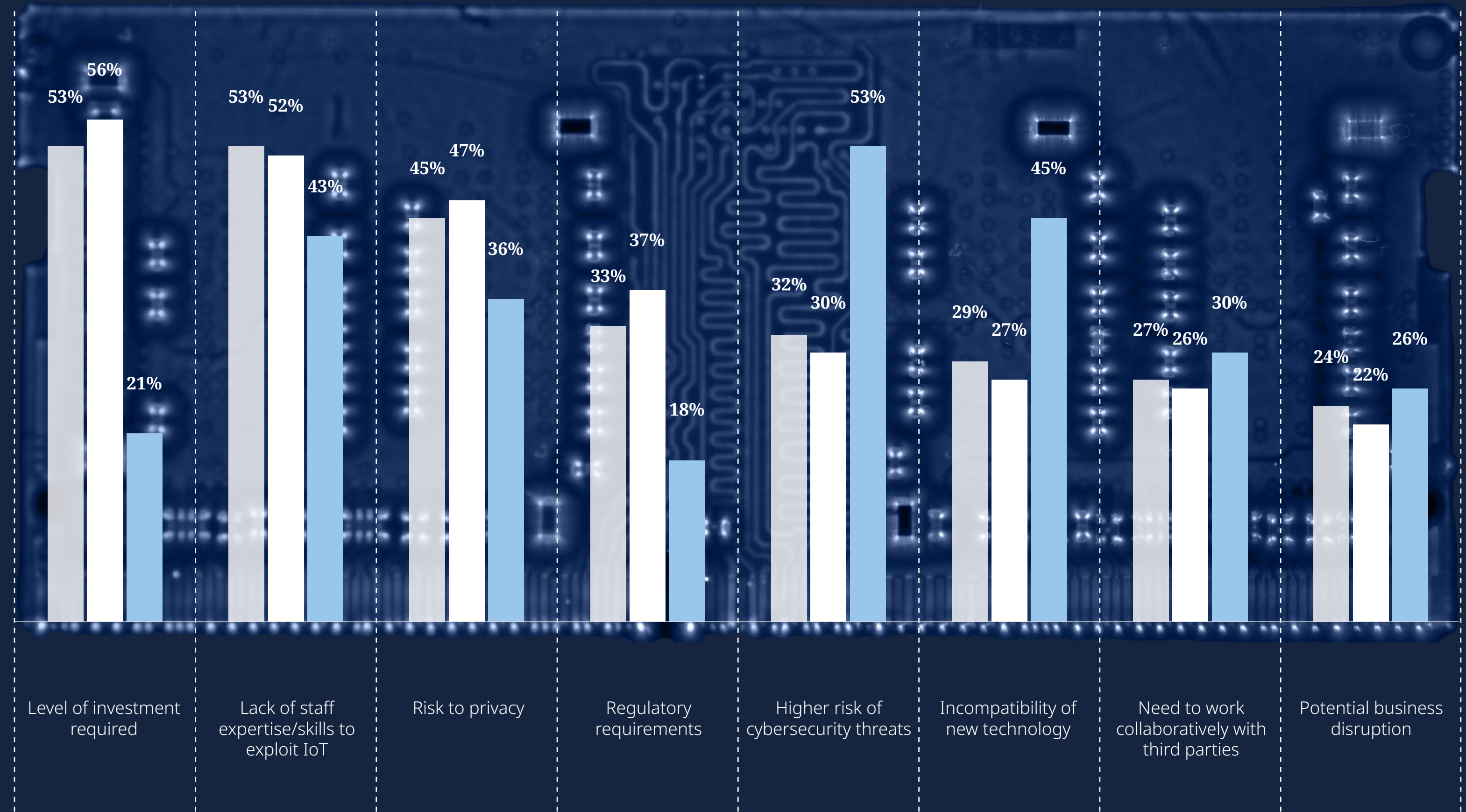


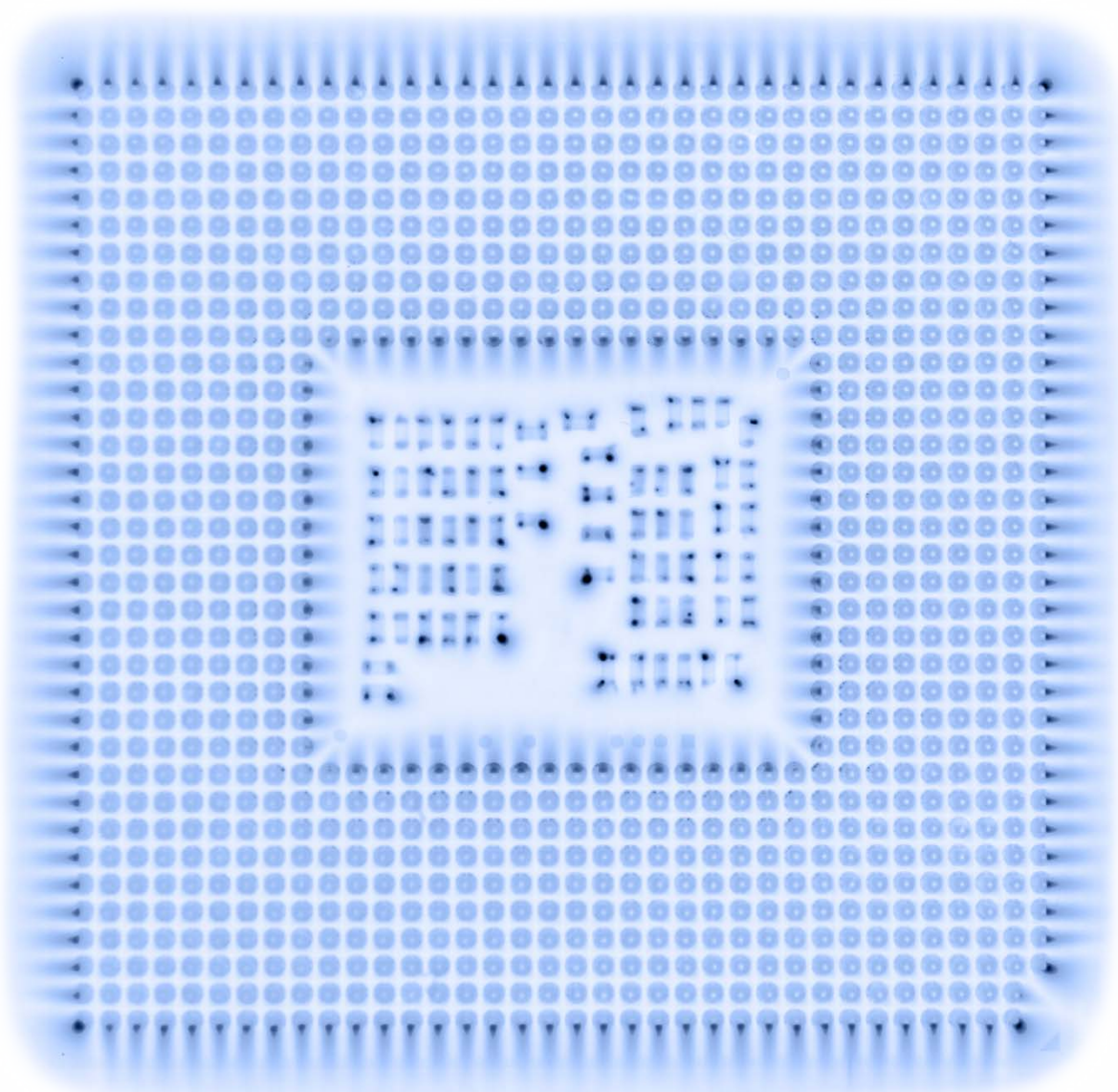
Image: Computer component under the Kirlian effect

More plan to collaborate with external vendors

External suppliers have emerged as one of the main forces driving businesses to adopt IoT technologies.

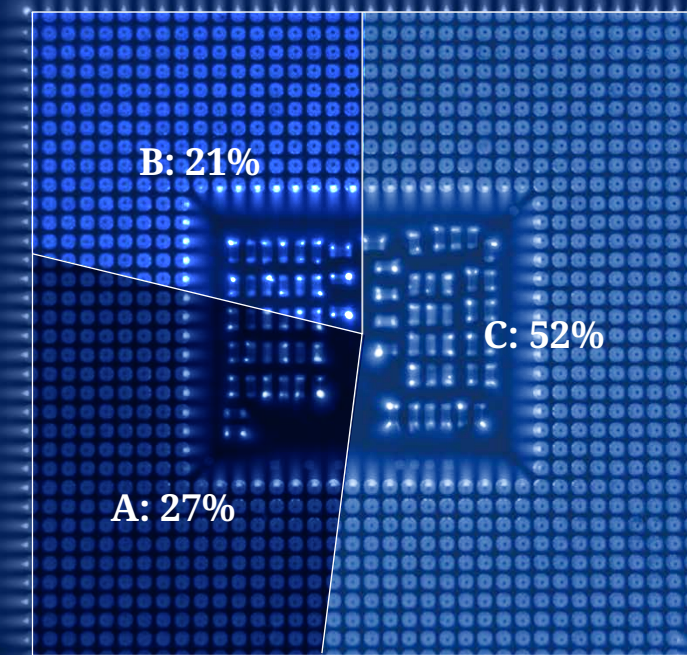
In response it seems businesses are recognizing this isn't a journey they can complete alone.

In our latest survey, 80% said they're now using or plan to use external vendors to some extent to help them transition to these new technologies. That compares with less than 50% in 2020, when a clear majority said they expected to keep the process entirely in-house.



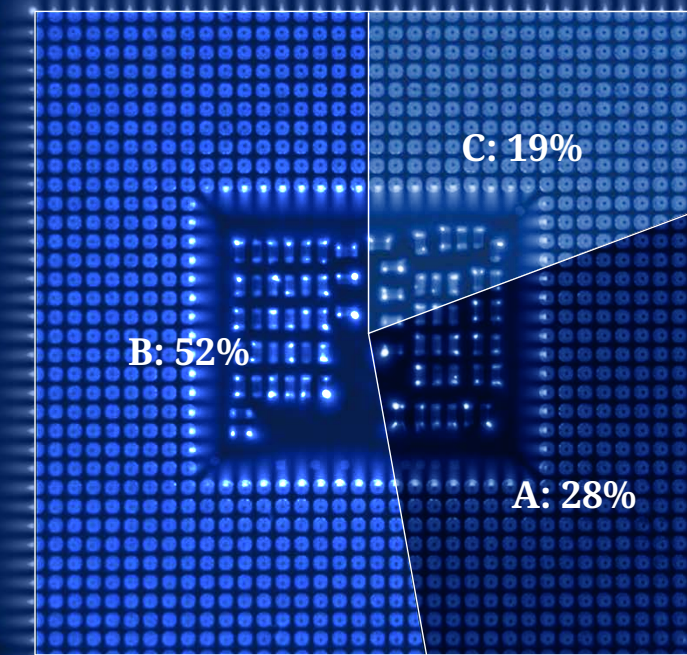
Meeting IoT / connectivity needs

2022



- A: Outside vendor/supplier only
- B: In-house only
- C: Mix of both

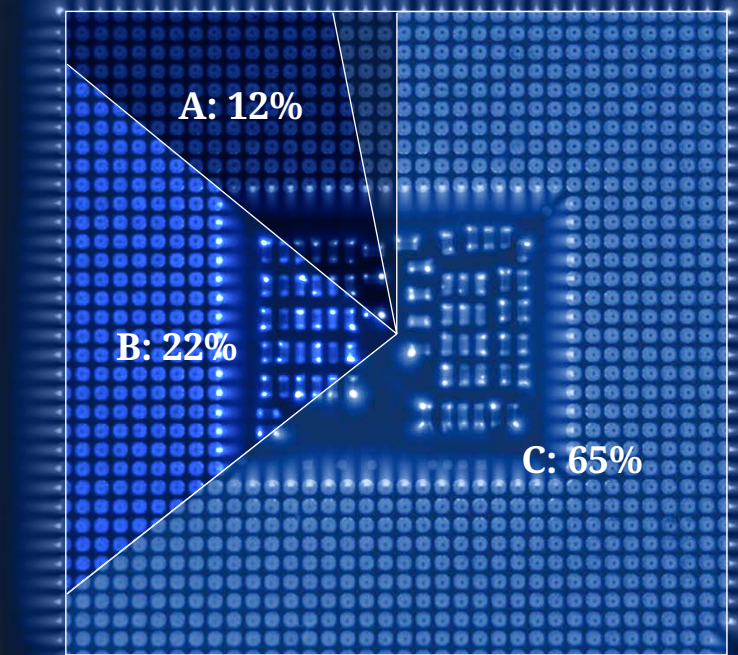
2020



- A: Outside vendor/supplier only
- B: In-house only
- C: Mix of both

2018

D: 3%



- A: Outside vendor/supplier only
- B: In-house only
- C: Mix of both
- D: Don't know

Image: Processor chip under the Kirlian effect

Conclusion

At the end of our last Technology Index report in 2020 we looked forward to seeing how a, then, highly confident tech sector would emerge from the COVID-19 crisis into the post-pandemic world.

There were concerns at the time about the long-term economic impact of the pandemic.

But few could predict how turbulent the world would become in the intervening two years. In that time we have seen existing challenges – supply chain disruptions and a simmering trade stand-off between the US and China – exacerbated by war in Ukraine, rapidly rising inflation, market volatility, a devastating cost of living crisis and the looming threat of recession across major economies.

Yet our latest Tech Index continues to find European tech companies in surprisingly confident mood. In fact, respondents express more confidence in the tech sector's growth prospects than at any time since we began taking these biennial soundings among leading businesses.

Only when asked to comment directly on the current geopolitical climate does that sense of optimism diminish – with our overall Tech Score reduced, although still remaining relatively high.

Technology has proved itself

That sense of continuing confidence, perhaps, indicates that some important lessons have been learnt as businesses have navigated recent uncertain times.

First and foremost, there's a clear belief that technology has proved itself in times of crisis. During COVID-19 that was for obvious reasons. Lockdown accelerated the adoption of key communication and banking technologies and the tech sector flourished while others were severely hit.

The game has changed in the current crisis to some extent. Now some tech companies with a consumer focus are under much greater pressure, both in selling their products and services and in raising finance.

The sky-high valuations companies were achieving only last year have fallen sharply, depressing M&A activity, with deal volumes sure to suffer for some time. Venture funds are pressing many of their portfolio companies to tighten their belts rather than lavishing them with cash.

But for tech companies with robust business models, particularly those serving industrial and commercial markets, there is still plenty of finance available to fund growth, whether organically or through acquisition.

That's primarily because there's a continued recognition that technology has a critical role to play in building economic resilience and opening new pathways to growth, even in tough economic times.

Key technologies such as Internet of Things, connectivity, AI/Robotics and 5G have the power to provide answers to a long-running dilemma – how to energize economies that for many years have been stuck in a cycle of sluggish growth and low productivity.

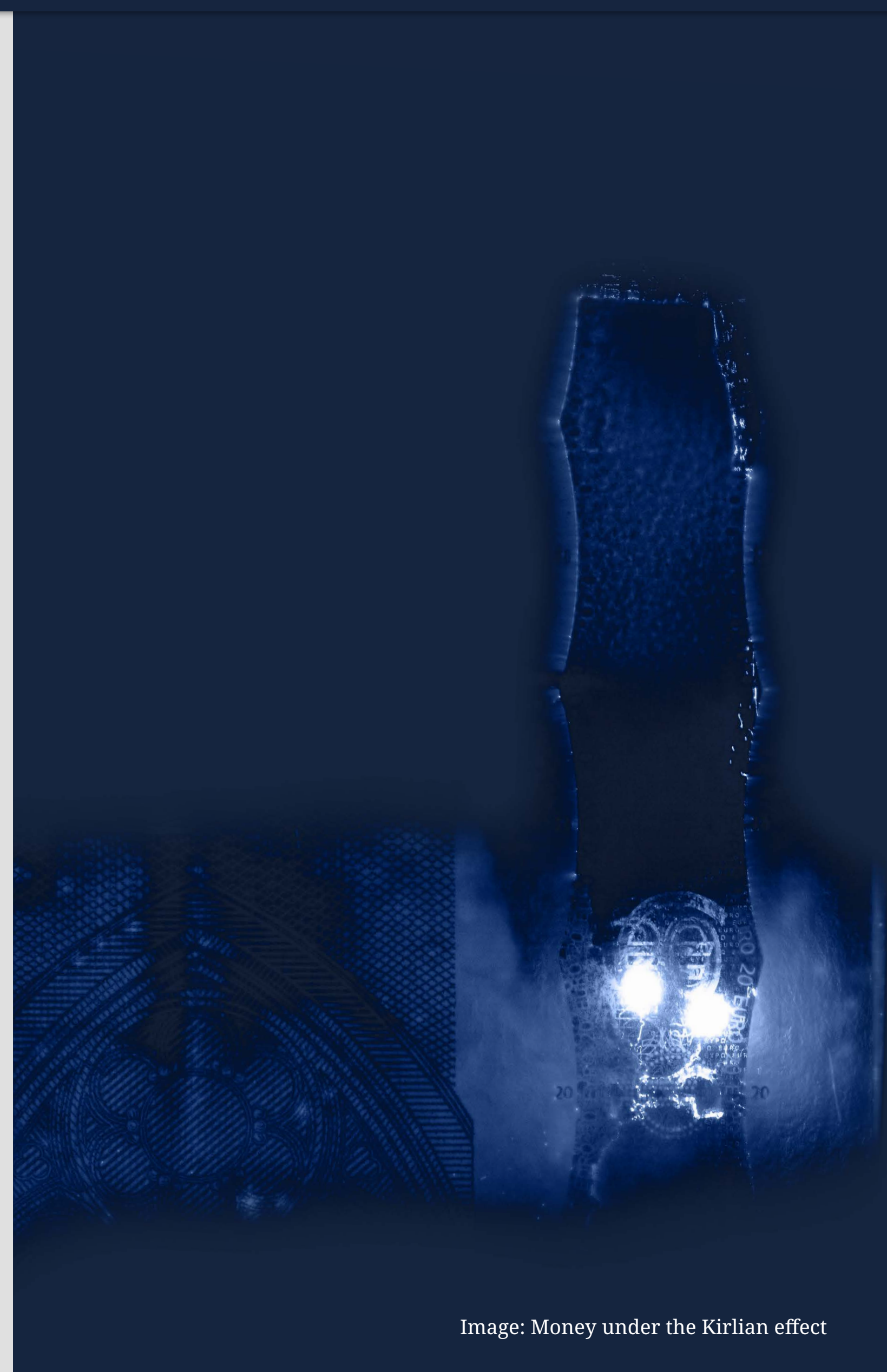


Image: Money under the Kirlian effect

But that will only be the case if companies hold their nerve and keep investing in digital technologies. And it will depend on companies recognizing that the benefits of these technologies can only be realized if they pursue digital transformation in the deepest sense.

That means adopting new business models that re-invent the way new products and services are created and taken to market.

Better prepared

Companies are operating in an increasingly tough and complex regulatory environment. But many seem more at ease with that reality, having lived through recent significant changes in regulation, not least the introduction of the EU's GDPR.

This time we see a desire among many businesses to be better prepared for new and evolving regulations in key areas, such as AI and fintech, to avoid the need to revise systems and processes once the regulation takes shape. There's a recognition too that regulation can be an enabler and not just a constraint.

Even in areas where regulation differs across different jurisdictions, companies appear ready to find a way through the contradictions. A high proportion of our respondents have little positive to say about Brexit, for instance. That's perhaps not surprising given that everyday trading has become more complex, approaches to regulation are diverging and important science and technology funding programs, such as the EUR95 billion Horizon Europe funding initiative, have been derailed amid continued political manoeuvring.

Ever tighter national security controls are also proving an increasingly complex challenge, particularly where the line between defending genuine national security concerns and protectionism is blurred.

Yet confidence that the general economic environment will continue to support growth remains high and this may also indicate that lessons have been learnt from past downturns.

Rather than ditch important projects only to regret it later (something we saw frequently after the global financial crisis struck in 2008), today we see a determination to keep investing carefully but bravely in projects that can deliver long-term value. Many companies view these challenging times as an opportunity to innovate rather than retrench.

In that sense it's encouraging to see that many companies are embracing the ESG agenda, although some are putting it lower down the list of immediate priorities.

The climate crisis demands that tech companies maintain that focus. They have a huge role to play (and much to gain) in making a success of the transition to clean energy and other sustainable technologies.

A central role

No sector of the economy is immune to the impact of such difficult and unpredictable conditions we now face. It remains to be seen if the current crisis is relatively short-lived or develops into one as deeply disruptive as the COVID-19 crisis.

The next two years will undoubtedly be incredibly challenging for the tech sector, as all others.

But for now, tech companies seem to believe, and with justification, that they can play a central role in helping to steer the global economy through the current economic storm and into better times.

To discuss the report further, please contact:



Mark O'Connor

Partner,
Global Co-Chair,
Technology Sector,
London



Erin Gibson

Partner,
Global Co-Chair,
Technology Sector,
San Diego



Trent Dykes

Partner,
Global Co-Chair,
Technology Sector,
Seattle

Appendix

Methodology and respondent profile

DLA Piper commissioned Coleman Parkes Research to canvass views of European tech companies to assess where they see opportunities for growth and what challenges they see standing in their way. Despite an increasingly uncertain economic and geo-political environment, the European tech sector remains remarkably optimistic and clearly focused on innovating their way through tough market conditions.

Respondent base and methodology

350 interviews were conducted online (supplemented by telephone research where necessary) in April and May 2022 with executives in key technology businesses ranging from EUR10 million to more than EUR10 billion in revenue. Soundings were also taken from members of the investment community and policymakers focused on the tech sector. All interviews were carried out in the respondent's local language.

Technology Index methodology

The results have been collated and weighted to provide DLA Piper's Technology Index Score. This is based on a diffusion index that weights the percentage of respondents' answers that are positive, negative and neutral, with the results presented as a scorecard next to each of the business areas monitored and an overall index.

How do we get the score?

[Click here to see how the score is calculated.](#)

Please note that due to rounding, percentages may not always appear to add up to 100%.

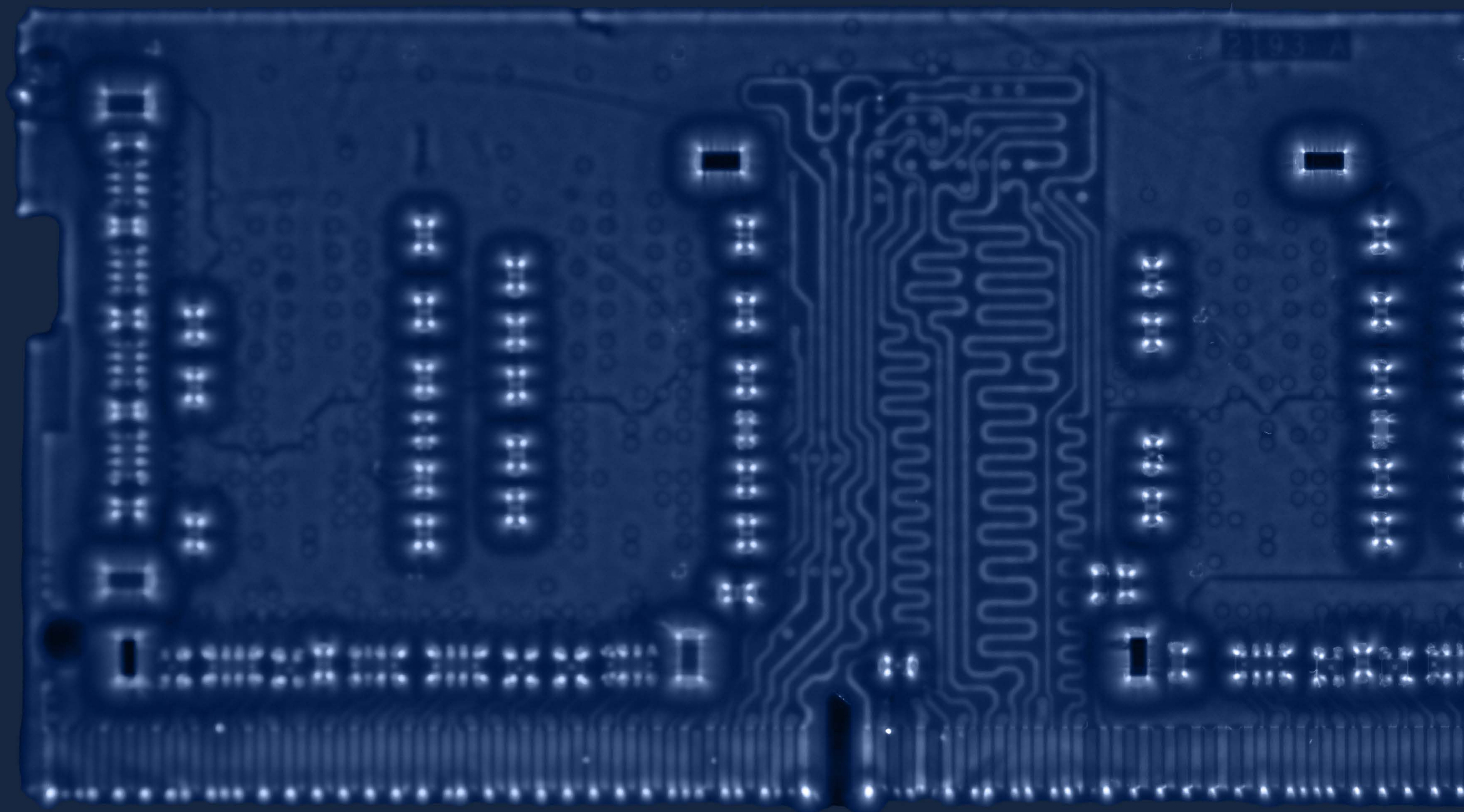


Image: Computer component under the Kirlian effect

Contributors



Mark O'Connor

Partner,
Global Co-Chair,
Technology Sector,
London



Erin Gibson

Partner,
Global Co-Chair,
Technology Sector,
San Diego



Trent Dykes

Partner,
Global Co-Chair,
Technology Sector,
Seattle



Alexandra Kamerling

Partner, London



Andrew Dyson

Partner, Leeds



Andy Gastwirth

Chief Information
Officer,
Washington, DC



Anthony Lloyd

Partner, Sydney



Arjen de Snoo

Legal Director,
Amsterdam



Ben Goodall

Senior Marketing
Manager, Global
Technology Sector,
Silicon Valley



Daphne Bens

Partner, Amsterdam



Diego Ramos

Partner, Madrid



Deborah Bould

Partner, London



Ed Griffiths

Partner, London



Eilís McDonald

Associate, Dublin



Eric DeSilva
Partner,
Washington, DC



Gareth Stokes
Partner, Birmingham



Giulio Coraggio
Partner, Milan



Hannah Smith
Senior Marketing
& BD Manager,
International
Technology Sector,
London



Imran Syed
Partner, London



Jesse Medlong
Associate,
San Francisco



Kit Burden
Partner, London



Kristi Swartz
Partner, Hong Kong



Larissa Bifano
Partner, Boston



Linzi Penman
Senior Associate,
Edinburgh



Lord Clement-Jones
AI Policy and
Regulation Consultant,
London



Magdalena Zmorka
Marketing
Coordinator –
International Practice
Group, Warsaw



Margo Tank
Partner,
Washington, DC



Kristof De Vulder
Partner, Brussels



Mark Radcliffe
Partner,
San Francisco



Michael Stead
Senior Associate,
Birmingham



Mike Conradi
Partner, London



Natasha Luther-Jones
Partner,
Leeds and London



Nicholas Boyle
Partner, Sydney



John Magee
Partner, Dublin



Omar Khabbaz
Senior Advisor,
DLA Piper
Business Advisory,
London



Paul Allen
Partner, Dubai



Paul Hopman
Partner, Amsterdam



Pilar Menor
Senior Partner,
Madrid



Rhys Davies
Partner, London
and Perth



Sanjay Shirodkar
Partner,
Washington, DC
and Baltimore



Sarah Jayne Scott
Sector Marketing
& BD Manager,
Edinburgh



Steven Phillips
Partner,
Washington, DC



Sylvia Ebersberger
Partner, Munich



Tom Heylen
Partner, London



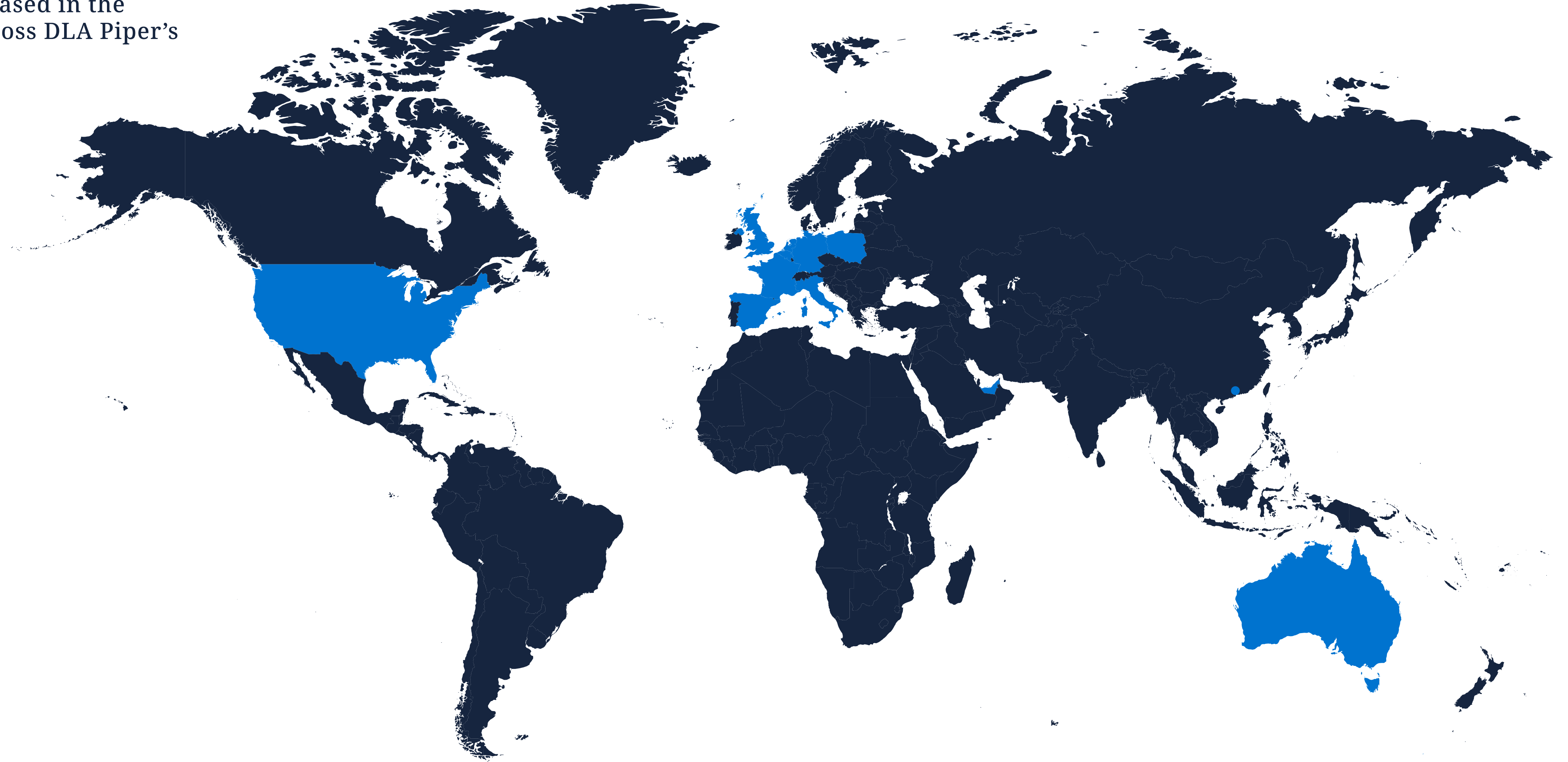
Vinny Sanchez
Partner,
Chicago and
Los Angeles



Yaël Hirsch
Associate, Paris

Our contributors are based in the following locations across DLA Piper's global network:

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- East Palo Alto
- Los Angeles
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- San Francisco
- Seattle
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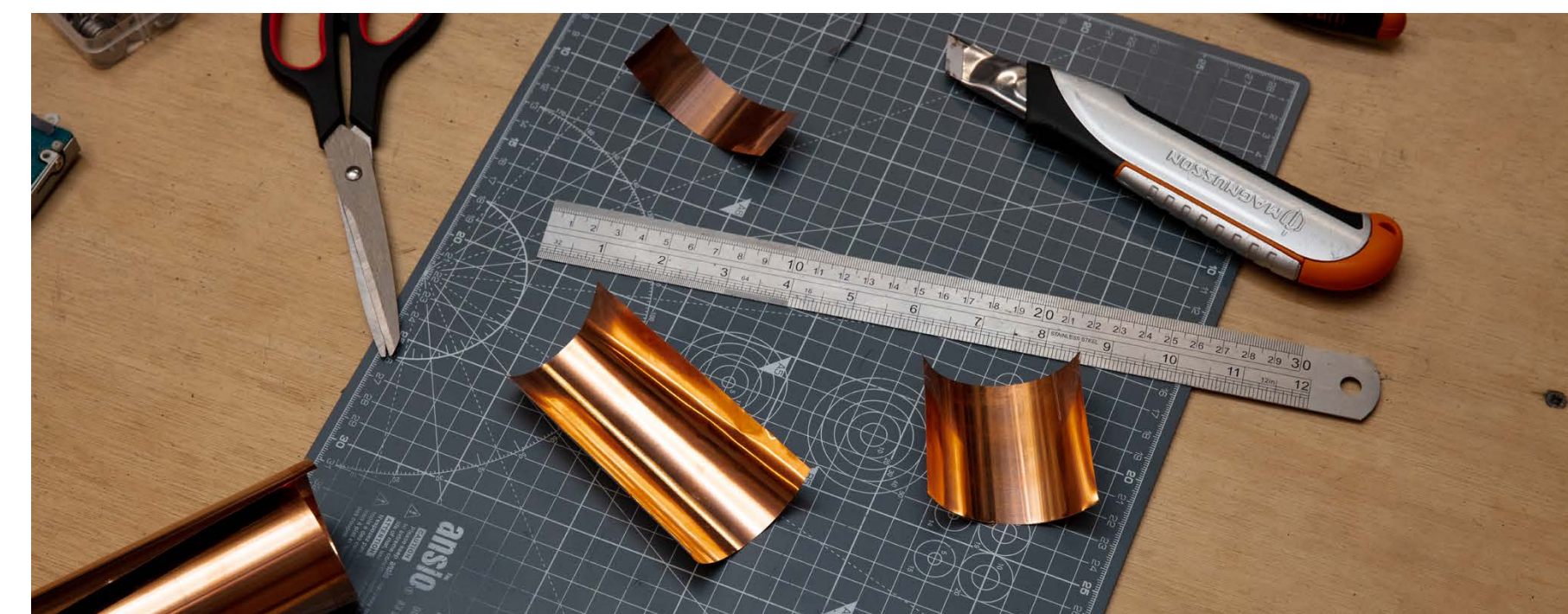
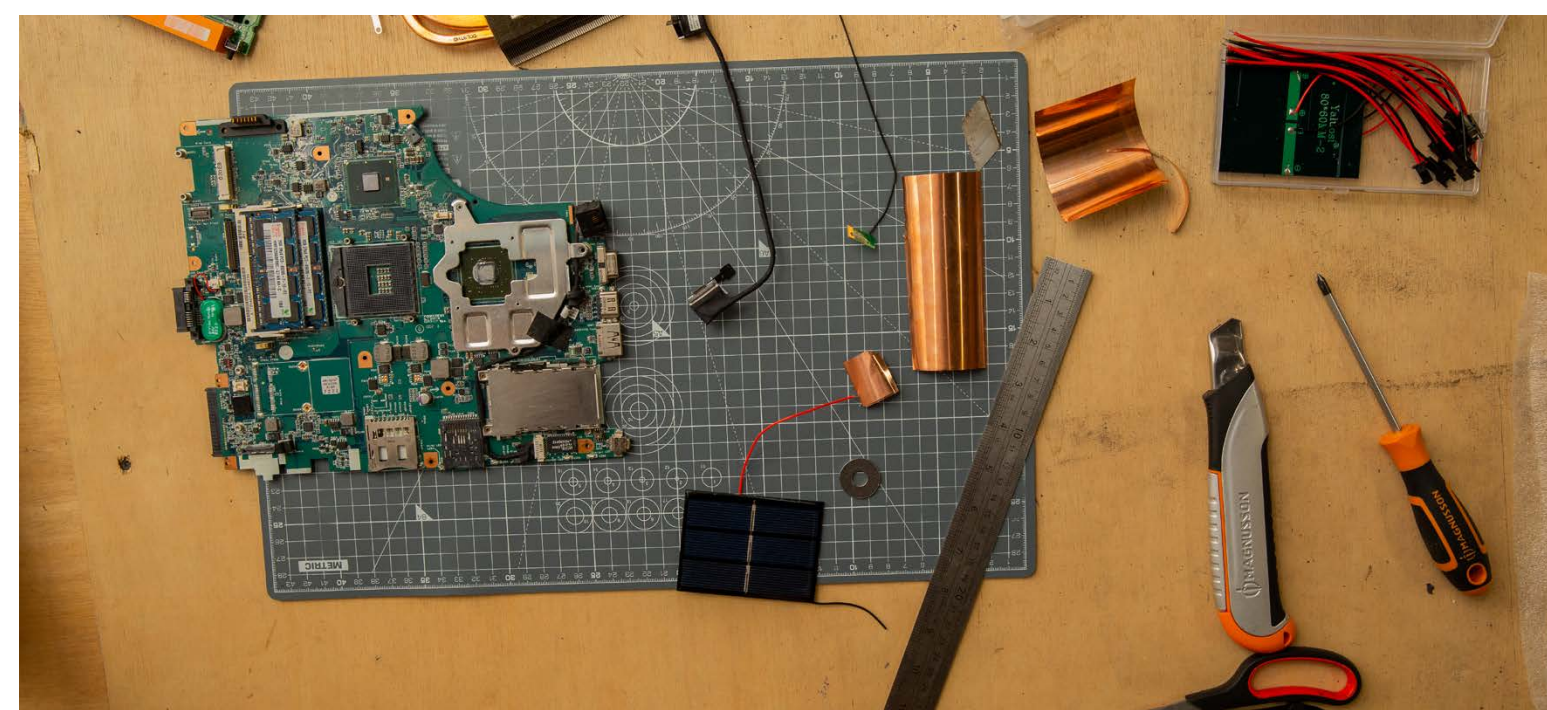
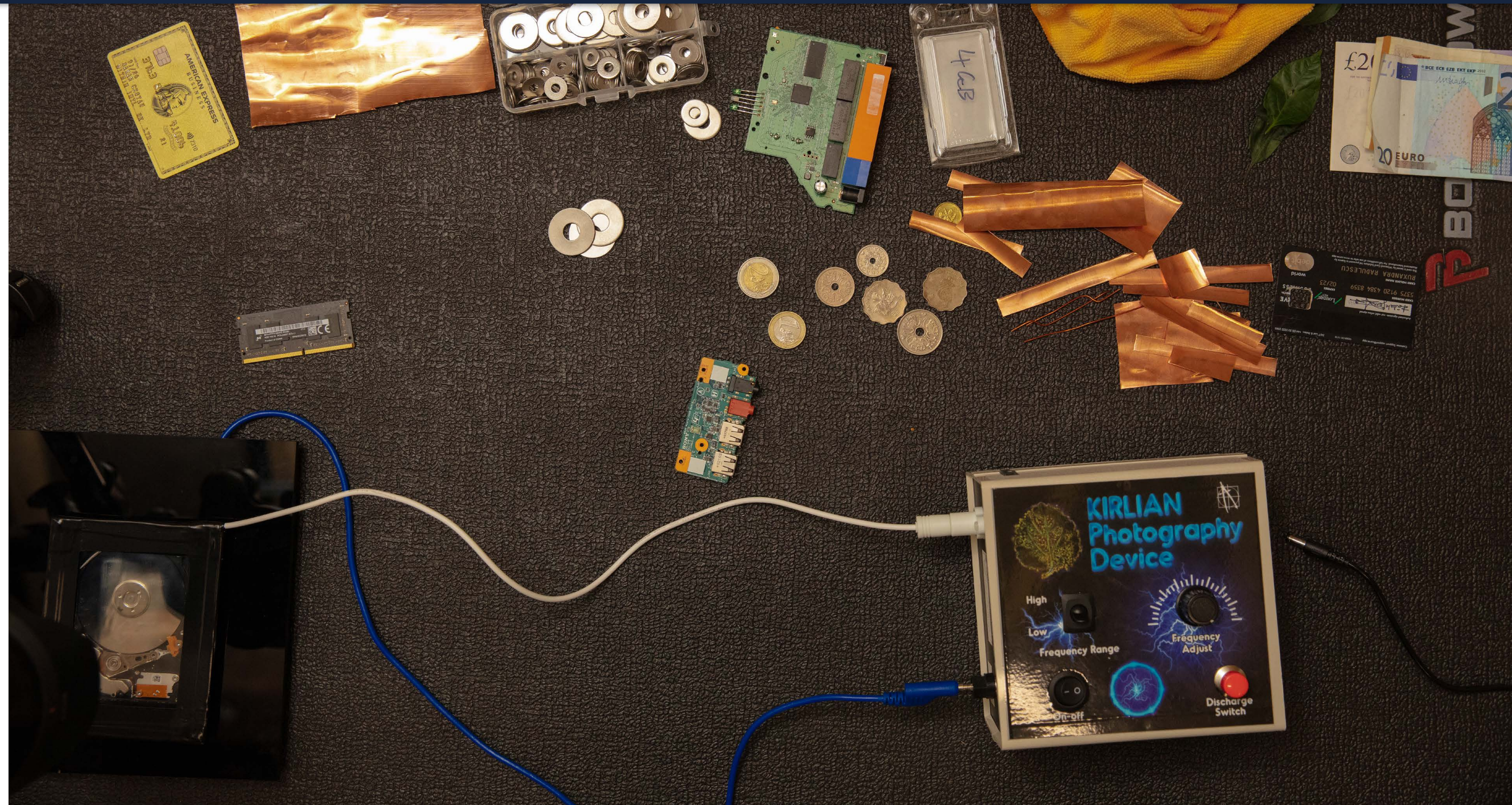


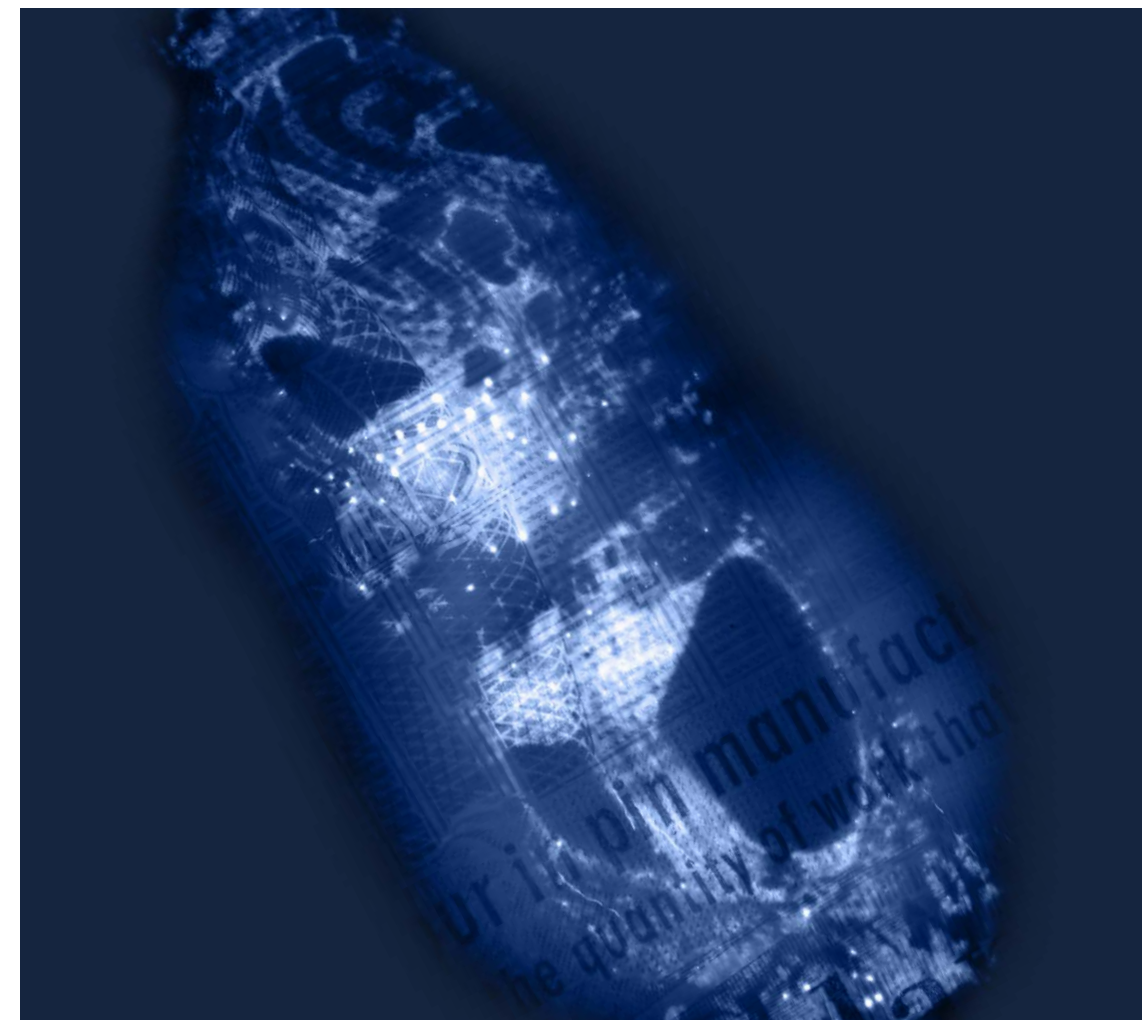
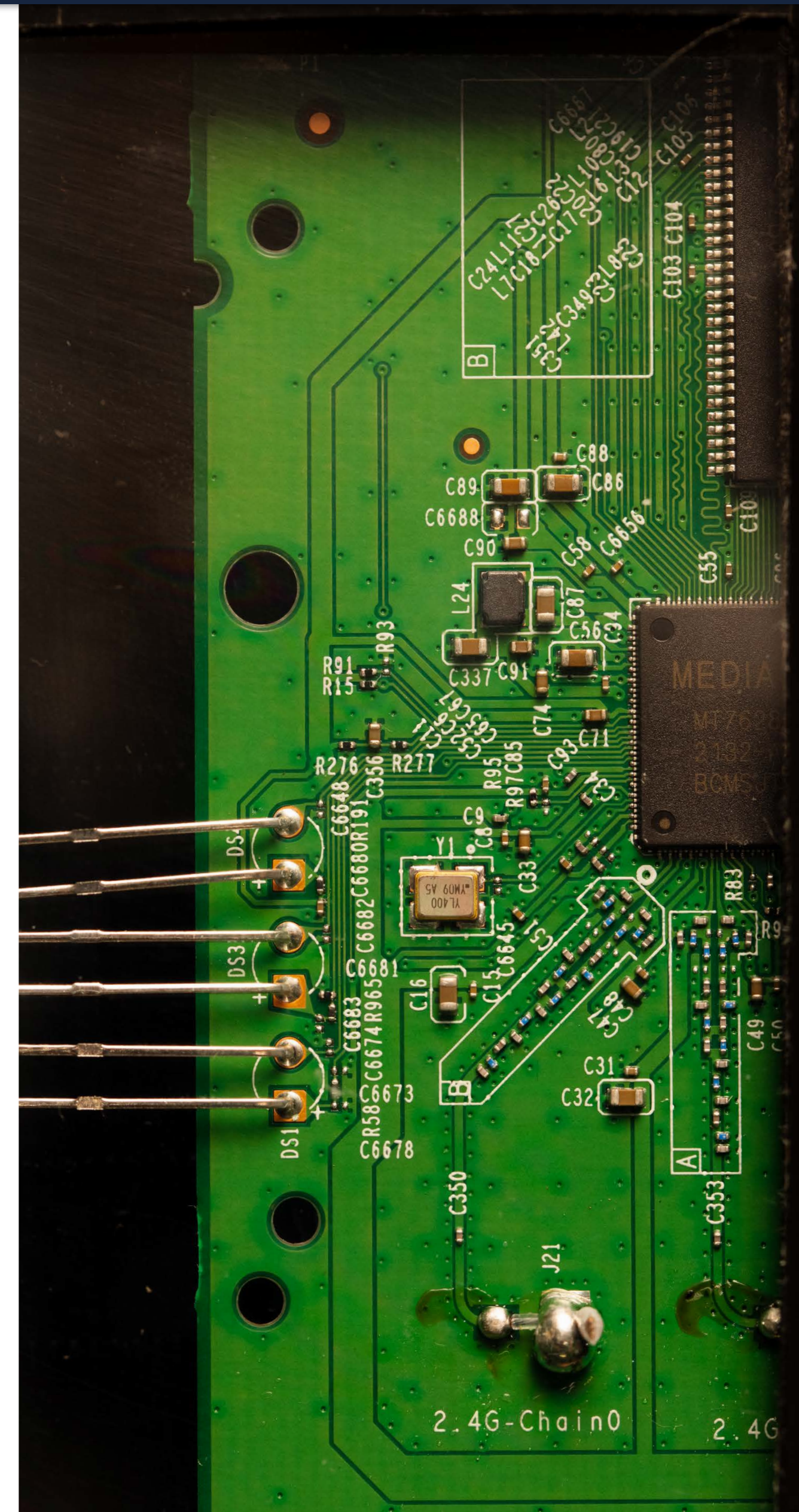
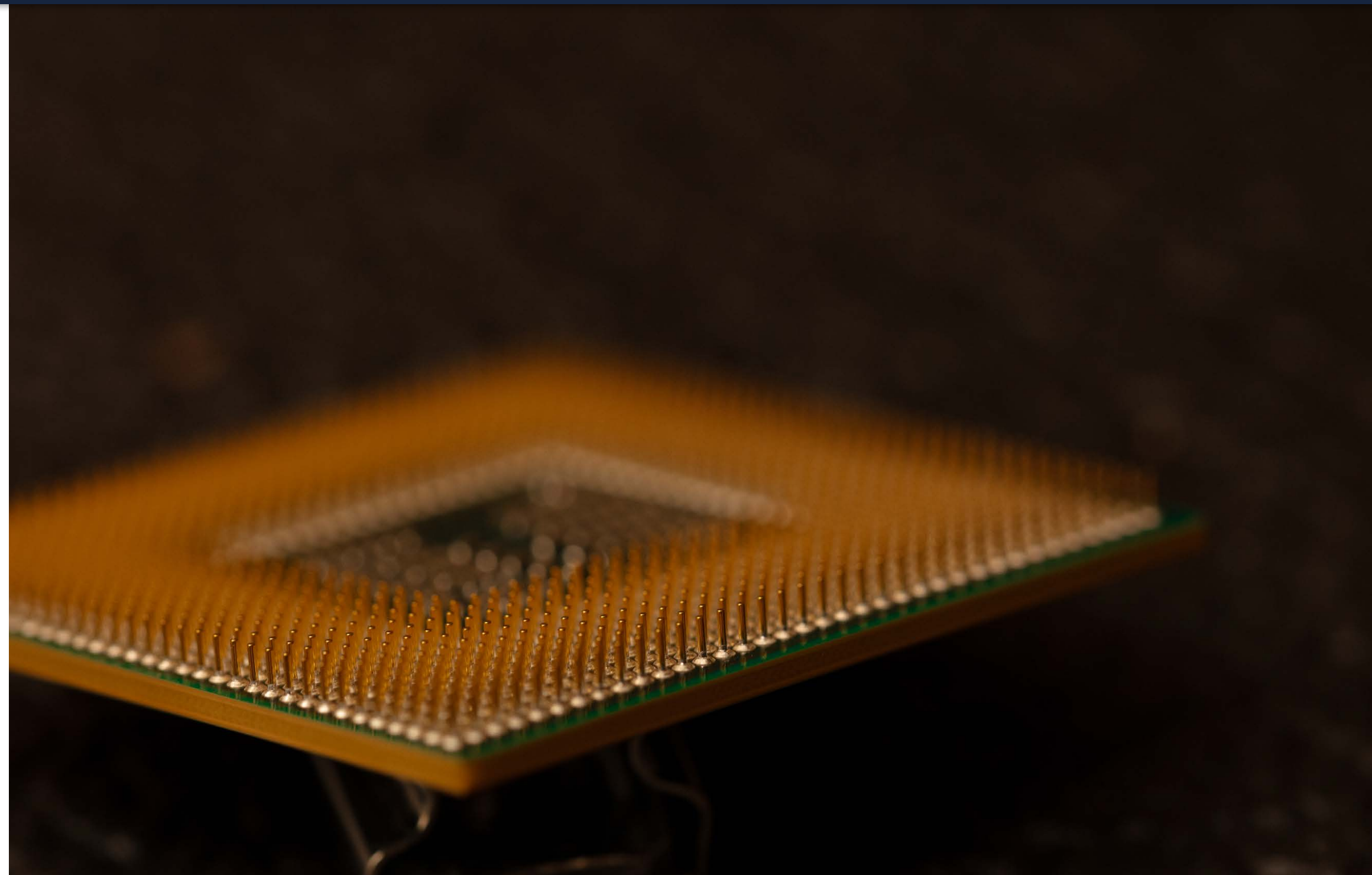
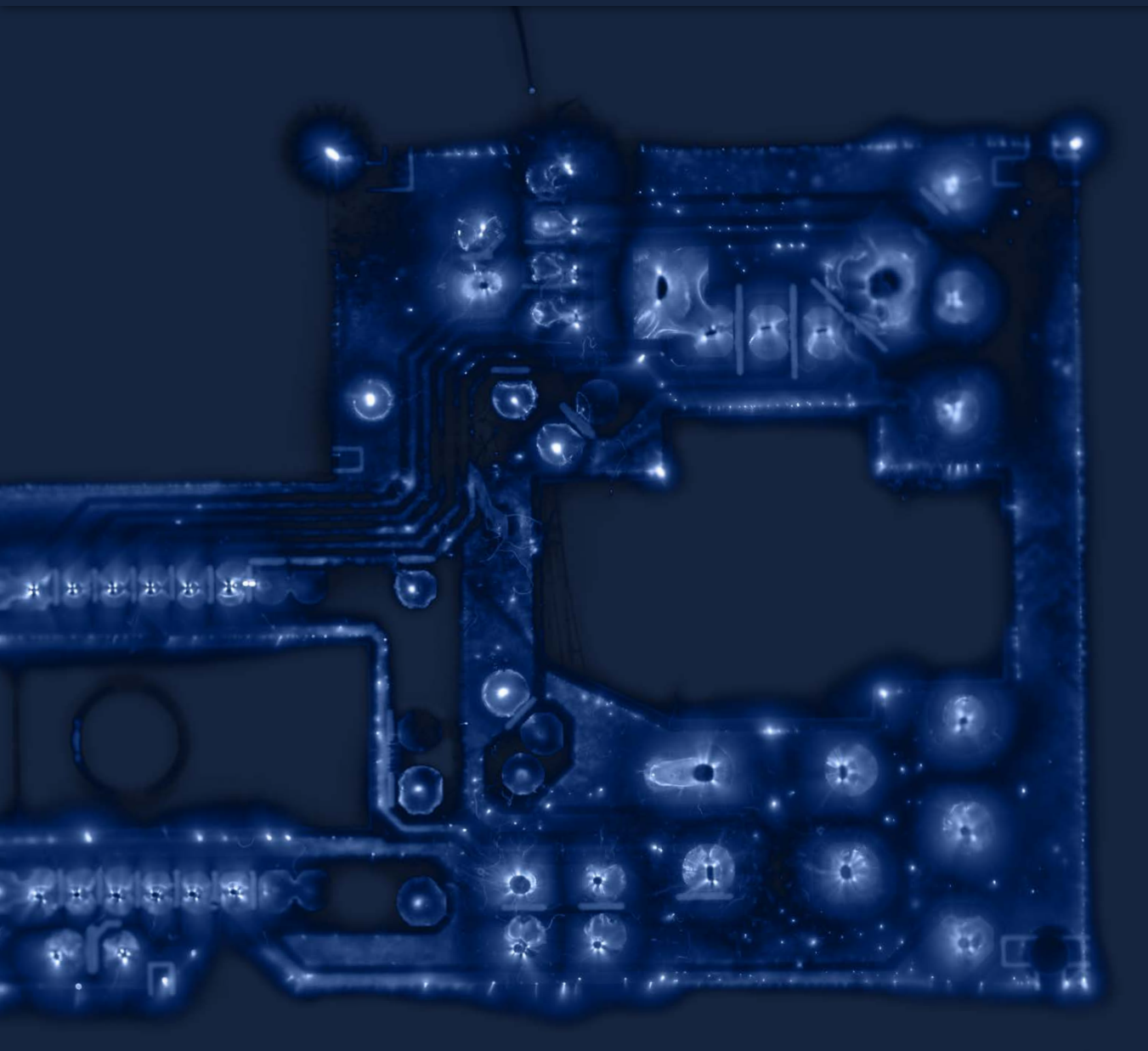
A glimpse behind the scenes - the use of Kirlian photography

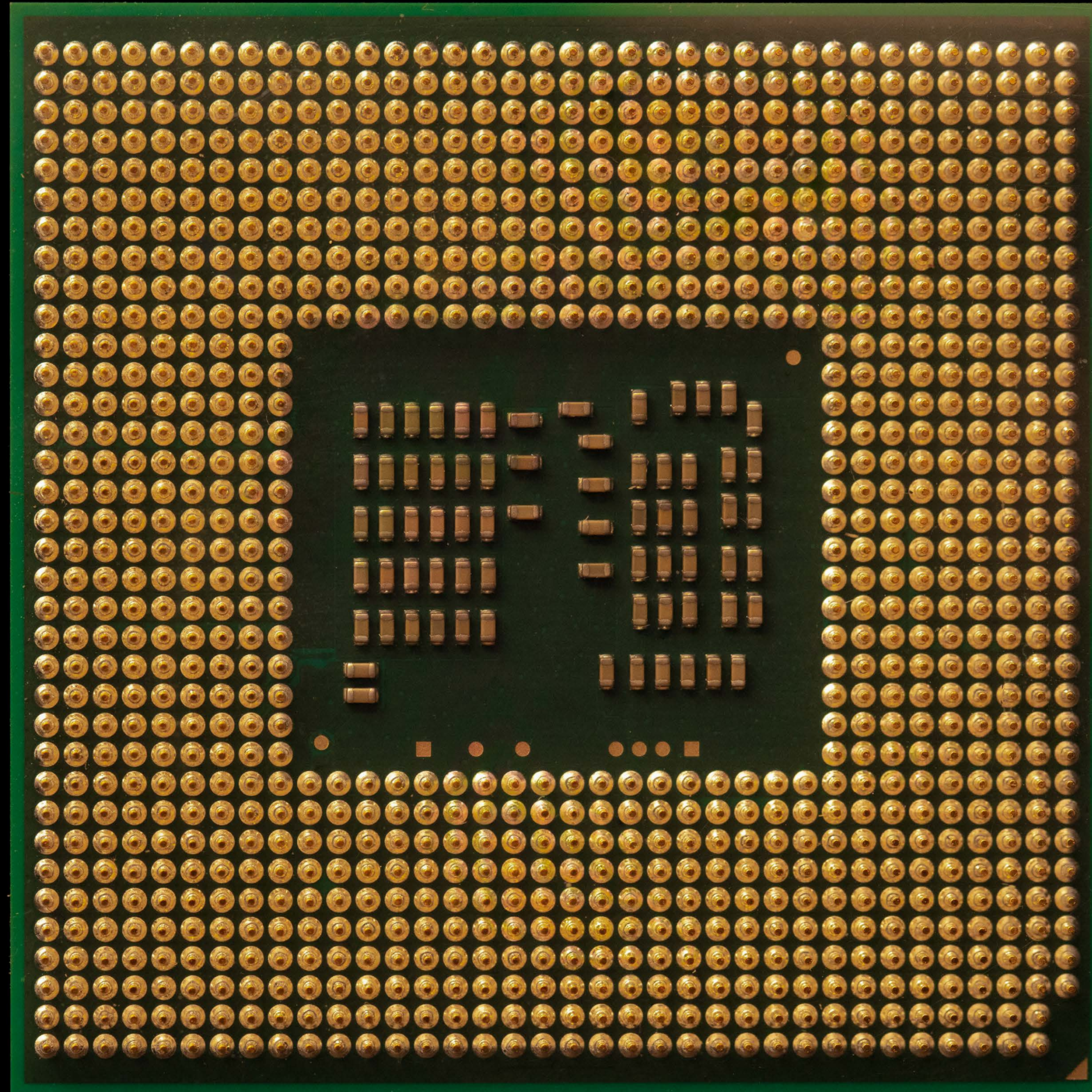
All the images included in the report are unique, and specifically taken for the purposes of this report.

We have used Kirlian photography to capture the coronal discharges of an object resulting in the striking imagery you see throughout the report.

By exposing an object to high voltage current inside the Kirlian machine, an electrical discharge is produced. This is then captured through image or film. An object of any material that conducts electricity can be used inside the machine.







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