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What technology trends will—and should—lead business agendas in 2022?

We asked leaders in industry, academia, and at McKinsey to share their perspectives on the technology trends likely to headline business agendas this year, the ones that could—but shouldn't—slip through the cracks, and what executives should think about when considering new technologies. Here is what they told us.

March 2022

Metaverse. Web3. Crypto. 5G.

These are just a few of the technologies grabbing headlines at the start of 2022. But what technology trends truly sit atop business agendas this year? Which might be under executives' radars but should be surfaced? And what should business leaders keep in mind as they consider these trends?

We asked some members of the McKinsey Technology Council, a group of global experts convened to assess, track, and debate real emerging trends in business and technology, for their perspectives on these questions. Specifically, we asked the following:

— What technology trend do you predict will headline business agendas for the remainder of 2022 and why?

— What technology trend do you think is under businesses' radars but merits more of executives' attention?

— What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?

Their answers might surprise you. While some leaders keyed in on bleeding-edge technologies such as quantum computing, others focused on bringing more rigor and operationalization to technologies that have been around for several years, such as machine learning. And their advice to business leaders often indicates that some age-old issues, such as breaking down organizational silos and reskilling the workforce, remain pertinent.

Explore their responses and share those that most resonate with you. Also feel free to let us know what technology trends and questions are on your mind by emailing us at techforexecs@mckinsey.com.

Ajay Agrawal

Professor of entrepreneurship, University of Toronto Rotman School of Management

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?

Traditional companies will continue their investments in digitization. Technologically advanced companies will continue their investments in automation.

What technology trend do you think is under businesses' radars but merits more of executives' attention?

Most traditional companies would benefit from greater attention to productivity-enhancing opportunities from automation. Technologically advanced companies would benefit from greater attention to productivity-enhancing opportunities from cognitive immersion via the metaverse.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?

Understand what is possible by way of digitization, automation, and cognitive immersion via the metaverse. Develop a thesis of what your industry will look like five to seven years from now and start building products and services today for that future.

Animashree Anandkumar

Director of machine learning research, NVIDIA, and Bren professor of computing and mathematical sciences, California Institute of Technology

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?

The advent of foundation models that are multimodal transformers trained on web-scale data sets has taken AI to supercomputing scale. This is already having a huge impact on businesses, since they can take these powerful pretrained models and quickly adapt them to their downstream tasks using only a few training samples.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
Self-supervised learning has shown a lot of promise in training competitive models that match or even beat models trained using supervised learning. This data-centric AI revolution will reduce our dependence on data and enable applications where data labeling is expensive or infeasible.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
Incorporating new technologies can be risky but also hugely rewarding. My advice for business leaders is to be agile in starting pilot studies that are realistic in realizing the benefits of new technologies and possibilities of a disruptive transformation.

Alan Baratz

President and CEO, D-Wave Systems

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
The impact of disruption. For the past two-plus years, we've all been navigating significant and accelerated change brought on by the pandemic. This is the year we move away from being disrupted to managing the disruption. Whether taking back our supply chains or navigating new ways of work, great businesses will begin to find and act on new solutions, technical and otherwise, to both revolutionary and evolutionary problems. As with every market shift, emerging technologies, such as quantum computing, will be required to tackle complex operational problems and achieve transformative results.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
While we've seen more and more businesses interested in quantum computing, there are still many that are unaware of how quantum can radically transform their business. In any given industry—from manufacturing and logistics to bioscience and pharmaceuticals—quantum computing can expedite operational efficiency, increase revenue, and give businesses an edge over competitors.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
Don't start with the technology—bright shiny objects tend to fizzle. Start with the problems you are trying to solve and then identify how these emerging technologies can help solve these problems and benefit your business. Emerging technologies are accelerating not only in volume but also in complexity. Seek out trusted partners that can both develop the road maps for incorporating these new technologies into your infrastructure and work closely with your organization to teach and train your teams. Having a dedicated team that partners with customers accelerates the benefits of the disruption and the net tangible value.

Michael Chui

Partner, McKinsey Global Institute

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
Crypto. I say this not necessarily because crypto will have material impact on the agenda of every business but because it will be in the headlines. So every business will have to figure out what crypto might mean for them and, to generalize a point our colleagues made in "Blockchain's Occam problem," determine for which use cases a crypto solution is actually superior to the alternatives and will generate significant demand.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
The industrialization of artificial intelligence. In companies that are capturing an outsized share of value from AI across many sectors, the application of AI and machine learning is moving from craft to profession. These companies are adopting a new

tech stack and set of processes known as MLOps, which allows them to predictably and more cost-effectively deploy AI models an order of magnitude faster than before, while monitoring performance, to race ahead of their competition.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
Learn from the speed and scale of transformational change that the pandemic unleashed. As challenging as COVID-19 has been to many lives and livelihoods, it has also forced every organization to break down barriers to change, enabled by technology, that would have otherwise taken years to overcome.

Yetunde Dada

Director of product management, QuantumBlack, a McKinsey company

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
This will be the year that we operationalize trustworthy machine learning and try to get ahead of the regulation that is falling into place globally. For too long, we have left systems that make decisions about people unchecked and have been eternalizing systems of inequality. Models should characteristically be transparent, have biases understood and mitigated, and have better data governance. The machine learning ecosystem for auditing models is highly fragmented and specialized, requiring experts; tooling has to be created to assist organizations with audits. And we also need to find new ways of engaging impacted communities while creating these models.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
Organizations worldwide have become excellent at creating digital products and applications. The same revolution needs to happen for machine learning. We have to start thinking about how we create machine learning products and develop ecosystems of tools that apply software engineering and DevOps practices to them. I expect to see new tools designed to help facilitate this transition, but it also requires an organizational shift to support the complexity of machine learning products. Proof of concepts prove value, but they should not be the end goal.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
You should have an easy-to-understand problem statement in place before seeking new technologies. Your needs should drive what technology gets adopted in your organization, rather than trying to fit technology for a problem that does not exist. Pursuing solutions to your requirements also helps to avoid hype technologies. Controversially, this makes me think about technologies such as the metaverse. I wonder what problem it is trying to solve, how other users have solved it, and if their solutions failed or succeeded. This needs-driven approach should guide your technology exploration and simplify your decision making and investments.

Nicolaus Henke

Senior advisor and senior partner emeritus, McKinsey & Company

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
We will see continued attention, even hype, triggered by "technical firsts" in horizontal building blocks such as the creation of metaverse environments and cloud-native platforms and companies; more automation in machine learning engineering; advances in generative techniques beyond GPT-3; and expanded tokenization. These technical firsts will get a lot of attention and inspire and enable innovative moves.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
What's most important for business leaders continues to be less about which of these technical firsts will occur but how they add up to meaningful impact within an enterprise or industry. Impact will be realized through deep verticals in very sharply defined domains, such as engineering more sustainable products, using the metaverse to vastly improve and accelerate the education of nurses and doctors, or automating clinical trials.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
Invest in educating senior management—particularly the business line, not just the engineering and technology functions—to experiment in house and with leading technical partners to drive improvement. Pick a few priority domains. Set up experiments. Learn by doing, and teach executives by doing. Be clear about which technical capabilities to build and which capabilities to share via external ecosystems.

Klemens Hjartar

Senior partner, McKinsey & Company

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
There will be a revival of data-centric architecture transformations, and open source for functional software is on the rise. Major corporations and organizations are updating their architecture guidelines to build first and buy second. In early February, for example, the US Department of Defense announced its Software Modernization Strategy, which will focus on leveraging the cloud to develop software applications.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
IoT (including cameras, sensors, connectivity, and so on) will need to go through a revival to continue the convergence of the physical and information worlds. Undergoing a data-centric architecture transformation and employing AI is a way to unlock the power of IoT.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
Any progress in technology starts and ends with talented people.

Julie Love

Partner and product leader for quantum computing, Microsoft

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
We will continue to see steady progress in quantum computing in 2022. Commercial impact from quantum hardware is still years away, but I expect the next year to bring improvements in underlying materials and hardware for building quantum systems, advancements in cloud capabilities for programming quantum systems through platforms offered by cloud providers, and impact delivered from offshoots of quantum technology, such as using algorithmic methods inspired by quantum computing to solve hard computational problems.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
Quantum computing holds the promise to deliver unprecedented solutions to some of society's most complex challenges. For example, it could help address climate change by enabling the design of a new catalyst for efficient carbon fixation. While significant advancements are needed to realize practical, industrial-scale impact, enterprises can get started today in the cloud or with partnerships to understand quantum's application areas. There are also opportunities for disruptive innovation from harvesting ideas from quantum thinking and innovation. By building on quantum concepts to reimagine classical algorithms, we've improved capacity management in cloud storage, made advancements in medical imaging, and reimagined freight optimization.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
Enterprises that can leverage quantum computing to accelerate key workloads will have an opportunity to bring disruptive innovation to their industries. The key to this will be learning to work across a heterogeneous compute fabric, leveraging not only quantum but also machine learning, AI, and more. It's also important to separate hype from reality. Quantum computing will have a profound impact on the global economy for a select set of big compute problems, such as predictive computational design in chemistry and materials. However, this will require tight integration with high-performance classical compute solutions and new ways of thinking and programming.

Jeremy O'Brien

CEO and co-founder, PsiQuantum

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
I foresee 2022 as the year when a rapidly increasing number of businesses start preparing in earnest for emerging technologies that are expected to revolutionize their industries. Given the rapid pace of innovation, business leaders will be preparing their companies to harness these powerful technologies to tackle some of the most urgent practical challenges and, in doing so, create a distinct and significant competitive advantage.

What technology trend do you think is under businesses' radars but merits more of executives' attention?
More and more corporations are facing the constraints of physics and chemistry (for example, in battery design, drug design, and materials), accelerated by increasingly scarce resources, the global push for sustainability, and the switch to low-carbon tech. We see quantum computing as crucial to helping overcome these challenges. Multinational companies across sectors have started to prepare for the inevitable availability of quantum computing and to evaluate how to utilize this new computational capability for lasting competitive advantage. As milestones in quantum technologies are achieved this year, I expect forward-looking executives to invest more time and money in readying their business for this technology.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?
Businesses should consider collaborating with emerging technology companies to define business readiness and to size the magnitude of the impact. In the case of quantum computing, this means evaluating the most impactful use cases, developing algorithms, and assessing the impact potential for both the business and industry, along with investing early in technical infrastructure, institutional knowledge, and in-house expertise. Companies should start preparing now to secure access to what will likely be an extremely limited supply of quantum computing. Given the type of breakthroughs quantum computing will enable, these early adopters could find themselves in a winner-takes-all market leadership position.

Alex Ratner

Co-founder and CEO, Snorkel AI

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?
Over the past few years, global enterprises have made historic investments in AI and machine learning; however, many are still struggling to deploy and realize business value from these investments. Today, it's not the core models or algorithms that block progress; rather, it's the first- and last-mile components such as data, infrastructure, risk management, and governance that do. I expect these will continue to be a major focus of attention as enterprises push to realize the great economic potential of their AI initiatives.

What technology trend do you think is under businesses' radars but merits more of executives' attention?

A major focus today in both AI academia and industry is bringing increased process structure and automation to all of the supporting elements of successful AI deployment: data preparation and management, model serving and governance, risk management and explainability, and so on. Once viewed as secondary concerns, these will become the center point of differentiated tech and execution for successful AI teams and AI-enabled enterprises.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?

Break down silos. Many technologies today are highly cross-functional, and to successfully implement and evaluate them, you need cross-functional teams. AI's success today is as much or more due to data, infrastructure, and relevant subject-matter expertise as it is to data science and machine learning skills. An AI project that relies on institutionally separated data, IT, infrastructure, data science, subject-matter experts, and business-line teams that don't work closely together is therefore almost guaranteed to fail.

Lareina Yee

Senior partner, McKinsey & Company

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?

The metaverse has already reached the top of the search charts over the past year. As curiosity grows, we will see more experiments and use cases, especially in the gaming, entertainment, and retail sectors. Business agendas and larger tech investments will likely focus on those that move the productivity needle, such as automation and process virtualization. Today, 50 percent of our work activities can be improved with these technologies, which include robotics, digital twins, and 3-D/4-D printing.

What technology trend do you think is under businesses' radars but merits more of executives' attention?

Given the complexity and speed of today's world, companies need to find new ways to create insights at a rapid pace. In this regard, the future of programming (software and machine learning) is looking bright. Examples of exciting innovations include new ways to write AI models that reduce complexity and the ability to rapidly scale capabilities (AI factories) using learnings from software development (for example, MLOps, including GitHub repositories and automated validation/testing of output).

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?

Invest ahead of full certainty. We learn by trying out different technologies and use cases. Through succeeding (and failing), we uncover ways to substantially advance productivity, solve problems we had not previously thought possible, or move at a speed that was unfathomable just a few years ago. The more we experiment, the more we will learn. As we learn, companies will be better positioned to decide which technologies are critical one-to-three-year investments versus those that are three to eight years out.

Rodney Zemmel

Senior partner, McKinsey & Company

What technology trend do you predict will headline business agendas for the remainder of 2022 and why?

MLOps (machine learning operations). It's an ugly word but a beautiful concept. Most companies using AI and machine learning are generating an idea here and there for using analytics to improve the business. To have real impact, you need to generate a flurry of ideas. It isn't just about clever data science algorithms but everything from data quality to testing and validation to bias checking and security. MLOps provides the opportunity to create an operating system of people and technology that can make the process of creating each new application dramatically easier, helping to enable the whole business.

What technology trend do you think is under businesses' radars but merits more of executives' attention?

Quantum computing and the quantum internet. It's easy to dismiss technologies that might be ten years off, but if their potential can be properly harnessed, the impact will be game changing. Quantum computing doesn't make sense for every company, but the range of potential applications we've seen is broad, from biopharma to automotive, chemicals, and, of course, telecom and financial services. If you are in those industries, and you take a long view, you need a team in your company that knows about it.

What's one piece of advice you would give to business leaders as they consider incorporating new technologies into their business?

Ask one question: Who is responsible for the technology's adoption? The business owners, not just the digital team, need to be incentivized to make it work. Companies have become much better at acquiring or building technology and understanding end-customer needs. But the nitty-gritty job of helping the business to use a technology well remains the hard part. It isn't just about training or sharing stories about the technology's benefits as part of change management; it's about understanding what it really takes for the technology to become part of how people do their jobs, including removing the barriers and aligning the incentives.

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