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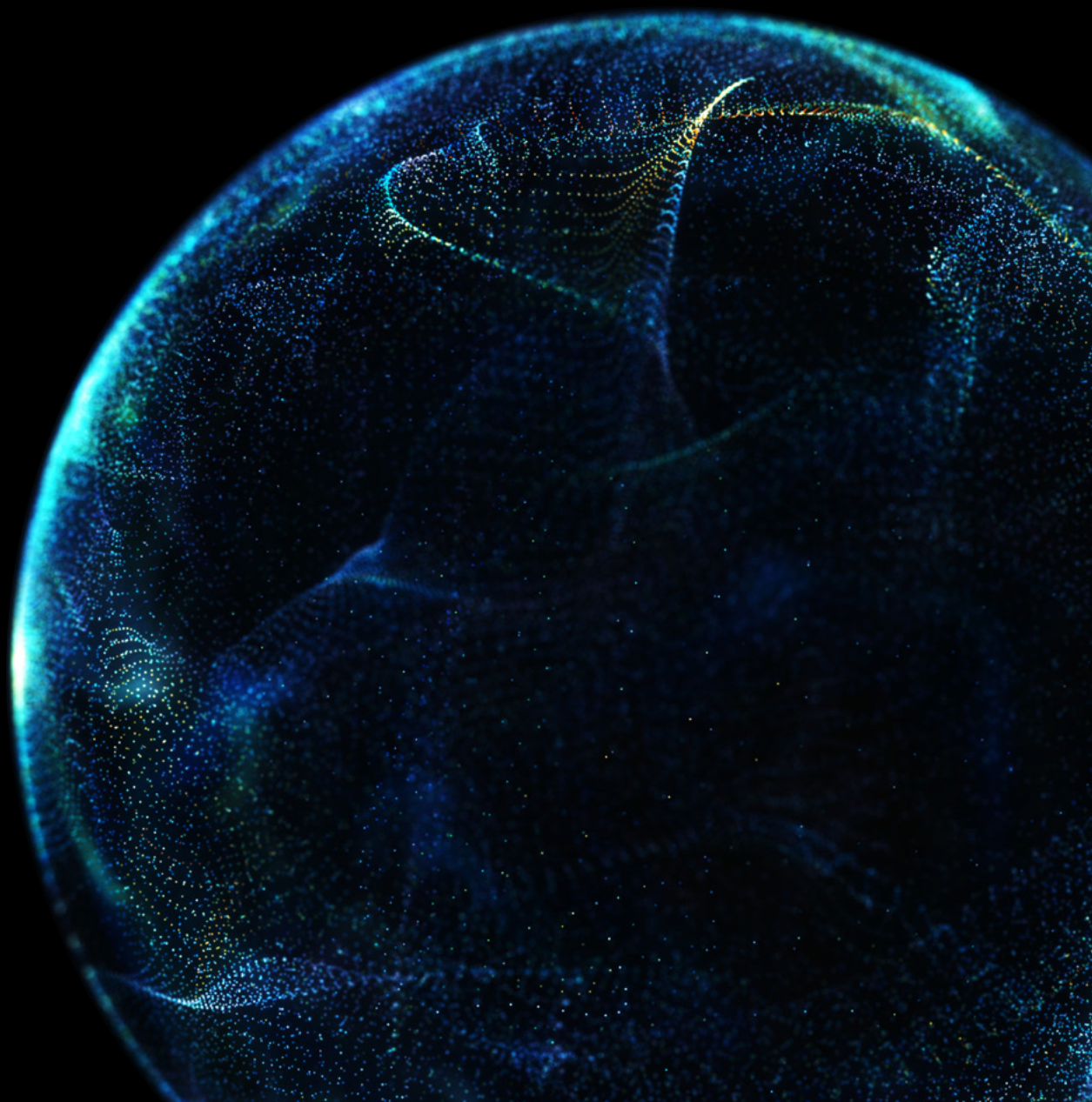
Business acceleration through convergence of emerging technologies

The path to value-oriented innovation



Technology convergence is set to unlock untapped business value for organizations

The Fifth Industrial Revolution, with artificial intelligence at its core, presents a unique opportunity for organizations to accelerate innovation and reshape business models through the convergence of emerging technologies. This is laying a foundation to fuel organization-wide transformation and create sustainable value.

The concept of technology convergence isn't new. At its core, it explores the ways in which seemingly disconnected technologies intersect to create powerful, and often unexpected, business results. Thanks to the transformative power of today's technologies, however, technology convergence is giving way to a new level of synergism, one that acknowledges the measurable improvements businesses can realize by integrating different technologies into a sum greater than their respective parts.

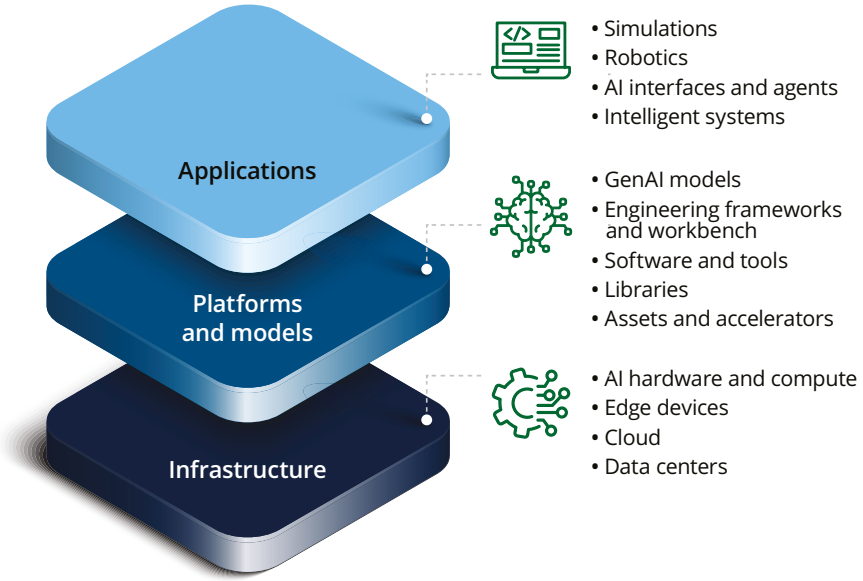
As technologies like AI, advanced robotics, immersive simulations, and quantum continue to advance, they are accelerating advancement in renewable energy and other emerging technologies as well, such as space tech, biotechnology, material sciences, and many more. In adapting and innovating with these technologies to stay resilient and competitive, however, it is important for businesses to understand the possible risk, embrace the potential, and unlock the business value unleashed by these transformative forces.

These technologies are becoming even more intertwined with every innovation, allowing tech and business communities to come together to achieve scalability, operational flexibility, business transformation and greater control. It is no exaggeration to say that technology convergence is contributing to the Fifth Industrial Revolution, creating exciting opportunities for organizations to explore.

AI as the catalyst for convergence

The rapid evolution of AI has emerged as a pivotal element in technological convergence, serving as a catalyst for other technologies. It is becoming a driving factor to building powerful synergies amongst infrastructure-oriented technologies (e.g., edge computing, data center optimization, accelerated computing, quantum computing, etc.) and front-end technologies (e.g., immersive simulation experiences, physical robotics, AI-powered user interfaces, etc.).

Think of infrastructure-oriented technologies as the 'hidden nexus' or inner core of a three-layer structure that is evolving faster than ever, provoking businesses to make fundamental shifts. Applications of front-end technologies like physical robotics and immersive simulation experiences are aligning to consumer and business demands and allowing users to engage through various channels. In between and across the inner core and the front-end, we have AI platforms, which are becoming the backbone of tech convergence strategies.



Agentic AI	Agentic AI is an AI system that can accomplish a specific goal with limited supervision. It consists of AI agents, can specialize in specific tasks and can learn from their experiences.[2]
Sovereign AI	The concept of "sovereign AI" refers to a country's ability to build and manage AI systems using its own infrastructure, data, and workforce.[3]
Physical AI	Intelligent systems that empower machines to autonomously perceive, interpret, and make decisions within physical environments, often in real time. Physical AI is concerned with making decisions and performing actions in real-world settings.[4]
IaaS (Innovation as a Service)	Innovation as a service refers to a model where businesses obtain innovation-related services from external providers, typically through a subscription basis.[5]
AI Factory	A dedicated computing environment designed to generate value from data by orchestrating the full AI lifecycle, including data ingestion, model training, fine-tuning, and large-scale inference.[6]

Physical AI machines, such as autonomous vehicles, provide a clear example of how emerging technologies like simulation experiences, AI models, edge computing, Internet of Things (IoT) sensors, and physical robots are amalgamating. Although these technologies can be viewed distinctly, the real magic happens when they are combined—when mechanical minds meet mechanical muscles. Take the following example. AI enables robots to operate autonomously. As they move through the world, the robots collect data that feeds into training algorithms, continually improving the algorithm itself.[1] This type of machine learning is the driving force behind physical AI or embodied AI, which leverages a wide range of IoT-generated and third-party data to interact with users and make autonomous decisions.

Yet, while physical AI brings operational flexibility for business enterprises, it can also raise concerns around governance, control, and security. Sovereign AI solutions, which aim to govern AI at national levels, play an important role in this regard. By providing accelerated computing, secure network and data infrastructure, and self-governing AI platforms and models, sovereign AI encourages focused innovation with AI applications. Governments around the world have committed huge investments to design, develop, deploy, and manage their own AI infrastructures, platforms, and application stacks, underscoring the importance nations are placing on achieving strategic autonomy, data sovereignty, and alignment with their national values.

When looked at from a user or customer engagement perspective, emerging technologies are also converging in response to growing and shifting consumer demands, resulting in evolving

user interfaces. Traditional user interfaces (UI) are increasingly inadequate for modern, complex applications that require more intuitive, efficient, and human-like interactions.[7] Machine learning, natural language processing, simulations, and computer vision are being used to create interfaces that are interactive, intuitive, and can adapt to user behaviors.

Additionally, AI agents that can interact, reason, and execute tasks autonomously are being implemented to enhance various business processes. In complex business processes like warehouse operations automation, which involve multiple tasks like order processing, resource allocation, and inventory management, a single-agent architecture may not be efficient. In such scenarios, multi-agent architecture is being adopted as it gives AI agents (typically built on specialized data and designed to perform specific tasks) the flexibility to connect with other AI agents in the system to access up-to-date information, streamline workflows, enhance responses, and eventually drive autonomous execution for any complex task. Moreover, the agent's ability to store past interactions in memory and enhance broad reasoning encourages a personalized experience and intelligent decision making.

Bringing convergence to life in the real world

Another way to explore convergence is by considering the widespread impact of other emerging technologies, such as space tech. In addition to rapidly evolving the commercialization of space, space tech's downstream applications are revolutionizing numerous earth observation activities, which range from wildfire identification and maritime surveillance to the detection of illegal deforestation by using physical AI machines like drones, and satellite imagery in tandem. Downstream applications in space tech transform raw satellite data into practical products and services for various sectors.

AI and space technologies are swiftly transforming the way cities are planned, operated, and developed. Through the use of sophisticated data analytics, satellite imagery, and automation, urban planners are making better-informed decisions that improve residents' quality of life. AI contributes intelligence and automation across multiple aspects of urban environments, such as optimizing traffic flow, managing resources (including forecasting energy demand, water usage, and waste production), strengthening public safety, and fostering citizen engagement.

Drug discovery is another great example of where AI, simulations, quantum computing, and biotechnology are being used to overcome technological challenges. For example, by using tools like the Variational Quantum Eigensolver (VQE) algorithm for molecular modeling, and layering in machine learning, companies are already calculating myriad potential drug interactions based on their molecular qualities.[8]

Creating quantum use cases

In a bid to develop practical use cases for quantum computing, Deloitte Tohmatsu Group is collaborating with QuEra Computing to accelerate Japan's quantum industry. Through joint research with academic institutions and businesses, the team is exploring the ways in which quantum value creation and return on investment are possible today.[11]

In drug discovery, AI guides quantum simulations, directs quantum computers on which molecules to target, and analyzes the results to identify the most promising drugs. This integration combines AI's reasoning capabilities with quantum computing's computational power and is an example of the increasingly important role that AI plays in enhancing efficiency, accuracy, and success rates.[9] It may even lead to higher returns on investment: a Deloitte report suggests AI could reduced the costs for drug discovery by up to 70%.[10]

Integration across sectors: AI leads the way, with other emerging tech at its core

- **Agriculture:** The integration of IoT and AI has enhanced smart farming to optimize output and augment the sustainability of agricultural production. Using IoT technology, farmers can collect real-time data on everything from soil conditions, weather patterns, and crop health to equipment status. AI-driven analytics help to interpret this wealth of information, enabling farmers to make data-driven decisions that improve crop yields, reduce input costs, and enhance land utilization and farm management.[12] AI adoption in agriculture is economically impactful, efficiency gains include water use reductions of 20–50%, fertilizer reductions of 10–30%, and pesticide reductions of 15–60% among early AI adopters, creating differential impacts not only at a business level, but at an environmental level as well.[13]
- **Automotive:** Autonomous vehicles are rapidly evolving by using technologies like edge computing, spatial computing, IoT sensors, simulation experience, and AI that allow users to navigate and operate without human intervention. The experience involves digital representation of the vehicle's environment, enabling the vehicle to understand its surroundings and navigate safely.
- **Energy:** Integrating renewable energy sources like solar and wind with smart grids and energy storage is essential for sustainability. Smart grids use AI, IoT sensors, and edge computing to optimize energy distribution, predict demand changes, and facilitate two-way communication between consumers and utilities. In India, for example, AI is boosting the energy sector with 79% efficiency gains.[14] This includes predictive maintenance, building energy management, and smart grids, reducing outages by 40% and maintenance costs by 30%.[14]
- **Finance:** Quantum computing and AI convergence is helping financial institutions optimize portfolios, enhance fraud detection, and refine risk modelling.
- **Healthcare:** Advances in spatial computing, AI, and simulation experiences are transforming medical imaging. These technologies enable surgeons to interact with 3D medical scans and models more intuitively and immersively, resulting in improved surgical planning, training, and execution. By using virtual reality, digital information can be overlaid onto the physical world or entirely simulated environments can be created, enhancing visualization, precision, and ultimately improving patient outcomes.
- **Smart retail:** Smart retail leverages AI, IoT sensors, and simulation experiences to enhance both customer experience and operational efficiency. Retailers are creating more engaging and convenient shopping environments through tailored recommendations, interactive displays, and automated checkout. The ongoing drive towards hyper-personalization has seen the convergence of spatial computing with AI to enable virtual try-on capabilities and color matching, measurably increasing conversion rates. When further integrated with chatbots offering real-time customer support, this functionality is generating increased transaction values.[15]
- **Manufacturing:** The intersection between IoT, AI, edge devices, and physical robotics has seen the rise of digitally connected smart factories, driving higher levels of operational agility, automation, and output than ever before—while simultaneously improving worker safety outcomes and reducing waste. AI-driven robotics also handle complex tasks on the manufacturing line, combining AI with machine vision systems for inspection to detect defects.[16] By making complex tasks more accessible, AI is allowing individuals with less education to participate in roles that were once out of reach, thereby expanding job prospects in regions facing educational barriers.

The path to innovation

As AI and emerging technologies rapidly transform our world, innovation leaders are being called on to think creatively, consider changing market dynamics, and innovate swiftly to help address evolving business requirements. Technology advancement has reached a point, where it is compelling organizations to develop a viewpoint on the impact of emerging technologies and explore ways to transform traditional business approaches into new business structures and models.

To generate innovative ideas and align with market momentum, organizations should cross pollinate impactful emerging tech applications from other industries and infuse to help simplify, automate and enhance business processes and offerings. Progression towards modern innovation is demanding instant adaptability to technology changes; spotting the ultimate value of innovation; and development of distinctive capabilities.

1. Value: Commitment to meaningful innovation

The emergence of pathbreaking technologies may require companies to clarify their route to innovation and consider how to capture the creative synergies of convergence. Despite the breakneck pace of emerging technology development, the Desirability, Viability, Feasibility (DVF) framework developed by IDEO still provides a robust framework for organizations.[17] It is uniquely suited to the task of convergence as it considers the ways in which interlocking systems can address multifaceted business challenges. At a high level, the DVF decision-making model encourages you to ask three core questions before embarking on an innovation journey:

- **Desirability:** Does this solution address real-world needs?
- **Viability:** What is the potential of the solution with respect to profitability and sustainability (e.g., capable of delivering long-term value)?
- **Feasibility:** Is it technically possible to build the solution?

For an innovation to succeed, all three elements of the DVF framework need to align, highlighting the importance of focusing on the true value that emerging technologies can generate rather than being dazzled by their functionalities and features.

2. Speed: Iterative, rapid prototyping to scale at speed

Organizations that can adapt to market changes swiftly and transform their operations and offerings along their innovation journey may have a greater prospect of becoming pioneers in their industry. With AI accelerating the speed at which technology and its applications are evolving, many organizations could face barriers to their current business in the long run. From digital payments to ecommerce, there are multiple examples of how new technology applications have disrupted the market and created pragmatic business challenges for traditional players. This demonstrates the significance of business agility, which, in the age of AI, goes beyond accelerating processes to change decision making, reshape collaboration, and provide opportunities to evolve and operate at market speed.

Innovation-as-a-Service (IaaS) is a business model that offers a flexible, modular approach that seamlessly integrates advanced technology, cultural transformation, and strategic guidance. This solution empowers organizations to rapidly respond to shifting market dynamics, foster breakthrough innovations, and sustain a culture of continuous improvement, ultimately driving resilience and long-term competitive advantage.[18] Organizations are adopting IaaS services to enable faster development cycles and rapid prototyping. As emerging technologies like AI evolve, this model can become increasingly important for organizations navigating continuous solution development.

IaaS is simplifying the process of continuous improvement, enabling businesses to experiment with multiple ideas in parallel. Rapid AI prototyping has emerged as a powerful method to validate ideas quickly. Additionally, by combining iterative design with advanced algorithms, users are creating scaled-down versions of products for testing before investing in full-scale development. This strategy promotes business agility, scalability, and accelerated time-to-market for new products and services, while also reducing risks associated with innovation.

3. New core competency: AI factories

The pace and timeframe of AI-driven business transformations shouldn't be compared to previous technology waves. That's because AI technology is driving organizational innovation journeys and will continue disrupting all industries until many business operations are automated. As the evolution towards intelligent systems gains speed, organizations—especially those with large or complex business operations—will need to reimagine the process of autonomous operations by devising optimal approaches to leveraging AI.

Although AI agents are becoming important to developing organizational intelligence through continuous learning, automating complex business processes can require Agentic collaboration, which can leverage business-specific datasets to generate intelligence and perform specific tasks. To use intelligence from various business segments and operations, organizations may need to set up AI factories in the future to act as central hubs for high-level intelligence. A strong data pipeline, algorithm development, foundational software infrastructure, and an experimentation platform to optimize AI models are the major components of any AI factory. These elements are interrelated and can be important in the age of emerging technologies as they can allow organizations to develop core competencies, achieve competitive edge, and build an internal innovation ecosystem.

Technology system integrators and advisory businesses can serve as the link between recognizing what AI can achieve (feasibility) and assessing its broader impact (desirability and viability). Working with partners who can bridge these gaps can help businesses integrate this intellect into core operations. This involves resource management, infrastructure management, and process automation to build and deploy AI solutions at a significantly accelerated pace. Moreover, AI factories' ability to guardrail and govern complex AI models can allow organizations to adjust to changing business requirements and seamlessly scale their AI capabilities as needed.

AI Factory components

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Sources:

1. Deloitte Insights, Breadth is the new depth: The power of intentional intersections, by Mike Bechtel and Raquel Buscaino, December 11, 2024.
2. IBM, The 2025 Guide to AI Agents, Anna Gutowska and Cole Stryker.
3. LinkedIn, The Rise of Sovereign AI: Nations Carving Their Own Paths in Artificial Intelligence, Chris Giel, November 15, 2024.
4. GlobalBiz Outlook, The Evolution of Physical AI: Where Intelligent Machines Interact with Reality and the World, October 12, 2024.
5. Cognizant, Innovation as a service.
6. NVIDIA, AI Factories Are Redefining Data Centers and Enabling the Next Era of AI, Dion Harris, March 18, 2025
7. ResearchGate, Revolutionizing Human-Machine Interaction: Fuzzy Logic in interface Design, August 2024.
8. Quantum Insider, Discover How AI Is Transforming Quantum Computing, by Matt Swayne, December 20, 2024.
9. PubMed Central, Harnessing AI and Quantum Computing for Revolutionizing Drug Discovery and Approval Processes: Case Example for Collagen Toxicity, July 22, 2025.
10. Accelerating drug discovery & development, Deloitte Report, February 21, 2023.
11. Quantum Insider, QuEra And Deloitte Tohmatsu Join To Advance Quantum Innovations In Japan, by Greg Bock, February 25, 2025.
12. Deloitte, On solid ground: AgTech is driving sustainable farming and is expected to harvest US$18 billion in 2024 revenues, November 29, 2023.
13. Agrohack, The Impact of AI on Efficient Agriculture: A Revolution in the Field, March 06, 2025.
14. AI Powers a New Era of Efficiency and Profitability in the Energy Sector, By Anand Gupta, May 23, 2025.
15. Smartdev, Retail Story: How Artificial Intelligence is Redefining Shopping, Ha Dao Thu, February 07, 2025.
16. Deloitte, Smart manufacturing solutions, 2025.
17. IDEO, Design Thinking, 2025.
18. Fujitsu, Innovation as a Service: a differentiated approach to sustainable competitiveness, September 24, 2024
19. Harvard Business School Online, The AI Factory: What It Is & Its Key Components, November 04, 2025.

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