

# Fundamental high-impact research

## Three big trends impacting your organization in 2030

### Technologies impacting your organization's future

The future is hard to predict – no-one knows for sure what's going to happen. NTT Research has a simple message; preparation is vital to long-term survival. Even if ten years seems too far ahead to worry about, having a plan is better than having no plan. NTT Research is a key innovation focused asset within the NTT group, looking at innovative technologies that will impact the industry over the next decade. The results from their efforts will help guide companies through the technology trends impacting them well into the next decade and beyond.

As we progress towards 2030, transformation will continue to be a critical function of any organization – customer requirements and market conditions change constantly. Adaptation is crucial. And, while the Internet of Things (IoT), big data, artificial intelligence (AI) and automation are deployed in many businesses now, challenges around their operation will greatly impact our ability to progress further with these technologies. This could hinder progress to meet core business outcomes. We need to consider alternative means to deliver them.

To combat this, NTT Research is progressing a series of next-generation technologies around computations based on quantum physics and brain science on an optical platform, cryptography and information security, and medical and health informatics. These three focus areas will help shape the future potential of organizations.

### Why is this important?

Understanding the limiting factors that will impact your business tomorrow, need to be considered and prepared for today.

Utilizing technologies such as IoT, AI and becoming autonomous for example creates its own set of challenges.

Some of the most pressing include energy consumption, the limitations of Moore's Law, security and privacy.

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**Enterprise use of AI grew  
270% over the past 4 years**

Gartner

## Understanding how trends today can impact you tomorrow

Discussing the challenges likely to hit your organization in ten years' time is an equally challenging board room discussion; particularly when minds are so focused on the short to medium term. However, a number of limiting factors are likely to arise if ignored over the coming five or so years, before biting hard at the start of the next decade.

Energy consumption cannot continue in its current guise. Not just in terms of environmental impacts, but the ability of organizations to reduce costs and improve margin. Moore's Law too has its limitations. Shrinking transistors have powered advances in computing for 50 years. But now, other ways must be found to make computers more capable. And of course, challenges around security and privacy aren't just going to disappear as hackers become even more sophisticated.

These concerns have the potential to impact growing trends around AI, IoT and big data for example. Game-changing technology is required to address them, and is the reason why NTT Research is focused on three core practice areas to help provide answers.

### Physics and informatics

As the systems and networks in our society, such as the internet, wireless communications networks, and traffic systems, continue to increase in scale and complexity, their optimization is becoming increasingly important. Quantum computing is the next big frontier of compute capabilities for global organizations. Not only will it solve some of the world's most complex challenges and questions, but it will have major implications for reducing energy consumption too.

NTT Research is collaborating with Stanford University on a National Science Foundation (NSF)-funded initiative into Coherent Ising Machines (CIMs). Currently, extracting solutions from a Quantum system is a major obstacle. With CIMs, information can be extracted in less than a second, enabling organizations to experience rapid computation to answer large-scale optimization problems. For example, this type of computing power will provide the science community with the ability to calculate anti-virus combinations within seconds, rather than in some cases, a projected timeline of billions of years.

### Cryptography and Information Security

Current encryption systems take either an all or nothing approach. You can unlock data, or you can't. You either have a key, or you don't. There's no in between in terms of the levels and types of information organizations want to keep secure currently.

To help change this, NTT Research is working on attribute encryption. This allows organizations to accurately pinpoint highly selective information for use to a variety of users, depending upon their security rights and status. This type of technology will help solve major security and privacy challenges, not to mention make information dissemination far more efficient.

### Medical and healthcare

The IT and medical profession has an amazing opportunity to work together, making life better and easier for us all. For example, we'll be able to recreate our own 'twins' within a digital context, helping us to understand the impacts of different medicines on our body. This type of technology will have major implications as to how we administer medicine, treat diseases and of course our life expectancy too.

The concept of [digital twins](#) has applications not just within the medical world, but in commercial business too. Within a commercial context, digital twins allow us to recreate entire production lines, supply chains and even entire factories to help optimize operations, increase efficiency and boost margins.

## Solving complexity now and tomorrow

While ten years may seem a considerable way off, the fact we're considering the limitations of technologies in use today, means organizations should begin to plan now. NTT and its focus applications may not be yielding any products today per se, but the work is grounded in the reality of organizational transformation, [addressing the limiting factors of tomorrow](#).

In tomorrow's intelligent world, innovation will be crucial to the way businesses operate every day – constant, incremental innovation, driven and enabled by technology. With our focus on innovation in the next decade, together with our colleagues at NTT Venture Capital, NTT Disruption, and NTT R&D, our collective of innovation business practices join forces to disrupt and transform your future through NTT Ltd.'s [Intelligent Innovation](#) framework and solution offering. Through innovation in partnership, and innovation through collaboration, we work together seeking new ways to help you drive market differentiation and harness our collective innovation intelligence.



**76% of risk professionals think IoT leaves them at risk of cyber-attacks**

Ponemon Institute

### About NTT Research

NTT Research opened its Palo Alto offices in July 2019 as a new Silicon Valley startup to conduct basic research and advance technologies that promote positive change for humankind. Currently, three labs are housed at NTT Research: the Physics and Information Science (PHI) Lab, the Cryptography and Information Security (CIS) Lab, and the Medical and Health Informatics (MEI) Lab. The organization aims to upgrade reality in three areas: 1) quantum information, neuroscience and photonics; 2) cryptographic and information security; and 3) medical and health informatics. NTT Research is part of NTT, a global technology and business solutions provider with an annual R&D budget of \$3.6 billion.

### About NTT Ltd.

NTT Ltd. is a leading global technology services company. We partner with organizations around the world to shape and achieve outcomes through intelligent technology solutions. For us, intelligent means data driven, connected, digital and secure. As a global ICT provider, we employ more than 40,000 people in a diverse and dynamic workplace that spans 57 countries, trading in 73 countries and delivering services in over 200 countries and regions. Together we enable the connected future.

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