

The combinatorial effect of emerging technologies

How can businesses harness multiple emerging technologies and prepare for the future?



- /Administration
- /Human Resources
- /Legal
- /Accounting
- /Finance
- /Marketing
- /Publicity
- /Promotion
- /Research
- /Business
- /Development
- /Engineering
- /Manufacturing
- /Planning



- /Administration
- /Human Resources
- /Legal
- /Accounting
- /Finance
- /Marketing
- /Publicity
- /Promotion
- /Research
- /Business
- /Development
- /Engineering
- /Manufacturing
- /Planning



EY

Building a better working world

Emerging technologies have the capacity to alter our lifestyle – what we mean by work, business and the global economy. Their practicality is an ongoing journey with continued experimentation and refinements.



Executive summary

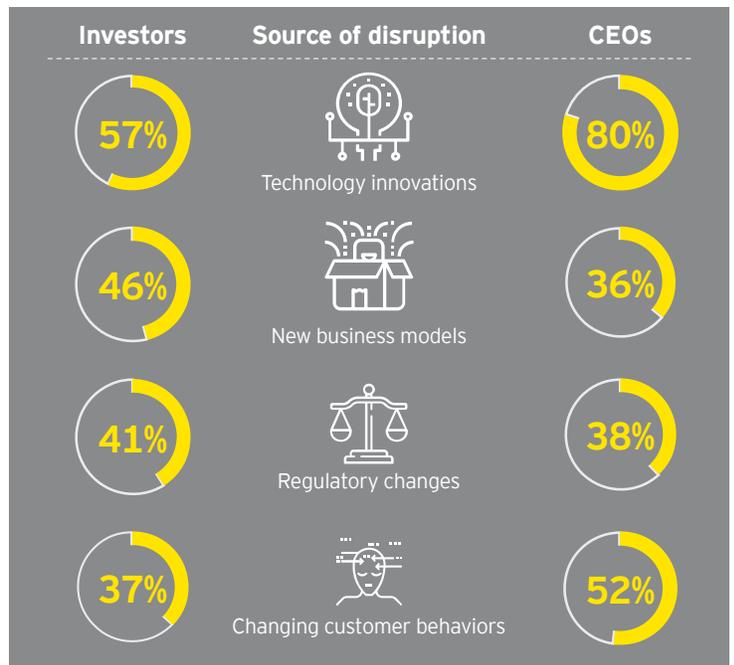
We are standing at the edge of an unparalleled technological transformation. The potential impact of billions of connected people, and increasingly powerful networked devices, all with access to breakthroughs in emerging technologies, is hard to conceive. With these exciting possibilities, emerging technologies have become core to business innovation.

Technological evolution has been the result of the combination and recombination of foundational elements of technology. Innovation in the next 10 years will be driven by combining different technology elements in new ways.

In order to harness multiple emerging technologies, we will need to start with the right question. It is not uncommon to hear business leaders ask, "How do I apply blockchain technology to our business?" This technology-led approach does not always elicit the most elegant solution. A better question would be, "How do we make our supply chain more nimble?" Starting with the business problem will result in a holistic solution.

You will look at a combination of options – blockchain, artificial intelligence (AI), robotic process automation (RPA), advanced analytics and several other emerging technologies will likely emerge as solutions.

The combined value delivered by multiple emerging technologies is multiplicative. The impact to business innovation and the transformative effect of a combination of emerging technologies is far more profound than what a single technology can provide alone – we call this the combinatorial effect of emerging technologies.



Source: EY Global CEO survey (2017) and global institutional investor survey.

It used to take Fortune 500 companies an average of 20 years to reach a billion-dollar valuation, but some of today's startups are harnessing digital technologies to get there in 4 years.

– World Economic Forum

Understanding the combinatorial effect of emerging technologies

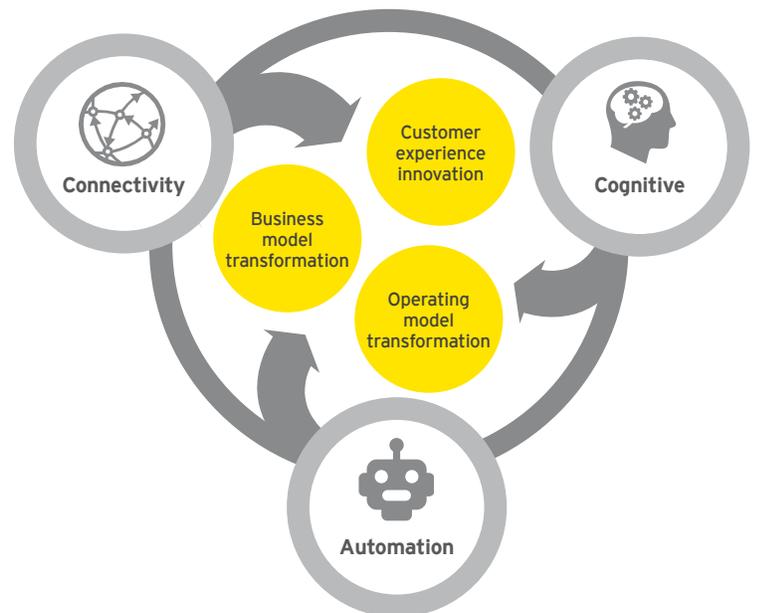
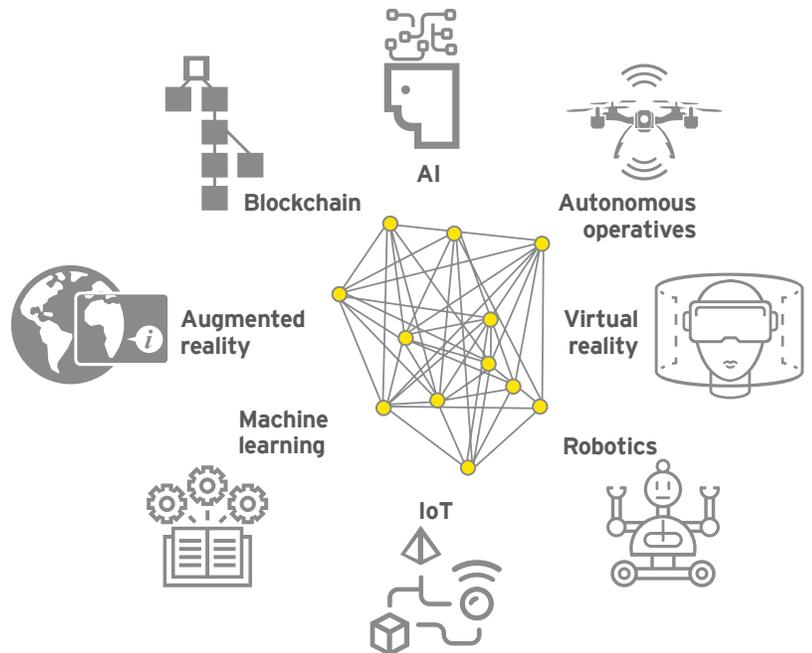
Combining various AI technologies, such as machine learning, natural language processing (NLP), RPA and others, has now become increasingly ubiquitous to perform tasks such as analysis of lengthy legal documents, leases and contracts. What used to take a human 4-5 hours to review can now be completed in a matter of minutes. At EY, we have combined technologies to perform analysis of invoices, mined public news sources to obtain timely perspectives on engagements, automated processes for tax compliance, performed asset valuation and automatically generated specific sections of reports, among other actions. We combined RPA, multi-cloud solutions, NLP and machine learning to peruse more than 4 million documents of labor litigation and developed a machine learning jurimetrics model.

In our experience, we discovered that certain emerging technology elements, such as data mining and machine learning, were clearly interrelated. Other technology elements seemed disjointed but, much like chemical elements, they could be combined to form new solutions with their own unique characteristics and applications. Our reference frame to understand the combined effect is the Periodic Table of Emerging Technologies, which contains mainstream, maturing and future emerging technology elements.

It is important to acknowledge that based on your business imperatives, the application of emerging technologies within your organization may be concentrated outward, inward or perhaps even a combination of the two, resulting in new business models for your company.

These applications are discussed in the article through three cases. In the first case, the combined effect was a transformed customer engagement model based on open-source design and digital manufacturing. Another company changed the experience of their workforce by combining emerging technologies. In the third case, a consumer products and retail company orchestrated new operational capabilities.

Combining emerging technologies has an effect on all parts of the business, including IT. We have observed that companies that successfully adopt emerging technologies really prepare themselves for change. As emerging technologies are adopted, the entire IT operating model should be evaluated and restructured to enable the adoption of emerging technologies. Areas that are typically impacted are IT strategy and road map, IT governance, IT organization, IT financial management, infrastructure operations, sourcing and vendor management, service delivery and information security (InfoSec).





The Periodic Table of Emerging Technologies

Before proceeding to understand the characteristics, the application and the impact of emerging technologies, it is important that we first identify and organize emerging technologies against a reference frame.

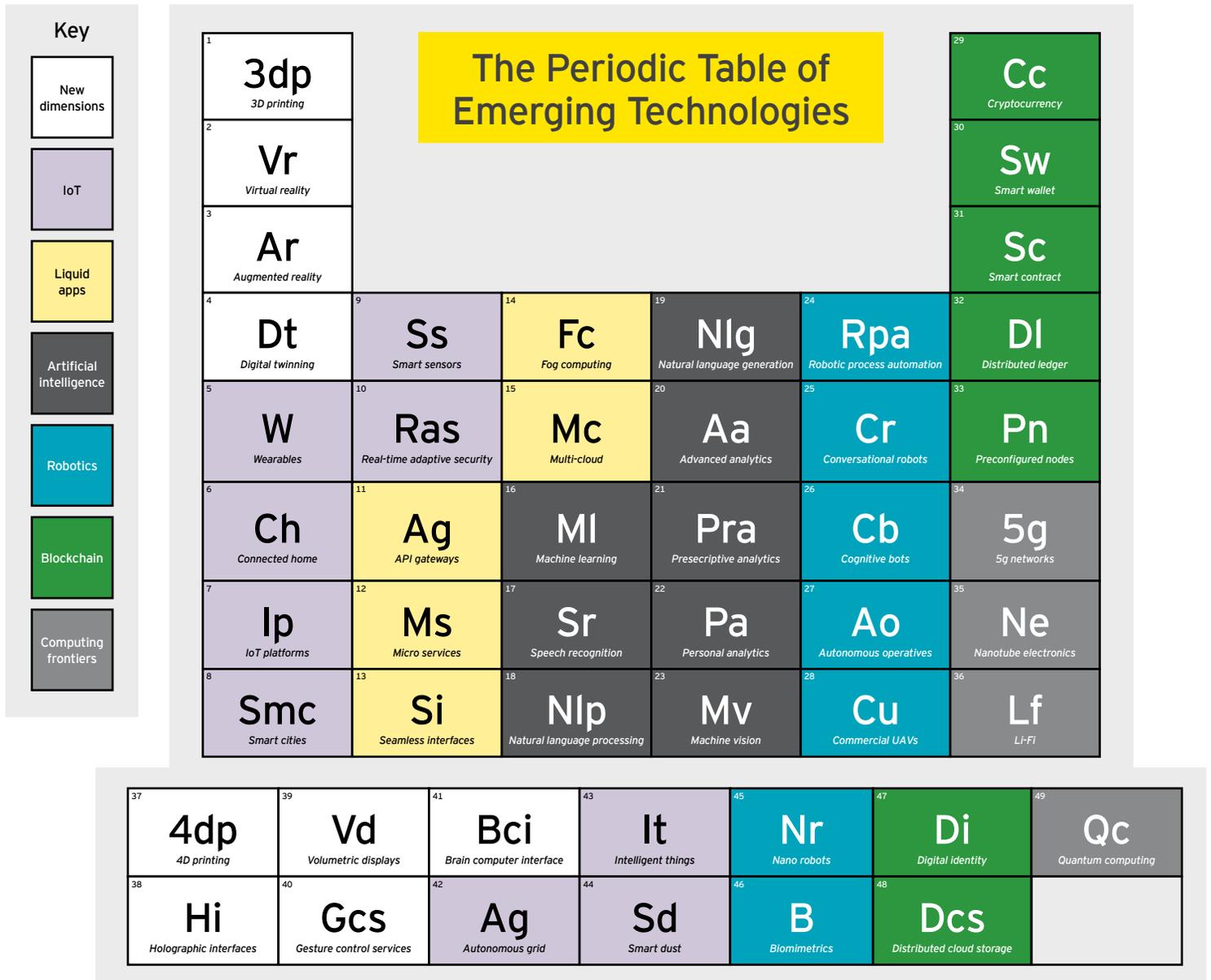
As technologies mature, the emerging technology terrain changes, moving from few market solutions and scattered use cases to industrialized products with proven use cases. Our reference frame is The Periodic Table of Emerging Technologies. It helps answer several critical questions:

1. *What is the level of maturity of the technology in question?*
2. *Who else has adopted it, and how?*
3. *What are the success stories? What was learned from failures?*
4. *What could be the impact to our business?*
5. *Can and should we adopt these technologies?*

Answering these questions helps assess the practicality of adopting emerging technologies for an organization.

Level	Characteristics
Mainstream 	<ul style="list-style-type: none">▶ Technology is known and well-understood▶ Several commercial products are available▶ Mature and stable ecosystem around vendors and service providers▶ Technology has proven use cases across several industry sectors▶ Implementation costs are easy to estimate▶ Experience talent pool more readily available▶ Implementation plan including duration, complexity, activities, risks and challenges largely known
Maturing 	<ul style="list-style-type: none">▶ First wave of commercial products are available▶ Market is scattered without clear leaders; sparse population of vendors and service providers▶ Few successful proofs of concept (POCs)▶ Expectations exceed capabilities▶ Implementation will require extensive involvement to realize value and manage change impact
Future 	<ul style="list-style-type: none">▶ Applications of technologies are theoretical; POCs are in progress▶ Early days of incubation; no commercial products available yet▶ Significant opportunity to build brand value based on successful POC▶ Implementation may expose business to unknown risks and threats

The Periodic Table of Emerging Technologies features prominent emerging technologies based on their capability grouping and their maturity.



Combinatorial effect harnessed

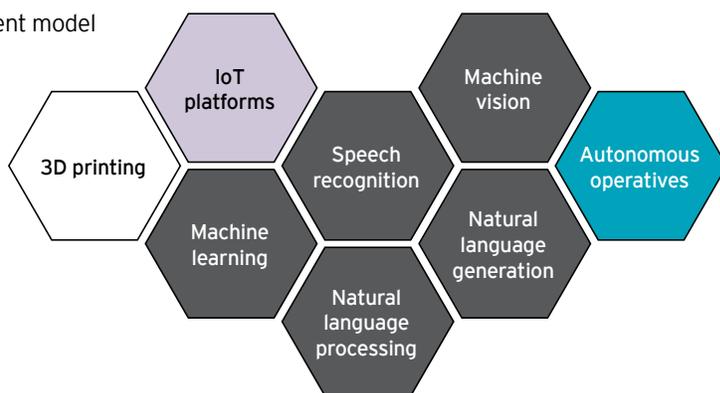
Snapshot No. 1:

Open-source design and digital manufacturing

[Combining 3D printing, Internet of Things (IoT) platforms, machine learning, speech recognition, natural language processing, natural language generation, machine vision and autonomous operatives]

The combinatorial effect:

An automobile manufacturer developed a disruptive customer engagement model by combining several emerging technologies. Their end-to-end model uses open-source vehicle designs leveraging a community of industrial designers, automotive engineers and automotive enthusiasts to develop an autonomous vehicle. The autonomous vehicle itself uses other emerging technologies around artificial intelligence. It is powered by IoT technologies for communication. The manufacturing process leverages micro-factories enabled by 3D printing.



CIO's call to action:

- ▶ **Governance:** Recalibrate decision-making bodies and their charters across business functions and IT
- ▶ **IT operating model:** Refresh IT vision, strategy and road map to maximize value from investments in emerging technologies; update IT capability framework, value chains, organization model, systems development life cycle (SDLC) methodology, sourcing model, etc., to successfully lead the business transformation
- ▶ **InfoSec:** Engage InfoSec to continuously monitor and mitigate emerging security risks and vulnerabilities around potential hacking of autonomous vehicles

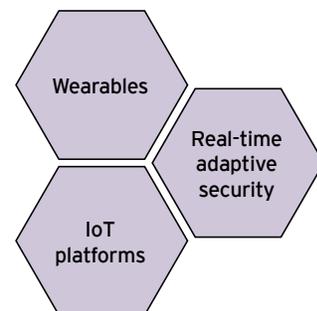
Snapshot No. 2:

Multipurpose digital identities

[Combining wearables, IoT platforms and real-time adaptive security]

The combinatorial effect:

A company wanted to better empower its people while creating cost efficiencies and protecting its information assets. It transformed wearable devices into multipurpose digital identities that are leveraged for access control, multifactor authentication, integration with mobile device management (MDM) solutions to restrict bring your own device devices physically, automating energy conservation (room temperature control, automatic light luminosity, next-gen power-saving Wi-Fi internet, etc.



CIO's call to action:

- ▶ **Governance:** Recalibrate decision-making bodies and their charters across IT, InfoSec and the business
- ▶ **IT operating model:** Update IT vision, strategy and road map; restructure IT capability model and IT organization to maximize value from "multipurpose digital identities"
- ▶ **Change management:** Achieve integration of digital identities across IT and InfoSec identity and access management, end-user computing, meetings and collaboration, etc.
- ▶ **Privacy:** Evaluate any impact to privacy based on jurisdictions
- ▶ **InfoSec:** Engage InfoSec to continuously monitor and mitigate emerging security risks and vulnerabilities from advanced wireless communication

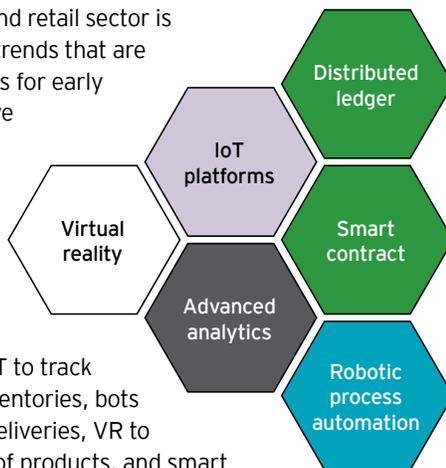
Snapshot No. 3:

Next-gen integrated supply chain

[Combining virtual reality, IoT platforms, advanced analytics, robotic process automation, smart contract and distributed ledger]

The combinatorial effect:

The consumer products and retail sector is buffeted by several megatrends that are creating new opportunities for early adopters and a competitive disadvantage for slow-movers. A company is developing its next-gen integrated supply chain capability powered by advanced analytics for demand sensing and production scheduling, IoT to track materials and manage inventories, bots to check shipments and deliveries, VR to enable enhanced picking of products, and smart contracts and distributed ledgers to sync supply chain management across participants.



CIO's call to action:

- ▶ **Governance:** Recalibrate decision-making bodies and their charters across business functions and IT
- ▶ **IT operating model:** Refresh IT vision, strategy and road map to maximize value from investments in emerging technologies; update IT capability framework, value chains, organization model, SDLC methodology, sourcing model, etc., to successfully lead the business transformation
- ▶ **IT financial management:** Evaluate new models to plan and track the IT budget and mechanisms to recover or charge costs
- ▶ **Change management:** Establish wide and deep engagement and communication between business and IT to generate value



Failing to plan is planning to fail

The adoption of emerging technologies has a combined effect on all parts of the business, including IT. As emerging technologies are adopted, several questions relating to the IT operating model and strategy need to be answered:

- ▶ What is our new governance framework as we prepare to adopt emerging technologies (e.g., with RPA, who has decision authority around parts of the process that are automated)?
- ▶ Are our IT organization model and reporting structure still relevant?
- ▶ Are we building the right IT capabilities to enable adoption of emerging technologies?
- ▶ Do we have the right budgeting and recovery/chargeback models around these emerging technologies?
- ▶ Should we change our infrastructure strategy and shift more workloads to the cloud to lower the adoption threshold for emerging technologies?
- ▶ From where should we source talent to support emerging technologies?
- ▶ There are several niche vendors and service providers we need to engage. Do we need to relook at our technology sourcing model?
- ▶ How do I integrate these new technologies with my legacy technologies?
- ▶ How do I manage risks such as cybersecurity and others?

Contact the authors



Tammy Alairys
Principal, Technology Transformation
Ernst & Young LLP
tammy.alairys@ey.com



Jim Little
Principal, Technology Transformation
Ernst & Young LLP
jim.little@ey.com



Mazen Baroudi
Principal, Technology Transformation
Ernst & Young LLP
mazen.baroudi@ey.com



Rohit Joshi
Senior Manager, Technology Transformation
Ernst & Young LLP
rohit.joshi@ey.com





About EY

EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. For more information about our organization, please visit ey.com.

Ernst & Young LLP is a client-serving member firm of Ernst & Young Global Limited operating in the US.

© 2018 Ernst & Young LLP.
All Rights Reserved.

SCORE No. 04465-181US
CSG No. 1806-2729511
ED None

This material has been prepared for general informational purposes only and is not intended to be relied upon as accounting, tax or other professional advice. Please refer to your advisors for specific advice.

ey.com