The Fourth Industrial Revolution

Industrial Revolution

The Fourth Industrial Revolution represents a fundamental change in the ways that we live and work. It is a new chapter in human development, enabled by advances that are commensurate with those of the first, second and third industrial revolutions - merging the physical, digital, and biological worlds and fusing technologies in ways that create both promise and peril. The speed, breadth, and depth of this revolution has forced us to rethink how countries should develop, how organizations create value, and how people from all walks of life can benefit from innovation. Now, as the world grapples with COVID-19, there is an opportunity to further embrace this revolution in ways that create a more inclusive, human-centred global economy.

Fourth Industrial Revolution: Agile Technology Governance

Some governments will be able to reinvent themselves to better understand what they are regulating

Governments may have to reinvent the ways that they operate in order to keep pace with technology. Powerful digital tools like artificial intelligence are swiftly disintermediating entire markets - taking influence away from traditional regulators and unskilled workers, and increasingly handing it to corporations and skilled labour. Governments everywhere are meanwhile being challenged to move beyond simply understanding major technological advances to being able to mitigate, shape, and harness them in order to govern better - that is, to become more accessible, transparent, and trustworthy. Governments making this transition will be forced to entirely change their approaches to creating and enforcing regulation, not least in order to safely stimulate rather than stymie innovation. These governments may have to create brand-new instruments to cope with the spread of new technologies, either by nurturing internal expertise or working together with the private sector. Those that are agile will be able to find ways to reinvent themselves in order to better understand what it is they are regulating - and to steer technological development in ways that improve the state of the world for everyone.

Faster 5G mobile networks promise to only make digital communication more ubiquitous, while increasing processing power and storage capacity are boosting the scope of knowledge immediately available to just about any computer user. When coupled with the increased availability and quality of data, communicated through increasingly rich and varied visualizations and other analytic techniques, these trends have the potential to fundamentally reshape communication, news reporting, and public services - in ways that can respond more directly to the needs of the public. But there are also serious related risks that need to be managed. According

to Cisco's 2018 Annual Cybersecurity Report, cyber attackers targeting governments have developed increasingly sophisticated and threatening malware, and can cover their tracks with encryption while exploiting new vulnerabilities in cloud computing and the Internet of Things. New and evolving rules of the road such as the European Union's General Data Protection Regulation, which came into effect in 2018, will be critical for managing the consequences of such threats - but will also introduce their own new complexities to governing.

Digital Economy and New Value Creation

The disruption caused by the Fourth Industrial Revolution has been accelerated by COVID-19, and increased our need for agility, adaptability, and positive transformation. As the global economy rapidly digitalizes, an estimated 70% of new value created over the next decade will be based on digitally enabled platform business models. However, nearly half of the world's population remains unconnected to the internet. While digital technologies have the potential to enable new value for everyone, they risk further exacerbating exclusion, the unequal concentration of power and wealth, and social instability. Companies must use digital infrastructure and data to collaborate, develop innovative business models, navigate disruption, and transition to a new normal - post-pandemic, purpose-driven, sustainable, and inclusive.

Digital Economy and New Value Creation: Purpose and Stakeholder Capitalism

Companies must exercise responsible leadership in the digital realm

Businesses are increasingly being challenged on the role they play in society. About three-quarters of the people surveyed in the 2019 Edelman Trust Barometer expect CEOs (rather than the government) to "take the lead on change." Historically there has been a disconnect between public expectations and business leadership. But now the concept of stakeholder capitalism, where companies serve society as a whole and not just shareholders - first articulated in 1973 in the Davos Manifesto - is becoming mainstream. For example, in 2019 the Business Roundtable, an organization that includes CEOs of the biggest US companies, changed its definition of a company's purpose from just serving shareholders to include a commitment to all stakeholders. Technology is enabling inclusive business models that support this shift. Uber, for example, has said it will integrate public transportation options into its popular ride-sharing app, while Alphabet's Loon project aims to provide internet connectivity to underserved areas. Meanwhile Apple has integrated anti-tracking privacy protections into its devices, Hewlett Packard is developing ways to reduce the energy consumed by supercomputers and data centers, and Twitter has banned political campaign ads with the stated aim of preserving civic discourse by avoiding the spread of micro-targeted misinformation.

Apart from potentially enabling stakeholder capitalism, digital technologies have added new dimensions to corporate responsibility. Inclusion and empowerment in the digital economy, and the need for responses to related automation and job losses, in addition to online safety, privacy, and responsible data management issues, are at the heart of the so-called

"techlash." This materialized in response to events like the 2018 Cambridge Analytica scandal, which triggered greater distrust in companies with business models that depend on monetizing personal data, and it has taken the form of worker-organized protests at major technology companies such as Google and Amazon against their approaches to #MeToo, climate change, immigration, and national security. While some techlash-related issues can be addressed through legislation and regulation, the lag between the policy-making and technology development means businesses can move beyond their basic legal obligations to experiment with new approaches to digital leadership. This kind of initiative can be seen in corporate commitments like the GSMA's Digital Declaration on behalf of mobile network operators, the World Wide Web Foundation's Contract for the Web, and the UN Secretary General's High-Level Panel on Digital Cooperation, which issued its report in 2019.

Digital Economy and New Value Creation: Digital Transformation of Organizations
The average lifespan for traditional companies is declining, while the revenue share for 'digital ecosystems' is expanding

The Fourth Industrial Revolution has reshaped entire industries - as sources of value shift across value chains and accelerate the need for greater agility, adaptability, and transformation. According to McKinsey & Company, an emerging set of "digital ecosystems" modelled after firms like Facebook and Airbnb could account for more than $60 trillion in revenue by 2025, or more than 30% of all global corporate revenue. Traditional organizations need to quickly reimagine ways to create and capture new business value in the face of this digital disruption. The average tenure of a company in the S&P 500 Index of large, US-traded firms is expected to decline from 24 years in 2016 to 12 years by 2027, as corporate leaders deal with an unprecedented combination of disruptive technologies, changing customer behaviour, and an impending climate crisis. However, disruptive technologies are also creating significant new value opportunities. Advanced 5G telecom networks are expected to generate more than $600 billion in new business by 2026, for example, while the market for distributed "edge" computing is expected to more than triple between 2019 and 2024, to $9 billion.

People increasingly expect technology to be personalized, convenient, and on-demand; and, according to the research firm Nielsen, nearly half of all consumers are now more likely to try new brands than they were five years ago. These people also expect companies to play a constructive role in society. According to a study published by Accenture, 62% of consumers say their purchasing consideration is driven by a company's ethical values and authenticity, and 74% want more transparency on companies' stances on environmental and social issues, and on how they source their products and ensure safe working conditions. In response, many business leaders have transformed their organizations to create new value. While nearly 96% of organizations are in some phase of transformation, according to research firm IDG, and 90% of enterprises have already adopted a "digital-first" business strategy, the results have so far been mixed; less than half of executives now believe they can extract and maintain the planned value from their transformation initiatives. Companies of all types now have a shared opportunity to

exchange information and co-create new frameworks, tools, and partnerships to successfully transition to a new business normal.

Priorities for collaboration:

-Accelerate successful business transformation to respond to technological and social disruption.

-Identify collective learnings and strengthen collaboration across industries.

-Co-create new insights, models, decision frameworks, and tools.

Digital Economy and New Value Creation: Digital Infrastructure for All
Public-private cooperation can accelerate digital connectivity for everyone

Global internet use reached a key milestone in 2019, when more than half of the world's population got online. However, three billion people remain unconnected, and therefore both unempowered and excluded from the digital economy. Even though legacy 2G and 3G mobile services in developing countries are now on the cusp of full adoption, broadband access in these places is still lacking. The United Nations' Sustainable Development Goals set a target in 2015 of 75% global broadband-internet user penetration by 2025 - which will require innovative financing via public-private partnerships to build out last-mile connections in emerging economies. Some promising, private sector-led initiatives are emerging, such as the Low Earth Orbit satellite constellations launched by SpaceX and Telesat, and Alphabet's Loon balloon network designed to deliver internet access to underserved communities from the edge of space. While there are related engineering challenges, they can be addressed with long-term investment and political support for these efforts. In parallel, in developed countries, next generation 5G digital communications systems are being built. These promise to connect billions of devices at faster speeds, power autonomous vehicles, smart factories and cities, and reduce network energy consumption. Initial deployments have enabled users to download full-length movies in seconds.

However, in the next two to three years the real value of 5G will be realized in the industrial sector. The bedrock of 5G is the integration of hardware and software networks; while large data centres have traditionally provided the computation necessary for people to stream YouTube videos or request an Uber ride, the "edge-computing" behind 5G is decentralized in order to enable lower latency. In addition, cutting-edge connect-and-compute functionality is on the horizon, which involves supercomputing in the cloud. So is quantum computing, which stores information in quantum bits rather than a traditional series of 0s and 1s (established firms like Google and IBM and nontraditional players like Honeywell are competing in this space). Public and private sector actors must consider the possibilities of this innovation in concert with the provision of basic broadband access, in order to avoid exacerbating the digital divide and to take the needs of developing countries into account. According to a joint action plan established by the World Bank, the World

Economic Forum, GSMA, and the International Telecommunication Union, developed countries can provide necessary economic stimulus post-COVID-19 through accelerated investment in 5G infrastructure - creating new jobs, and moving towards carbon neutrality.

Priorities for collaboration:

-Strengthen public-private collaboration to advance new policies and investment models in digital infrastructure, and accelerate global connectivity.

-Identify and support the implementation of replicable business, collaboration, and investment models for the inclusive and sustainable deployment of 5G networks.

-Leverage technology innovation to expand connect-and compute capacities.

Digital Economy and New Value Creation: Business of Data

Innovative approaches to data stewardship manage trade-offs while creating inclusive value

Increasing digital connectivity has led to unprecedented volumes of online data. According to IDC, the "global datasphere" will grow from 33 zettabytes in 2018 to 175 zettabytes by 2025 - when three-quarters of the world's population will interact with data every day, nearly half of all data will be available to the public via the cloud, and nearly a third of it will be provided in real-time to aid decision making. Companies and governments are increasingly using data to try to add value by delivering personalized healthcare, or by building smarter cities and public services. Data has been a particularly useful public health tool during the COVID-19 crisis; at least 25 countries have introduced contact-tracing applications meant to curb its spread. As data increasingly becomes a source of economic value, there is mounting pressure to share and use it in ways that benefit everyone. This means respecting personal freedoms like privacy and security, and actively preventing the use of data to perpetrate human rights abuses or to discriminate. Governments have introduced rules to enforce responsible data use, such as the European Union's General Data Protection Regulation - which aims to give internet users more control over their personal data.

With most data-driven innovation and services coming out of the private sector, businesses play an increasingly important role in demonstrating responsible data stewardship. New mechanisms - including business models, technologies, and practices - are being developed in isolated pockets across various industries. Business leadership is essential for unlocking data's transformative value in a way that builds trust and relieves pressure on policy-makers to intensively regulate industries. Efforts such as the Sovrin ledger, designed as a public repository for digital identities, and Massachusetts Institute of Technology's Solid project strive to embed new internet principles, rules, and protocols that give people more control over their personal data online. Meanwhile innovative legal and collaborative structures are being tested to streamline data sharing, such as data-trade

marketplaces. Data is critical for national security and a nation's competitiveness; while data flows across borders are necessary for global trade, governments are increasingly trying to reduce their dependence on foreign firms by asserting data sovereignty. Examples of this include China's data localization rules, and the GAIA-X data sovereignty effort spearheaded in Europe by Germany and France. The harmonization and coordination of governments' policy frameworks will be key for balancing national goals with the benefits of international innovation.

Priorities for collaboration:

-Identify and promote technology and policy innovation in trusted data sharing and use.

-Mobilize business stewardship and leadership on data.

-Coordinate global cooperation on cross-border data flows.

GLOBAL ISSUE

Digital Economy and New Value Creation: Technology for COVID-19

Digital technologies have been crucial for the global response to the pandemic

COVID-19 created a pressing need for digital technologies that can help us respond to the pandemic, adapt to a new normal, and build long-term resilience. Companies and governments are deploying digital tools to share information about the spread of the coronavirus, support detection and containment measures, enable healthcare workers and authorities, accelerate treatment, and safeguard workers. Facebook has said it published data including a symptom survey and interactive maps aimed at helping fight the spread of the coronavirus, while Google has said it made the aggregated, anonymized data used for its maps available to public health officials, and Norwegian telecom company Telenor has said it made mobility data available to government officials tracking the pandemic in that country. Companies have also jointly committed to using artificial intelligence to fight the spread of disinformation - something described by World Health Organization Director-General Dr. Tedros Adhanom Ghebreyesus as being as dangerous as the virus itself. Meanwhile KT, the South Korean telecom company, said it launched an epidemics prevention platform in Ghana and Laos, and Huawei said it has used a 5G network built at a hospital in Wuhan, China to support internet-connect medical devices crucial for treating patients.

In the United Kingdom, the National Health Service has partnered with companies including Amazon, Microsoft, and Google on data-driven resource optimization to aid healthcare authorities in their decision-making. And, the World Bank, the International Telecommunication Union, the GSMA and the World Economic Forum announced a joint action plan to help countries remain connected during the crisis, while other international organizations and bodies have played key roles in coordinating efforts - not least the World Health Organization and the European Commission. It is vital that businesses not only partner with governments and

academia on the use of digital tools, but also that they tailor them to local needs. There are lingering questions about patient interaction and accountability in emerging areas such as telemedicine, not to mention data rights, privacy, and the risk of government surveillance through contact tracing. The challenges raised by COVID-19 will not be short-lived, and businesses must prepare for the long haul by working towards greater global economic resilience and social cohesion. This will involve international cooperation on identifying potential vaccines, and establishing shared rules for a new normal that will involve measures like contact tracing and other potentially invasive digital tools.

Priorities for collaboration:

-Consult with global health experts, and align solutions and efforts with needs of global communities.

-Identify, evaluate and aggregate solutions that deliver value and with great potential for scale.

-Coordinate partnerships and contextualize solutions to influence effective deployment, uptake and impact in countries and governments in need.

Fourth Industrial Revolution: Technology Innovation
'General purpose' technologies like artificial intelligence can have profound consequences for society

Some innovation - like the development of new pharmaceuticals - has an obvious and direct link to novel scientific research. Other types may result from using existing technology in new ways, or even from developments in unrelated fields. Many companies behind the sharing economy, for example, are essentially offshoots of existing internet and mobile technologies. While certain emerging technologies like drones or 3D printing may create new markets and disrupt existing networks, technical innovation in the form of so-called "general purpose" technologies has the potential to disrupt entire groups of industries; examples have included the steam engine, the automobile, the computer, the internet and, potentially, artificial intelligence - all of which have had profound consequences for society. Since research and development is key, policy-makers have been keen to focus on ways in which it can be improved. Common areas of focus include national systems for research funding, systems for awarding and protecting patents (which are sometimes state-subsidized), improvement in translating university research into value for the private sector, and tax incentives for innovative firms (such as R&D tax credits, or special tax regimes for revenue derived from intellectual property).

The physical and biological worlds are merging partly due to the creation of new materials designed to emulate the biological world. The related discovery of new classes of recyclable, thermosetting polymers (plastics) called polyhexahydrotriazines is a major step towards a more sustainable economy, for example. New materials are now routinely being used in medical implants, for tissue engineering, and for the creation of artificial organs - and 3D printing is increasingly being used to create customized structures. The biological and digital worlds overlap most controversially in the world of genetic engineering. Widely accessible and affordable gene sequencing and editing systems, such as CRISPR/Cas9, make it possible to reliably and precisely remove or replace sequences in the genomes of both plants and animals. The biological and digital worlds are also overlapping in the form of sensors used to monitor health and behaviour, and to understand and influence brain activity. Advances that might have once been confined to digital systems, like the application of cryptography to blockchain technology to create programmable, secure, and distributed records, are also now having an impact in the real world - in terms of managing land records, for example, or tracking deforestation.

Parent Topic

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