



THEMATIC INSIGHTS

Disruptive Technology

Innovation meets society
and business



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Breaking away from the rules of the game

Disruptive technologies are, by definition, those that can transform our lives, businesses, and even the global economy. Commentators have remarked that we seem to be in an era where they are becoming increasingly ubiquitous and hence there is potential for technological breakthroughs to impact society and the economy at an unprecedented pace.¹

At the start of this new decade, it is worth reviewing how companies have envisioned future business models and platforms - and then sought to turn those disruptive ideas into valued products or services. Consider, for

instance, client relationship management (CRM) software. Historically, companies like Siebel sold software to their clients that would be installed onsite, alongside maintenance and consulting services. On March 8, 1999, from an apartment in San Francisco, Marc Benioff and his co-founders started what became one of the fastest growing enterprise software companies in history.² Salesforce entered the industry with their objective making CRM software more user-friendly and easier to buy: they pioneered a business model built on cloud computing based on subscriptions, not outright purchase. Twenty years on, Salesforce has transformed the CRM industry into using a “software as a service” (SaaS) model. Today, technological disruption can be seen driving change in industries from manufacturing to retail and from banking to healthcare.³

Overall, disruptive technologies are characterized as models and platforms that:

1. challenge traditional industries
2. have exceptional growth potential, as they move from niche to mainstream, and in doing so potentially can transform society, business and even the global economy.

1 https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Disruptive%20technologies/MGI_Disruptive_technologies_Executive_summary_May2013.ashx; <https://assets.kpmg/content/dam/kpmg/pl/pdf/2018/06/pl-The-Changing-Landscape-of-Disruptive-Technologies-2018.pdf>

2 <https://www.cnbc.com/2018/12/01/amazon-web-services-is-growing-faster-than-salesforce.html>

3 <https://assets.kpmg/content/dam/kpmg/pl/pdf/2018/06/pl-The-Changing-Landscape-of-Disruptive-Technologies-2018.pdf>



Why do companies focus on disruptive technologies?

Innovations can range from incremental to radical or groundbreaking. Incremental innovations take the form of refinements or improvements; in other words, they are about doing something better.⁴ Disruptive innovations typically occur when current knowledge and capabilities risk becoming obsolete and new knowledge may be critical to exploit the “uncharted waters”.⁵ These innovations have the potential to transform the way particular segments of society live and work.

Today one can see technologies, such as the Internet of Things (IoT), disrupting multiple major industries (e.g. agriculture, manufacturing, retail, smart buildings).⁶ To stay competitive in today’s market, many companies are investing in technologies that can improve their core business, as well as in disruptive technologies that can potentially create new streams of revenues and defend the firm against potential competitors.⁷

Research has shown that companies which combine incremental innovation (relatively minor adaptations of existing products and business concepts) with more radical innovation (fundamental changes leading to a switch from existing products or concepts to completely new ones)⁸ are associated with sales growth⁹, longer survival¹⁰ and improved learning¹¹. Companies that value disruption take advantage of declining computing and digitalization costs, stay ahead of their customers and their evolving needs and update their capabilities.¹²



4 Tushman, M.L. and O'Reilly, C. (2002) Winning through Innovation: A Practical Guide to Leading Organizational Change and Renewal. Cambridge, MA: Harvard University Press.

5 Ibid.

6 <https://www.information-age.com/7-industries-will-radically-changed-iot-123467258/>

7 Tushman, M., Smith, W., and Binns, A. (2011) The Ambidextrous CEO, Harvard Business Review, June, 74-80.

8 Raisch, S. and Birkinshaw, J. (2008) Organizational Ambidexterity: Antecedents, Outcomes and Moderators. Journal of Management. 34, 3, 375-409.

9 He, Z. L. and Wong, P.K. (2004) Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. Organization Science, 15, 481-494.

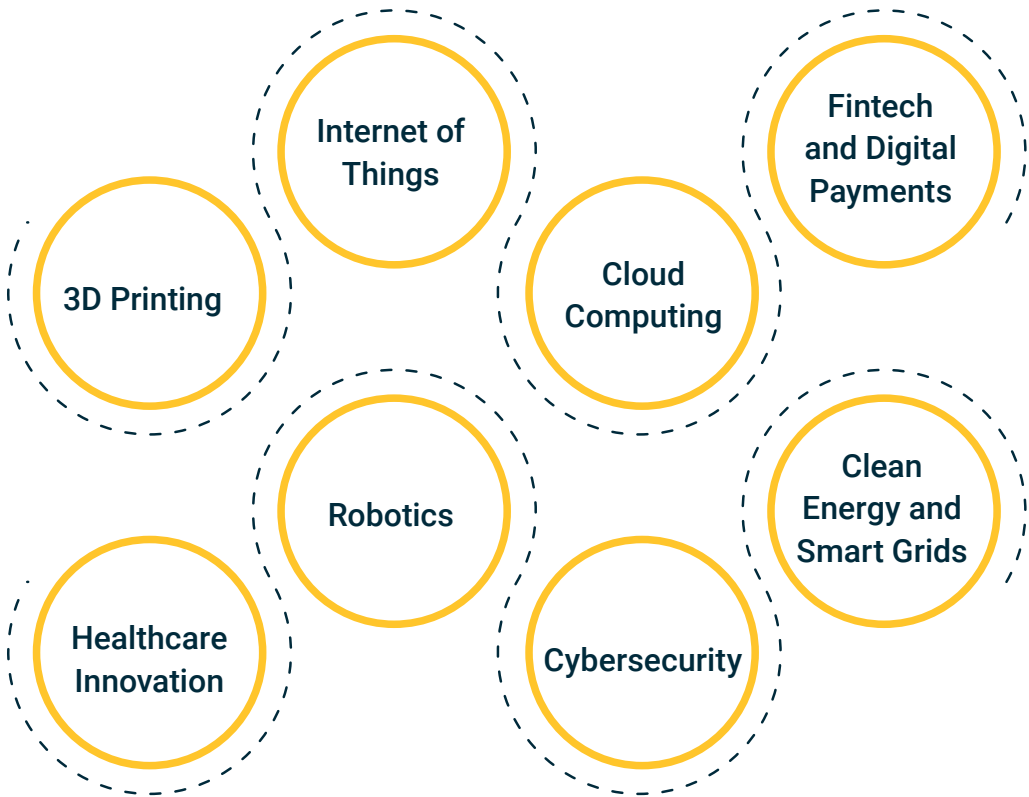
10 Andriopoulos, C. and Lewis, M. (2009) Exploitation-Exploration tensions and organizational ambidexterity: Managing paradoxes of innovation, Organization Science, 20, 4, 696-714.

11 Holmqvist, M. (2004) Experiential learning processes of exploitation and exploration within and between organizations: An empirical study of product development, Organization Science, 15, 1, 70-81.

12 <https://www.forbes.com/sites/johnkotter/2013/04/03/how-to-lead-through-business-disruption/#79f0c5e72644>

Nine disruptive technologies in focus

From a wide range of disruptive technologies that will impact society and business, we focus on the following nine, which have the potential to produce competitive advantage and excess growth over the next five to ten years.



3D Printing

3D printing technology, also known as ‘additive manufacturing’, has seen an increasing uptake by several industries.¹³ 3D printing involves making a physical object by printing layer upon layer from a three-dimensional digital drawing or model.¹⁴ According to Sculpteo’s report, The State of 3D Printing 2019, manufacturers increasingly rely on 3DPs since they shorten project cycles between design and production and enable greater customization.¹⁵ 3D printing, therefore, has the potential to offer significant reductions in shipping costs and waste.¹⁶ With new developments from 3D printing housing (construction) to 3D bioprinters creating human tissue (biotech), the market is expected to grow rapidly. For example, the forecast for 2020 is \$16 billion for all additive manufacturing (AM) products and services worldwide.¹⁷ Revenue forecasts for 2022 climb to \$25.5 billion and \$40.8 billion in 2024.¹⁸

¹³ https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/advisory/ey-3d-printing-game-changer.pdf

¹⁴ https://en.wikipedia.org/wiki/3D_printing

¹⁵ <https://www.forbes.com/sites/louiscolumnbus/2019/05/27/the-state-of-3d-printing-2019/#6c151db546c2>

¹⁶ [https://www.ey.com/Publication/vwLUAssets/ey-3d-printing-report/\\$FILE/ey-3d-printing-report.pdf](https://www.ey.com/Publication/vwLUAssets/ey-3d-printing-report/$FILE/ey-3d-printing-report.pdf)

¹⁷ <https://wohlersassociates.com/press81.html>

¹⁸ Ibid

Internet of Things

Internet of Things comprises everything - sensors, meters, smart devices, domestic appliances, heating services, integrated products and solutions, etc. - that is digitally connected. IoT is the collection of objects that 'talk' to each other in homes, cars, manufacturing and industrial sectors. The technology market is growing rapidly due to (1) sensors (embedded in such IoT devices) continuing to become cheaper and more advanced¹⁹, (2) the rising adoption of cloud-based solutions in the IT industry²⁰ and (3) the growing use of artificial intelligence (AI)²¹. Fortune Business Insights valued the global IoT market at \$190.0 billion in 2018 and projects it to reach \$1102.6 billion by 2026, a CAGR of 24.7% over the forecast period (2019-2026).²²

Cloud Computing

Cloud computing is the practice in which data or software is kept, processed and delivered in remote servers instead of a local network. Data and software can then be easily accessed anywhere, anytime, via the Internet. As the world becomes more digital and connected, cloud computing is becoming pervasive. Companies of all sizes across the world have been able to scale globally and efficiently, in ways previously reserved for large organizations. In a report released in April 2019, Gartner forecasted that the worldwide public cloud services market will grow 17.5% to total \$214.3 billion in 2019, up from \$182.4 billion in 2018.²³ They also projected that this market will grow to \$331.2 billion in 2022.²⁴

19 <https://www.mckinsey.com/industries/private-equity-and-principal-investors/our-insights/growing-opportunities-in-the-internet-of-things>
20 <https://www.fortunebusinessinsights.com/industry-reports/internet-of-things-iot-market-100307>
21 Ibid
22 Ibid
23 <https://www.gartner.com/en/newsroom/press-releases/2019-04-02-gartner-forecasts-worldwide-public-cloud-revenue-to-g>
24 Ibid



Fintech and Digital Payments

Advances in mobile devices and networks, changing consumer demographics and growing investments in a range of areas of technology such as mobile payments, digital wallets and blockchain have been the catalysts for profound change in traditional industries like payments, retail banking, wealth management and insurance.²⁵ Companies that target unmet customer needs are driving the growth of the global Financial technology (Fintech) market. According to Valuates Reports, the global fintech market size is expected to grow to \$124.3 billion by the end of 2025, at a CAGR of 23.84%.²⁶ Moreover, new providers and digital tools/platforms have come to the payment industry. According to Mordor Intelligence, the global digital payments market was valued at US\$ 3,885.57 billion in 2019, and is expected to reach US\$ 8686.68 billion by 2025, a forecast CAGR of 13.7% between 2020 and 2025.²⁷

25 <https://www.pwc.com/gx/en/financial-services/assets/pdf/technology2020-and-beyond.pdf>
26 <https://www.prnewswire.com/in/news-releases/global-fintech-market-size-is-projected-at-a-cagr-of-23-84-during-the-forecast-period-2019-to-2025-valuates-reports-887660231.html>
27 <https://www.mordorintelligence.com/industry-reports/digital-payments-market>

Healthcare Innovation

During the last decade, advances in AI, genomics, supply chain digitalization and analytics have also been brought to play on the healthcare sector. Some players have focused on early identification of illnesses, while others have worked on new treatments.²⁸ For instance, Alphabet’s Verily (its healthcare unit) is collaborating with Optos (a Nikon subsidiary) to create technology and solutions for enhanced detecting of diabetic retinopathy.²⁹ Healthcare spending will be driven by clinical and technological developments, government directives and support for technology solutions, rising use of big data, a global population, which is aging, growing and becoming wealthier, and rising labour costs.³⁰ Deloitte projected that the global healthcare spend would reach \$8.7 trillion by 2020.³¹ Within this, the healthcare technology market is forecasted to reach \$390.7 billion by 2024 from \$187.6 billion in 2019, at a CAGR of 15.8% between 2019 and 2024.³²

28 <https://time.com/5710295/top-health-innovations/>
29 <https://www.optos.com/en/press-releases/26-dec-2016-nikon-and-verily-establish-strategic-alliance-to-develop-machine-learning-enabled-solutions-for-diabetes-related-eye-disease/>
30 <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-hc-outlook-2018.pdf>
31 Ibid.
32 <https://www.marketsandmarkets.com/PressReleases/healthcare-it-market.asp>



Robotics

Between 2009 and 2018, global robot installations increased from 60,000 to 422,271 annually.³³ Growth in robotics and automation has been fuelled by technological developments in sensor technologies, AI, declining costs for electrical components, as well as deglobalization and protectionist policies.³⁴ Robots are also moving beyond the traditional factories and warehouses into offices, hospitals, retail spaces and homes and are beginning to adopt personal assistant, surgical, security, autonomous retail and security roles, working alongside humans (otherwise known as “cobots”). They are becoming cost-effective and smaller, and expanding into new territories like small and medium enterprises.³⁵ According to Mordor Intelligence, the robotics market was valued at \$39.72 billion in 2019 and is expected to register a CAGR of 25% between 2020 and 2025.³⁶

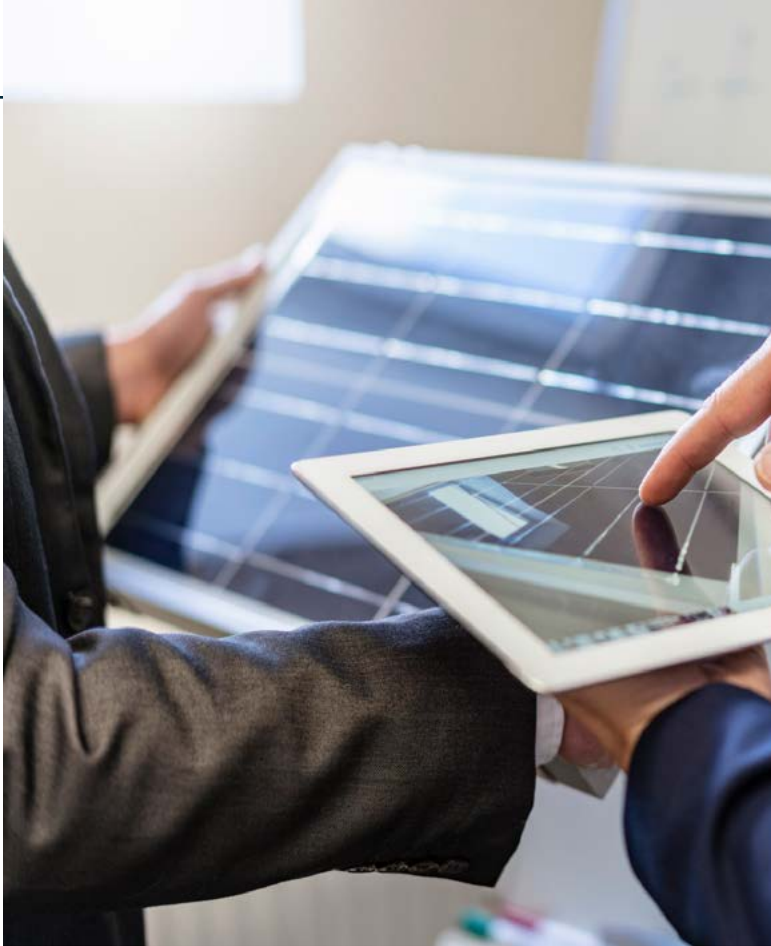
33 <https://ifr.org/downloads/press2018/Executive%20Summary%20WR%202019%20Industrial%20Robots.pdf>
34 <https://www.mckinsey.com/business-functions/operations/our-insights/automation-robotics-and-the-factory-of-the-future>; <https://www.mckinsey.com/~media/McKinsey/Industries/Advanced%20Electronics/Our%20Insights/Growth%20dynamics%20in%20industrial%20robotics/Industrial-robotics-Insights-into-the-sectors-future-growth-dynamics.ashx>; <https://blogs.lse.ac.uk/usappblog/2019/06/22/industrial-robots-are-bringing-jobs-back-home-but-not-for-low-skilled-workers/>
35 <https://www.mordorintelligence.com/industry-reports/robotics-market>
36 Ibid.

Cybersecurity

Cybercrime (representing a wide variety of criminal activities including fraud, hacking, cyber warfare, as well as cyber bullying and electronic harassment) is already a substantial concern for many industries³⁷ and will likely also become a key issue for others as the digitalization of the economy proceeds. As technology becomes more sophisticated and high-profile cyber security breaches are increasing in frequency, cybercrime is turning into one of the biggest concerns for CEOs around the world.³⁸ The global cybersecurity market was worth \$159 billion in 2019 and is forecasted to grow to \$270 billion by 2026.³⁹

Clean Energy and Smart Grids

Many nations are investing in new clean energy infrastructure with the goal of supplying enough power to meet (at least part, if not all of) their energy needs.⁴⁰ For instance, in February 22nd 2017, Denmark generated with its wind turbines enough energy to power the entire country for the day.⁴¹ According to REN, Portugal's renewable electricity production surpassed monthly consumption for what is likely the first time, in March 2018.⁴² In 2019, Costa Rica used clean energy for 300 days.⁴³ Several countries across the world have already acknowledged the need of upgrading their smart grid infrastructure (which includes electric grid, electric meters and devices, networks, energy storage and management, as well as software enabling the smart grid infrastructure sector) and have taken actions to encourage this transition.⁴⁴ A 2017 report by Joint Research Centre (JRC), which included 950 smart grid projects (R&D and demonstration) across Europe, showcased that a total of EUR 5 billion has been invested.⁴⁵ According to a 2016 report by the market intelligence firm Northeast Group, China is predicted to spend US\$77.6 billion on smart grid infrastructure over the next decade.⁴⁶ Smart grids lead to a range of important benefits: more efficient and reliable transmission of electricity, faster restoration of electricity after power disturbances, declining operations and management costs for utilities and improved security.⁴⁷



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His research focuses on organisational ambidexterity: how companies can excel at both incremental and radical innovation.

37 <https://www.pwc.com/us/en/services/consulting/cybersecurity/library/broader-perspectives/cybersecurity-concern-opportunity.html>
38 <https://www.pwc.com/gx/en/ceo-survey/2020/reports/pwc-23rd-global-ceo-survey.pdf>
39 <https://www.austcyber.com/resources/sector-competitiveness-plan/chapter1>
40 <https://www.clickenergy.com.au/news-blog/12-countries-leading-the-way-in-renewable-energy>
41 <https://futurism.com/denmark-just-ran-their-entire-country-on-100-wind-energy>
42 <https://qz.com/1245048/portugal-generated-enough-renewable-energy-to-power-the-whole-country-in-march/>
43 <https://www.evwind.es/2020/02/02/costa-rica-celebrates-300-days-living-alone-with-renewable-energy/73364>
44 <https://markets.businessinsider.com/news/stocks/smart-grids-infrastructure-market-2018-2030-1020371421>
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46 <https://www.smart-energy.com/regional-news/north-america/smart-grid-china-northeast-group/>
47 https://www.smartgrid.gov/the_smart_grid/smart_grid.html



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