



# **Leading Digital Transformation**

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Digital transformation is an ever-changing challenge for every business. Explore the current obstacles and the potential avenues for next-gen management science.

**Imperial Business Partners**

# Introduction

**D**igital transformation initiatives have seen accelerating investment, particularly in the post-COVID era, with spending expected to reach more than \$1.8 trillion this year (IDC)

The potential payoff of digital transformation is systemic, with an estimated improvement to global GDP from digital transformation to exceed \$13 Trillion by 2030 (McKinsey). The main hindrance to widespread adoption of digital transformation is, surprisingly, not primarily a technological one. In this article, we will investigate the managerial and organisational obstacles to digital transformation, and potential avenues to apply next-generation management science to successfully navigate a society-scale transition.

As background, Imperial College Business School's Centre for Digital Transformation has identified four major pillars for innovation that can address fundamental challenges regarding digital transformation. These will be discussed in more detail in this article, but to summarise briefly:

- › **New organisational phenomena:** new work practices, new financial systems, new search behaviors, and new business models;
- › **Scope of the firm:** how platform companies transcend traditional sales / manufacturing / distribution models, and how emergent organisational forms such as Distributed Autonomous Organisations (DAOs) drive competitive advantage;
- › **Algorithmic control:** data & algorithmic governance, systems of AI management, digital privacy, AI regulation, and risks of 'ethics washing'; and
- › **AI+Human systems:** shifting mindset at scale, accelerating reskilling / upskilling, managing new kinds of organisational structures, and predicting future events via collective intelligence to drive a more nimble firm.





# Enabling technologies

**T** here are a set of enabling technologies that enable and empower digital transformation. While not in and of themselves the primary focus of this article, we will briefly review the concepts in order to provide better context.

**Artificial intelligence:** machines that ‘think’ like humans, providing decision support and decision-making capabilities that can automate perhaps 50% (or more) of current work within the next decade (PwC, OECD, Oxford Economics).

**Big data analytics:** use of large scale data sets and systems can reveal hidden patterns, power better artificial intelligences, and unlock new business opportunities. The techniques to do this successfully without introducing bias or unintended consequences are nontrivial.

**Cloud computing:** migrating legacy client/server and local systems into a cloud-based, borderless environment enables greater control, flexibility, and agility for a firm, although it introduces risks and complexity, from data privacy to security.

**Distributed systems:** web3 technologies are a step beyond cloud computing, where intelligence, data, and even system governance are propagated across an interconnected network.

**Cybersecurity:** all of the technologies that enable digital transformation introduce meaningful cybersecurity risks, which are exploited as much through behavior of management and employees as they are weaknesses in technology systems themselves. Cyber warfare has seen the emergence of AI offense and defense systems, sometimes with state sponsorship, requiring greater vigilance and investment from the Board level on down than is currently extant.

There are also new technologies on the horizon that, while not enjoying largescale deployment today, hold potential for material impact in the future, such as quantum computing and metaverse systems. While beyond the scope of this article, they may be addressed in a future publication.

# Current status of digital transformation

**T**he global status of digital transformation is very much “work in process.” While prior to 2020, companies and governments had been slowly migrating to cloud and distributed environments, with flexibility on worksite and accompanying improvements to cybersecurity posture, the past two years have seen pandemic-induced flexibility and acceleration of adoption at a mass scale.

● Use of digital money, for example, increased 50% within a matter of months in the early months of the pandemic—yes, forced by emergency need, but also illustrative of the fact that the ‘rails’ for transforming the financial system (in this instance) had been laid, needing only choice to drive greater volume.

● Digital health records and health analytics, likewise, were instrumental in managing pandemic response, and now that dark interconnectivity has been ‘lit up’, other potential applications beyond emergency response are being explored.

● The nature of work and education has been perhaps permanently altered by the experience of successful remote collaboration. While at first a necessary reaction, companies and workers have found that flexible work has gone from option to requirement, with profound implications both directly for organisations as well as interconnected industries, such as commercial and residential real estate.

The COVID-19 pandemic forced many organisations to accelerate their digital transformation activities, and we are seeing the ongoing decentralisation of the workforce continue—with both positive and negative consequences of this new way of working still poorly understood. From a worker perspective, going ‘full digital nomad’ enables (in a number of cases) high wages to be earned in low-cost-of-living environs. From a corporate perspective, commercial real estate expense can now be dramatically reduced. Yet with these changes in work sites, we also see companies going from having four points of cyber security vulnerability to 10,000. We see collaboration activities that occurred through sustained, regular daily social contact attenuating in a purely remote work space.

Post-pandemic effects aside, industry has been steadily working to automate manual functions, and in the process reshaping the global workforce to one where repetitive tasks are assumed by machines and creative judgement focused within humans. This changes the nature of jobs, the number of jobs, and the educational levels needed to fulfill them. We anticipate a continued large-scale realignment of the global workforce on par with the First Industrial Revolution—which we note proximately has been associated with multiple wars, mass civil unrest, revolution, and realignment of geopolitical centres of power.

In our conversation salons at Davos, workshops at Imperial, and in bilateral meetings with C-suite leaders, government officials, and rank-and-file workers, we have identified three major obstacles to digital transformation. We note that new, disruptive technology is not, in fact, the primary rate-limiting factor on efforts to drive digital business and reshape organisations and economies.

**The top three concerns holding back digital transformation are all addressable by management and information science:**

- Mindset and behaviour
- Technology legacy
- Connecting strategy with reality



**Mindset and behaviour.** By far the most challenging area for leaders is the resistance of organisational mindsets to adopt new technologies, new ways of working, new collaborative behaviours, and other actions necessary to effectuate digital transformation. New ideas tend to stimulate an organisational ‘immune response’ of rejection, which can hinder or outright derail efforts of top executives to implement change initiatives.

**Technology legacy.** An AI-powered data analytics engine is all well and good, but not if the data needed to power it is siloed and inaccessible (or, in the case of one notable financial institution, stored on over 100 million paper documents). Collaboration technology necessary to empower a remote workforce may be inaccessible or unusable due to antiquated security software or policies. Some companies refuse to even adopt cloud systems, insisting on ‘on premises’ software deployments in the oft-mistaken belief that it provides for greater security or control. Legacy infrastructure provides a powerful inertial resistance to the new systems and practices that are essential to digital transformation.

**Connecting strategy with reality.** The world’s top management consultancies have sold billions of dollars of engagements to help tens of thousands of companies around the world devise digital transformation strategies. However, a struggle for executives remains the phase change: bridging the gap from day-to-day managerial and operational goals with the longer-term, larger-scale perspectives presented to the Board and C-Suite in the form of corporate strategy. In the words of William Shakespeare, ‘Tis many a slip twixt cup and lip’, and corporate leadership are challenged repeatedly to tie long-term strategy with short-term operational requirements.

**As the Imperial Center for Digital Transformation builds up our research platform, we are highly focused on how we can direct the intellectual capital and convening power of our institution to deliver highly relevant solutions that are critically needed by decision-makers seeking to remove obstacles to digital transformation and successfully capitalise on its potential.**

# Research focus

**A**s mentioned at the beginning, Imperial College Business School's Centre for Digital Transformation has identified four major pillars for innovation that can address fundamental challenges regarding digital transformation. Our affiliated faculty are focusing a body of research and translational activity around these pillars.

New  
Work Practices

New  
Financial Systems

New  
Search Behaviours

New  
Business Models

**New organisational phenomena:** Digital technology and networked communications have enabled human organisations to come together, operate, and optimise in new and different ways. In some instances, this creates new capabilities or markets that could not have previously existed.

- **New work practices:** A number of questions emerge when contemplating the kinds of work practices extant in the Digital Era, including not only work site and security in a partially or fully remote system, but also (separate from and interrelated to physical structure) team and group structure, permanent versus contract versus crowdsourced or collaborative labour, and other dynamics of how work practice changes in an agile and digital environment.
- **New financial systems:** The rise of digital technologies has enabled the creation of new financial products and new kinds of financial systems, ranging from better ways of modeling credit using artificial intelligence to replacing aging backend infrastructure of the banking system with faster, lower cost, and more secure means of moving and managing money. How are digital assets in these systems priced, issued, maintained, managed and regulated?
- **New search behaviours:** Digital technology has dramatically reshaped how purchasing and user choice decisions are made, ranging from novel approaches to information discovery, to the application of artificial intelligence and geo-location systems to deliver relevant choice at the 'moment of truth'.
- **New business models:** With digital technology we see business models that deviate significantly from 20th century and earlier business models. Ecosystems, collectives, 'co-opetition' and platform strategy come into play.

**Scope of the firm:** The scope of the firm can look dramatically different in the Digital Era. Areas of interest include:

- How platform companies transcend traditional sales / manufacturing / distribution models. For example, when a company such as Google can have 6 million developers (who are not on payroll) creating Android apps, and actually generating new revenue for Google in order for those developers (at their own expense) to market and sell those apps, where do the risks and obligations lie? How is regulation applied? How is this kind of ecosystem managed, empowered, and grown?
- How emergent organizational forms such as Distributed Autonomous Organisations (DAOs) drive competitive advantage. With the governance technologies associated with web3 being explored at scale, what are the advantages of a DAO? How is it coordinated? What new possibilities does it unlock and what risks are engendered by 'crowdsourced governance'?
- Other frontiers of how scope of the firm changes when the perimeter is digital instead of analogue.

**Algorithmic control:** A predicate technology for many areas of digital transformation is artificial intelligence (AI). The instructional code for AI and the algorithms that drive it introduce new requirements for management that need to be better understood, disseminated, and optimised.

- **Data & algorithmic governance:** when we introduce algorithmic decision making, a number of questions need to be answered both about how we manage those algorithms, and also the data associated with them. Significant risk can be introduced to a firm that executive leadership and Boards may not fully comprehend, and there is a growing body of best practice around the governance of data and algorithms.
- **Systems of AI management:** in parallel to the data / algorithm question, select firms are beginning to pioneer a dedicated area of new management practice to oversee AI across the firm, including both operational / functional and compliance activities.
- **Digital privacy:** The EU GDPR and UK GDPR, along with other privacy regulation emerging around the world, require new practices, products, processes, business models, and strategies to accommodate a world in which harvesting data for free from end-users is coming to an end.
- **AI regulation:** World governments are increasingly putting in place AI regulations, notably the European Parliament for EU-wide standards and more recently a proposal from the US government. As policymakers grapple with regulating AI, how do we avoid either over- or under-regulation? What inputs are needed to navigate successful policy interventions in this domain?
- **Risks of ‘ethics washing’:** Just as market and regulatory forces drove companies to adopt ESG practices, many firms would then engage in ‘green washing’, making it look as if they were sustainable when in fact it was all theatre, no action. Similarly, as greater focus on ethics and responsible innovation have arisen, a number of prominent companies notably announced ethics initiatives, and then disbanded them when the recommendations from third-party experts ran too contrary to the profit requirements of the enterprise. How can governments, corporate leaders, and advocacy groups navigate around ‘ethics washing’?

**AI+Human systems:** An emergent area of inquiry at the intersection of management theory and computer science is that of hybrid intelligence where human and artificial intelligence work in close synergy with each other. This AI+Human intelligence is able to provision activities that are not conducted as effectively either by machines alone or by people alone, including:

- **Shifting mindset at scale:** synthesis of feedback loops between human and AI can deliver mindset shift at scale, solving one of the biggest and most intractable obstacles to implementation of digital transformation.
- **Accelerating reskilling/upskilling:** in order to keep pace with the digital revolution, companies and individuals need to reshape their skillsets and knowledge at ever-accelerating rates. AI+Human technologies have been demonstrated to dramatically improve learning outcomes, but this is a nascent area of academic inquiry and requires more, and more rigorous, applied research. The urgency is real as over \$400 billion annually is spent on professional education and much of it fails to deliver the desired outcomes.
- **Managing new kinds of organizational structures:** Increasing complexity of scale, scope, and speed needed to make decisions creates an imperative for new organizational structures—but the “command staff” model of organisation may not be fully capable of coping with the decision requirements around these new organisational structures. AI+Human technologies can potentially augment the capacity of managers to make not only rapid decisions, but the right decisions, and coordinate activity across multiple geographies and loci of activity.
- **Predicting future events via collective intelligence:** To drive a more nimble firm, managers would benefit from the ability to more clearly see into the future. With Human+AI systems, initial research has already shown the ability to generate accurate predictions of certain kinds of future outcomes. Tying this capability into new methods of organizational management could help the digital firm of the future to predict and more rapidly respond to new threats and new opportunities.

# Potential impacts

**M**ost if not all sectors of the economy will be fundamentally changed by the macro trends outlined above, some sooner than others, and some more deeply than others. **Factors that will influence these market impacts include**

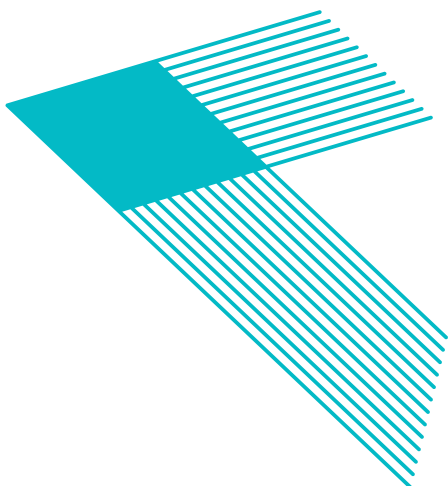
- the pace of automation,
- how proactive different market actors in digital transformation,
- which tasks can be automated more easily,
- government regulation,
- competition, and
- a variety of other intrinsic and extrinsic factors.

In the medium term (next three to seven years), PwC predicts that financial services, manufacturing, and wholesale / retail trade are the industries that are in the most vulnerable positions due to the amount of repetitive white-collar tasks that can be automated by ever-more-sophisticated machine systems.

In the longer term (10+ years), transportation and logistics will overtake all of them in terms of scale and depth of impact, as the use of autonomous vehicles diffuses throughout the economy. This will have a knock-on effect in the service economy, to the array of industries that support transportation and logistics.

Beyond the large sectoral trends, perhaps the most important issue relates to how quickly incumbents in all the sectors react to the new technologies and incorporate them into their digital strategies, products, processes, services, and business models. This digital transformation is typically a multi-year process, and waiting is generally considered a poor strategic choice, since competitors' moves make it more and more difficult for incumbents to catch up over time.

Examples include the growing financial services market, of which fintechs and digital banks have been expanding rapidly at the expense of traditional banks, and telecommunications, where over-the-top messaging and communication services have come at the expense of traditional telecoms companies. We expect to see every major sector of the economy begin to undergo meaningful digital transformation over the next five to 15 years, from food production to health care.



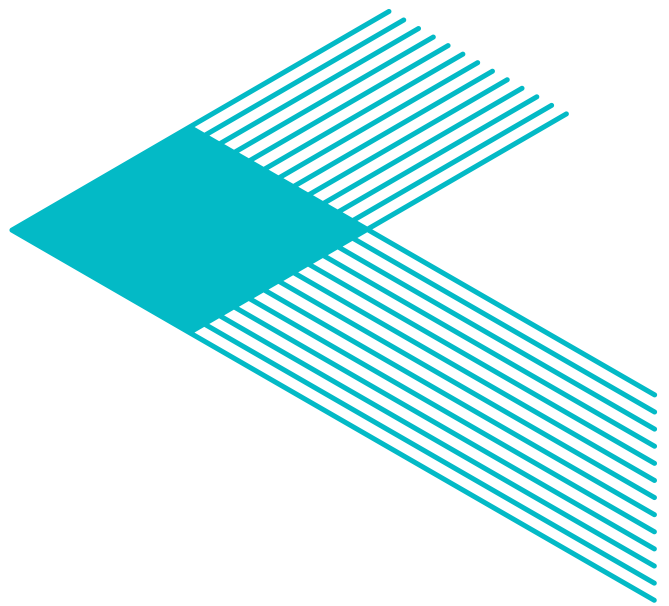


# Next horizons

**N**ot all technological advances in the digital space are ‘disruptive’ or ‘radical’, causing a restructuring of the entire sector. In fact, many digital advances can help save cost or boost productivity. As part of the digital transformation process leading to the four kinds of innovations discussed above, executives may wish to consider how incorporation and adoption of different Industry 4.0 technologies might enable them to automate business processes, cut costs, and connect the entire value chain / value network.

The process of thinking this through will help confront the complexities of digital transformation and start down a longer road of ‘future-proofing’ the organization. Future proofing is a complex strategic discipline, and in recent years there are a new set of extant and emerging toolkits to assist with this high-order management exercise. Imperial’s Centre for Digital Transformation is pioneering efforts to provide leadership with the essential capabilities to respond to and shape a new world order.





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