Harnessing the economic benefits of Artificial Intelligence

The industry is unanimous: AI will change the world and be ubiquitous in tomorrow’s economy. AI major gains are likely to focus on productivity, efficiency, automation and costs, enabling consumers and businesses to capitalise on the digital economy. However, companies that fail to recognise the advent of AI and respond to them by disrupting themselves, innovating and re-engineering their business models will, at best, lose their competitive advantage, and at worst, disappear.

1

Promises of AI

AI is already changing our daily lives, improving human health, safety and productivity and offering transformational possibilities for consumers, businesses and society as a whole.

**AI: a new factor of growth**

Combined with key technologies such as the Internet of Things, Big Data Analytics or blockchain, AI has the potential to create a new basis for economic growth and to be a main driver for competitiveness and job creation.

**AI could contribute up to EUR 13.3 trillion to the global economy by 2030**

More than the current output of China and India combined. Of this, EUR 5.6 trillion is likely to come from increased productivity and EUR 7.73 trillion from consumption-side effects.¹

**Benefits of Enterprise Artificial Intelligence**

AI is disrupting the entire business value chain by automating existing business processes, uncovering new value from data and augmenting human decisions and actions.

The ability to analyse levels of data that are beyond human comprehension allows businesses to personalise experiences, customise products and services and identify growth opportunities with a speed and precision that has never been possible before.

**Figure 1: Origins of the value gains coming with AI**¹

Labour productivity improvements are expected to account for over 55% of all GDP gains from AI over the period 2017 – 2030.

As new technologies are gradually adopted and consumers respond to improved products with increased demand, the share of impact from product innovation increases over time.

58% of all gains in 2030 will come from consumption side impacts.

**AI impact on economy by 2030:**

- EUR 5.6 trillion from increased productivity
- EUR 7.73 trillion from opportunities related to consumer experience

**Source:** PwC Analysis
Figure 2: AI future promises by industries

<table>
<thead>
<tr>
<th>Project</th>
<th>Produce</th>
<th>Promote</th>
<th>Provide</th>
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<tbody>
<tr>
<td>Accurate demand forecasting, smart sourcing, and enlightened R&amp;D</td>
<td>Higher productivity and minimized maintenance and repairs</td>
<td>Products and services at the right price, with the right message, to the right targets</td>
<td>Enriched, tailored, and convenient user experience</td>
</tr>
<tr>
<td>Retail</td>
<td>1–2% EBIT(^1) improvement using machine learning to anticipate fruit and vegetable sales</td>
<td>30% reduction of stocking time using autonomous vehicles in warehouses</td>
<td>50% improvement of assortment efficiency</td>
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<td></td>
<td>20% stock reduction using deep learning to predict e-commerce purchases</td>
<td></td>
<td>4–6% sales increase using geospatial modeling to improve micromarket attractiveness</td>
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<td></td>
<td>2 million fewer product returns per year</td>
<td></td>
<td>30% online sales increase by using dynamic pricing and personalization</td>
</tr>
<tr>
<td>Electric utilities</td>
<td>Objective to cut 10% in national electricity usage by using deep learning to predict power demand and supply</td>
<td>20% energy production increase using machine learning and smart sensors to optimize assets’ yield</td>
<td>$10–$30 savings on monthly bills by using machine learning to automatically switch electricity supply deals</td>
</tr>
<tr>
<td></td>
<td>10–20% EBIT improvement by using machine learning to enhance predictive maintenance, automate fault prediction, and increase capital productivity</td>
<td></td>
<td>12% fuel savings for manufacturers’ customers, airlines, by using machine learning to optimize flight routes</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>10% yield improvement for integrated-circuit products using AI to improve R&amp;D process</td>
<td>30% increase of material delivery time using machine learning to determine timing of goods’ transfer</td>
<td>13% EBIT improvement by using machine learning to predict sources of servicing revenues and optimize sales efforts</td>
</tr>
<tr>
<td></td>
<td>39% IT staff reduction by using AI to fully automate procurement processes</td>
<td>3–5% production yield improvement</td>
<td>12% fuel savings for manufacturers’ customers, airlines, by using machine learning to optimize flight routes</td>
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<tr>
<td>Health care</td>
<td>$300 billion possible savings in the United States using machine learning tools for population health forecasting</td>
<td>30–60% productivity improvement for nurses supported by AI tools</td>
<td>$2 trillion–$10 trillion savings globally by tailoring drugs and treatments</td>
</tr>
<tr>
<td></td>
<td>£3.3 billion possible savings in the United Kingdom using AI to provide preventive care and reduce nonelective hospital admissions</td>
<td>Up to 2% GDP savings for operational efficiencies in developed countries</td>
<td>0.2–1.3 additional years of average life expectancy</td>
</tr>
<tr>
<td>Education</td>
<td>Virtual teaching assistants can answer 40% of students’ routine questions</td>
<td>1% increase in enrollment by using a virtual assistant to follow up with applicants</td>
<td>85% match with human grading, using machine learning and predictive modelling</td>
</tr>
</tbody>
</table>

Source: McKinsey Global Institute
The economic impact of AI in businesses will be driven by 3 pillars.

1. Productivity gains from automation

AI enables massive productivity gains for businesses automating their processes. Robotic and cognitive process automation, multi-agent collaborative systems, machine learning and natural language processing are helping companies maximise value by improving input (labour, capital and assets) productivity. Capital-intensive sectors such as manufacturing and transport will benefit the most from productivity gains.

2. Increased consumer demand

Consumer demand is likely to be driven by the availability of personalised and/or higher-quality AI-enhanced products and services in the coming years. It has been forecasted that the gains derived from consumer demand will overtake the gains originating from productivity.

3. Innovation dissemination

AI has a strong ability to propel innovation as it can quickly analyse data that would have otherwise taken a lifetime to process, lower R&D costs and create new possibilities for experimentation.

### 2 Transformative impact of AI on businesses

AI creates a new way of thinking about technology, business development and strategic execution, which affects the entire business, rather than just the technology and innovation divisions.

#### Strategic implications

AI has the potential to fundamentally disrupt core businesses and provides opportunities to innovate with entirely new business models.

Auto manufacturers for example are fundamentally rethinking their business model as ‘Personal Mobility’ service providers instead of manufacturers of vehicles. Besides, legal and consulting firms are using robotic and cognitive process automation and blockchain to disrupt and re-engineer their business processes.

#### Enhanced decision-making

AI combined with analytics also enables organisations to make more effective and quicker decisions to collaborate, grow and shrink their businesses. Many industries are already using AI for prediction in order to improve decisions. Credit card networks for instance use AI to predict whether each attempted transaction is fraudulent and to allow legitimate transactions.

#### Major overhaul of marketing functions

Recent advances in multi-agent collaborative systems, machine learning and natural language processing have brought AI to marketing areas.

- **94% of CEOs** who have adopted robotics say that it has increased productivity²

### 3 Operations & development

Machine learning, industrial IoT, big data and robotics are fundamentally transforming product development and operations across all sectors.

They enable the development of robust pricing strategies under different scenarios to find the best price for new product introduction. Combined with the industrial internet of things, machine learning can predict anomalies with sensor data, images, videos and audio data and therefore reduce losses.

Manufacturers for instance are using machine learning and other AI techniques to better predict failure and breakdowns and thus to reduce maintenance costs.

#### A disruption of inbound logistics

The awareness and ability to make fact-based decisions that AI makes possible is completely revolutionising supply chain management. IoT means that everything can be connected and capable of collecting data on all activities performed by a company. So all data related to an inventory (e.g. origins and transit routes) can be collected and analysed through the use of advanced analytics tools such as machine learning.

In-depth simulation can be run, allowing for example the implications and knock-on effects of missed deadlines to be assessed before they even occur and remedial actions to be taken ahead of inconveniences being caused to customers.

### 4 AI drives innovation in medical research

Advances in machine learning and AI are reshaping healthcare by accelerating innovation.

#### Understanding DNA language

Meaningful progress is made in understanding how DNA impacts life thanks to the processing of vast amounts of data.

#### Drug discovery

Another application of AI in healthcare is the reduction of both cost and time in drug discovery. Algorithms can be used to replace tube experiments, predict pharmacologic properties of drugs and analyse scientific literature. Recent discoveries include drugs that may significantly reduce Ebola’s infectivity or chemical compounds that may work on Alzheimer’s disease.
Brain: strategic scenarios thanks to AI

French data company Dreamquark developed Brain, a platform for businesses to build predictive models with their data. Businesses just need to upload their data and select their variables, then Dreamquark’s AI learns from the data and makes it possible to visualise and review the results.

Thanks to those data generation abilities, companies can explore different scenarios and build new, innovative and successful strategies.

Brain’s cognitive resources are especially used by insurance, financial services and healthcare professionals to take advantage of the massive amount of data they have stored.

www.dreamquark.com

DeepL: a breakthrough in translation

German tech company DeepL (creator of translation search engine Linguee) launched in 2017 DeepL Translator, leverages AI to deliver the world’s most accurate and natural-sounding machine translation tool. According to tests putting DeepL Translator against the competition, translators preferred DeepL’s results by a factor of 3:1.

The reason for this success is that DeepL uses a supercomputer in Iceland, capable of 5 100 trillion floating point operations per second, enough power to translate a million words in under a second. Besides, DeepL’s neural networks are powered by high-quality translated sentences provided by Linguee.

www.deepl.com

Maintenel: machine learning to reduce operating costs

Maintenel (stands for maintenance electronics) is a Latvian start-up in predictive maintenance. The solution enables companies to reduce the operating and maintenance costs of their equipment.

The solution for predictive maintenance is based on rapid-deployment hardware, software and cloud components.Maintenel measures the workload of equipment by counting the period of time spent in different operation modes. On receiving this data, Maintenel’s cloud-based software allows detailed labour analysis and enforces timely preventive maintenance using predictive maintenance features.

www.maintenel.com

Talkwalker: the first social media analytics platform

Talkwalker is a Luxembourg-based social media monitoring tool for marketers trying to review and identify tactics to improve their social media and content marketing. The platform analyses in real time online social, print and TV/radio content and uses advanced AI to find the most relevant and impactful information. It also offers a wide range of social media analytics and monitoring tools by centralising metrics from companies’ customers, campaigns, competitors and industry and by enabling them to track their campaign performance in real time.

www.talkwalker.com

Lumoa: AI for world class customer experience

Finnish company Lumoa offers online customer experience management services, helping companies to identify and solve customer problems in a fast, easy and affordable way.

Lumoa uses AI to understand what drives customers’ satisfaction up and down, by collecting customer feedback, translating and categorising them, assessing their sentiment and finally showing the positive and negative drivers of customer experiences instantly. It also enables companies to measure their customer experience on a daily basis.

http://lumoa.me/

IBM Watson Supply Chain

Capitalising on the capacities of IBM’s Watson, the company recently launched Watson Supply Chain for supply chain optimisation. The principle is to use cognitive technology for a transparent, demand-sensitive, customer-centric and predictive supply chain. It leverages machine learning to track and predict supply chain disruptions based on gathering and correlating external data monitored from numerous sources such as social media, newsfeeds, weather forecasts and historical data.

www.ibm.com/watson/supply-chain
However, a new set of industry organisations are facing the need to adapt their business models and operations to the adoption of AI. All economic sectors are expected to experience significant changes as businesses seek to harness the economic benefits of Artificial Intelligence (AI).

Concerns regarding AI as well as the lack of key enablers such as skills and infrastructure are still slowing AI adoption, especially in non-tech companies and SMEs.

Non-adoption can be a critical risk for businesses. The impact of AI on productivity is so competitively transformative that businesses that fail or fear to adopt could quickly lose a significant amount of their market share and have their business model become obsolete.

**AI: boon or bane for employment?**

One of the biggest concerns regarding AI is that it will replace human labour. 9% of all jobs are indeed at high risk of being automated. However, a new set of personnel will be required to build, maintain, operate and regulate emerging technologies linked to AI and to help people learn to work with them. Therefore, there is a resistance from employees and decision-makers to adopt a technology that might end up replacing their co-workers.

The overall impact of AI in jobs is highly controversial today. A recent study launched by the World Economic Forum predicts that AI will destroy 5 million jobs in 15 major developed and emerging countries. However, industry leaders such as Microsoft, IBM and Salesforce affirm on the contrary that the use of AI in businesses will instead create qualified jobs.

**The skills gap**

Skills scarcity is a major constraint on the adoption of AI. All economic sectors are facing the need to adapt their workforce’s skillsets. At stake is their ability to support and complement the AI-powered user experience.

To do so, companies have 2 options: they can either hire external talents or they can rely on their own resources. The first obstacle here is the general shortage of digital talents and data scientists in Europe. Companies therefore need to upskill and retrain their own human resources, which is a complex and costly process.

On the other hand, many decision-makers are not sufficiently digital-savvy to identify the skillsets employees need to work alongside AI-directed machines. Therefore, sourcing the right digital assets and skills is a critical challenge for company leaders wishing to effectively deploy AI.

**80% of board members are not sufficiently digital-savvy to guide their organisation in the digital era.**

**Unanswered ethical questions**

Trust in AI and uncertainty on ethical issues are restraining users as well as entrepreneurs from further using the outcomes of AI such as algorithms for their own needs. Is it reliable? Is it transparent? Does it generate biased results or responsibility in the event of accidents? These are all key questions that are still unanswered. For example, how should a self-driving car choose between saving its passengers or pedestrians?

The advanced use of data for machine learning is also raising critical questions regarding data protection, especially for data transferred across state boundaries. Laws regulating the transfer of data, such as the EU GDPR, already exist but are likely to be tightened up in the future, creating uncertainties for companies relying on data exchange or commercialisation.

**Black box algorithm and trust**

Many AI algorithms relying on machine learning are now so complicated that nobody, even their programmers are able to check and understand how their decisions are made. This issue is called “black box algorithm” given that the input and output are known but the process between them is unknown.

The difficulty or impossibility to check how AI reaches its conclusions creates a lack of accountability that harms trust in AI.

**Cybersecurity threats**

Automation and the introduction of IoT in businesses massively increase the vulnerabilities present in networks. Therefore, AI adoption requires companies to adopt stronger and smarter cybersecurity practices. This is a major hindrance for companies which cannot afford such a cybersecurity strategy. In the wrong hands, AI could be used to conduct cyberattacks.

However, AI can also be a major source of progress for cybersecurity strategies, enabling real-time defences and limiting the impacts of attacks.

**How can companies capture the value of AI?**

**Identify where to use AI**

AI needs to be explored for the value it brings to specific business functions rather than for a need for novelty. AI projects and pilots should earn their priority based on the needs of the organisations considering them. Research company Gartner thus recommends that companies analyse AI projects with the same deliberation and care they place in conventional, non-AI projects and especially recommends that they adopt AI for customer interactions (customer engagement, call centre, digital marketing) because of the potential for return on investment.
Lessons learnt from best practices

Companies’ best practices should align around seven key dimensions to conduct a successful AI strategy.12

1) Create a business-aligned analytics & AI strategy

The key is to align AI with strategic goals and performance indicators in order to avoid adopting AI just for its hype.

2) Don’t expect magic

A common problem is to believe AI will magically learn without human intervention, while it requires a lot of effort into acquiring and cleaning data and training both machines and employees.

3) Build the technology foundation

It is necessary to provide the systems, infrastructure and skills needed to support analytics and integrate AI technologies throughout the organisation.

4) Opening up to scrutiny

Before adopting AI, there is a need to ensure the technology can communicate its decision-making process in a way that can be understood and scrutinised by business teams to avoid the ‘black box algorithm’ issue.

5) Build clean and unbiased data

Applications must be built on clean, reliable and unbiased data set. This is a major condition for building trust in AI.

6) Demonstrating regulatory compliance

Maintaining regulatory compliance and being able to show it is essential to build trust in AI platforms.

7) Organisational structure

The change in business models triggered by AI needs to be reflected in companies’ organisational structures. Successful AI strategies are coupled with a dedicated AI governance structure. In addition, hiring or training data scientists and employees with the right skillsets is essential to achieve AI organisational maturity.

Sectors where AI would deliver the biggest returns

There are particular business sectors where AI promises the greatest return on investment in the very near future.13 Their identification enables businesses to target and time their investment.

Healthcare

Supporting diagnosis and early identification of potential pandemics are two of the areas in healthcare with the biggest potential. This is the sector where the biggest medium-term impact (0 to 3 years) has been identified.1 However, concerns over the privacy and protection of sensitive health data still need to be addressed.

Automotive

Considerable progress is being made in research and experimentation into autonomous fleets and predictive maintenance. Most of the necessary data is available and technology is advancing; however, businesses still need to win consumer trust.

Financial services

AI developments enable full process automation (not just back-office functions but customer-facing operations as well), fraud detection and personalised financial planning. All the necessary technologies exist but customer and regulatory acceptance are still important barriers.

Retail

AI can revolutionise both in-store experience and online shopping. Retailers are beginning to use deep learning to predict customers’ demand and create smart inventory and delivery management.

References

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12 Dr. Anand S.Rao for PwC, 2017, Artificial Intelligence Credentials

Figure 3: Index on potential AI consumption impact

<table>
<thead>
<tr>
<th>Sectors</th>
<th>% adoption maturity – Near term (0-3 years)</th>
<th>% adoption maturity – MId term (3-7 years)</th>
<th>% adoption maturity – Long term (7+ years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive: 3.7</td>
<td>35%</td>
<td>47%</td>
<td>18%</td>
</tr>
<tr>
<td>Financial Services: 3.3</td>
<td>41%</td>
<td>59%</td>
<td>0%</td>
</tr>
<tr>
<td>Healthcare: 3.7</td>
<td>37%</td>
<td>23%</td>
<td>40%</td>
</tr>
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Source: PwC Analysis
About the Digital Transformation Monitor

The Digital Transformation Monitor aims to foster the knowledge base on the state of play and evolution of digital transformation in Europe. The site provides a monitoring mechanism to examine key trends in digital transformation. It offers a unique insight into statistics and initiatives to support digital transformation, as well as reports on key industrial and technological opportunities, challenges and policy initiatives related to digital transformation.


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