ARTICLE

Revolutionizing Industries with AI

The Transformative Impact of AI on Business Models and Workforce Dynamics

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Executive Summary: The Transformative Impact of AI on Industries

The ongoing AI revolution is set to dramatically reshape the landscape of global industries, mirroring the transformative effect the internet had over two decades ago. This revolution, however, is poised to leave an even more indelible mark due to AI's unparalleled cognitive capabilities, enabling it to perform creative and understanding-based tasks that have traditionally been the domain of humans. From customer support to graphic design and beyond, the automation of such tasks promises significant efficiency gains but also heralds a period of profound workforce and business model disruption.

According to recent studies, using GenAI reduces the time required to complete coding tasks by 55% compared to completing them without GenAI. Furthermore, creating graphic images requires 99% less time with GenAI, and writing a 5-page, well-researched paper or legal brief takes 37% less time with GenAI. Additionally, resolving one customer query takes 16% less time with GenAI.

In our comprehensive report, we have devised an innovative methodology to gauge the impact of AI across 21 industries, focusing on two critical dimensions: **the effects on the workforce and the potential for disruption to core business models.** By analyzing the time savings afforded by AI in task completion across different sectors and examining the potential shifts in industry value chains, we offer a quantifiable assessment of AI's disruptive potential.

Our findings reveal that sectors such as Media, Software, and Healthcare stand at the forefront of vulnerability to AI's encroachment, with significant implications for both their workforce and business models. These industries face an urgent need to adapt, leveraging AI to forge new competitive advantages while mitigating its disruptive effects.

Conversely, industries such as Banking, Insurance, Retail, Telecoms, and Government are identified as particularly susceptible to workforce disruptions. These sectors are advised to embrace AI-driven productivity tools while focusing on upskilling their employees towards more value-additive roles.

At the other end of the spectrum, industries centered around physical products and services—namely Agriculture, Mining, and Energy—are currently perceived as less vulnerable to AI-induced changes. Nonetheless, firms within these sectors are cautioned against complacency, as the evolving capabilities of AI could unlock unforeseen advantages and necessitate strategic adjustments.

This report underscores the dual-edged nature of the AI revolution: while it presents unparalleled opportunities for efficiency and innovation, it also challenges existing business paradigms and labor markets. Embracing this change requires proactive measures from companies across all sectors to rethink their strategies, innovate their operational models, and prepare their workforce for the future. The AI revolution is not merely an impending shift but a current reality that demands immediate and thoughtful action to harness its full potential while navigating its complexities.

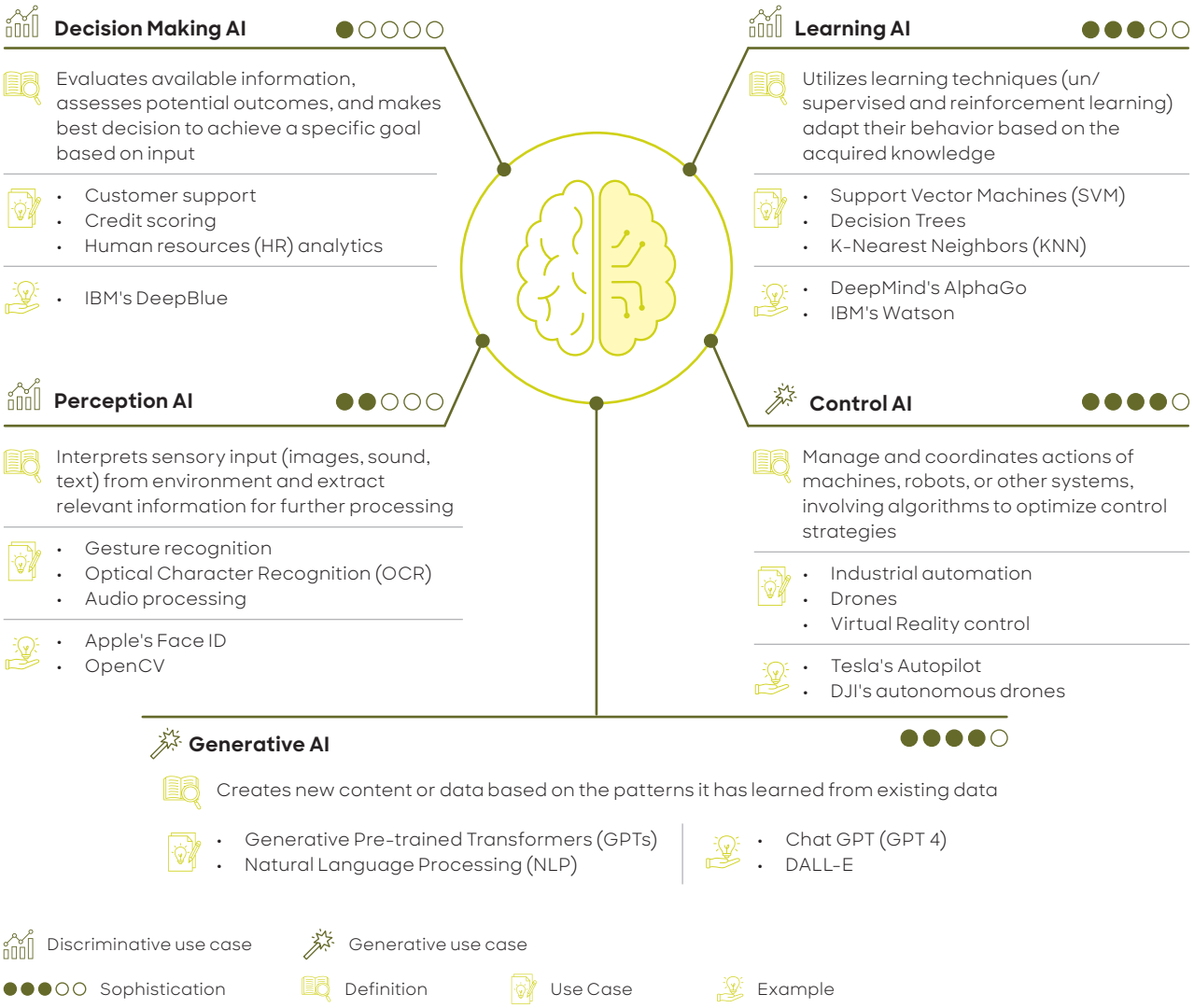
1 Artificial Intelligence (AI) Overview

In essence, AI works by combining large datasets with algorithms that can learn from data and make predictions or recommendations based on the patterns they discover.

The recent advancements in AI have been largely fueled by a specific field called deep learning. This technology allows computers to emulate human cognitive processes using artificial neural networks (ANN). ANNs are a type of machine learning model that imitates the functioning of the human brain by processing information through interconnected nodes called neurons. By learning from examples and recognizing patterns, ANNs can make decisions without being explicitly programmed for specific tasks. They have a wide range of applications, including face recognition, voice recognition, drug design, and climate science. AI can be classified as Discriminative or Generative. Discriminative AI classifies data based on their characteristics, while Generative AI creates new data based on inputs.

Below is a summary of the broad types of AI, further grouped into discriminative and generative categories. ▶ A

A Classification of Artificial Intelligence



Source: Roland Berger

Out of these types, Perception, Control, and Generative AI are the most relevant applications for businesses, as they can help enterprises optimize operations, innovate products, and drive workforce productivity. In the past year or so, we have witnessed significant progress in developing and adopting Generative AI models and applications, with ChatGPT, Dall-E, Midjourney, and Sora exploding onto the scene. Why does it seem like AI suddenly has a moment?

Why AI is at a turning point now?

AI is no longer a new technology; it has evolved for decades. However, three key factors recently have converged to create a robust environment for AI development and innovation, resulting in a sudden advancement in the creation of Generative AI.

First, thanks to the internet, the vast amounts of user-generated content enabled by social media, and all the data captured by smartphones, there is now an abundance of digital data - text, photos, videos, and metadata - required to train AI models.

Second, in 2017, Google researchers created the Transformer model, which can use vast amounts of text to train itself to 'understand' language. After training it with virtually the entire corpus of text on the internet, the model could statistically predict the most likely word that will occur next in any given sentence.

Third, the invention of graphics processing units (GPUs) by companies like NVIDIA has provided the vast processing power necessary to train these transformer models.

These three essential prerequisites have facilitated the evolution of Generative AI and Large Language Models (LLMs) such as OpenAI's ChatGPT, Google's Gemini, and Meta's Llama2.

2 The Impact of AI on Industries

AI, particularly Generative AI, is poised to cause significant disruption across industries, just like the internet did in the early 2000s and mobile did in the 2010s. AI will change how companies create and deliver value to their customers and how they organize their workforce and govern their operations. Two primary dimensions will determine how susceptible industries are to disruption.:

1. **Business model disruption** depending on the nature of the business: Companies offering non-physical products and services (e.g., software) and relying extensively on data generation and processing for their core business models, products, and distribution channels are more likely to be disrupted by AI.
2. **Workforce transformation** depending on the composition of the workforce: Companies with workforces are concentrated in roles involving generating content (e.g., writers, graphic designers), analyzing data, or dealing with customer requests (e.g., call center agents) are more likely to be disrupted by AI.

We have quantified the potential impact of AI on each dimension for 21 significant industries encompassing the highest amount of economic activity to identify which industry verticals are most vulnerable to disruption. ▶ B

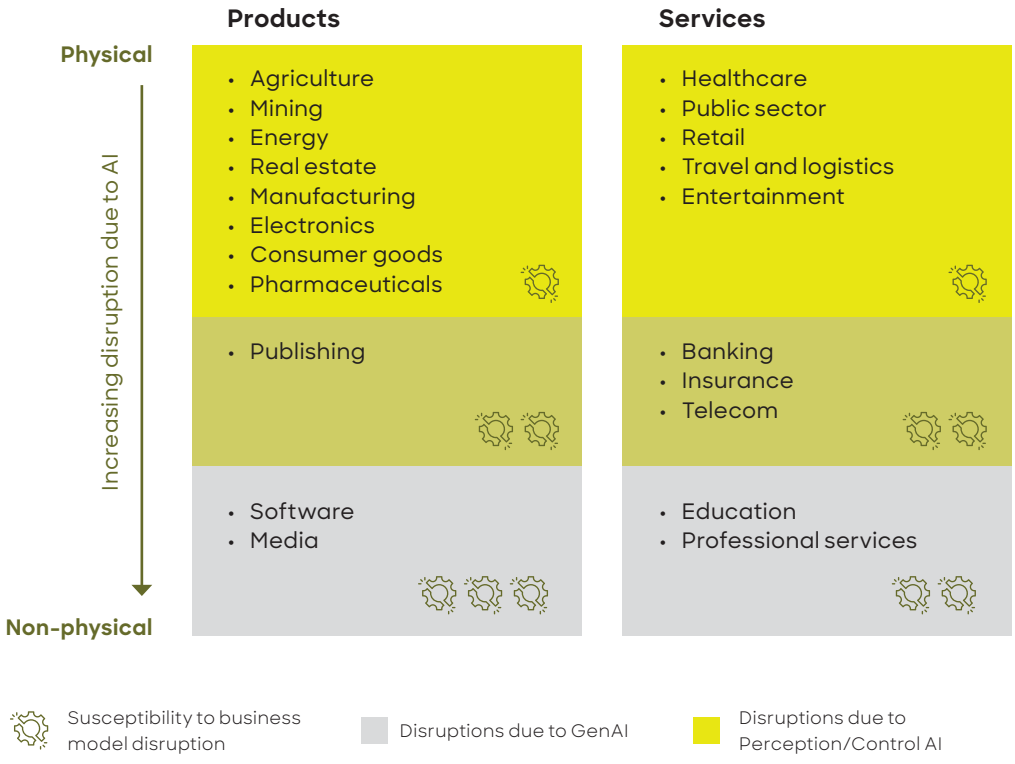
The graph below splits key industry verticals by whether the industry vertical is product or service-driven, by understanding the primary output or value proposition of each industry. We further map the industry vertical based on whether the operations are primarily physical or non-physical driven.

Physical-driven industry: This category typically includes industries that rely heavily on physical assets, specialized equipment, or tangible products to deliver their services or products. These industries often require significant investment in infrastructure, manufacturing facilities, or physical tools. Examples include:

- healthcare (depending on medical equipment),
- construction (depending on building materials and machinery), and
- manufacturing (depending on factories and physical production lines).

Non-physically driven industry: Conversely, non-physical sectors primarily rely on intangible assets or services. These include knowledge, skills, or digital assets. These industries often have a lower reliance on physical infrastructure. Examples include education (focused on knowledge transfer and can be conducted virtually), software development (primarily digital products), and consulting services (expertise and advice-driven).

B Probability of business model disruption due to AI on industry verticals



Source: Roland Berger

Business Model Revolution

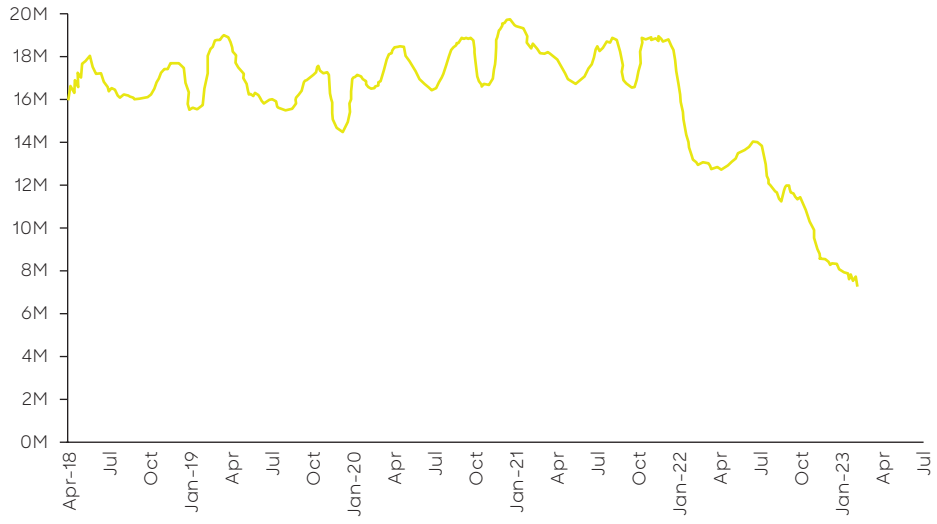
We are already witnessing AI-driven disruptions to business models and competitive responses, particularly in the software industry.

A classic example is DALL-E from OpenAI or Midjourney - AI models that generate images from textual descriptions - reimagining the graphic design industry. These models can instantly produce unique images, illustrations, or designs based on simple text inputs, making the same output that a graphic designer might take hours to do. AI-generated image technology has threatened to disrupt the core business model and product offering of Adobe, a major graphic design software company, forcing them to launch Firefly, an AI image generation feature. Rather than be disrupted, Adobe has chosen to disrupt itself to remain relevant in the market instead of leaking users to a fast-moving competitor.

Similarly, OpenAI's Sora poses a significant disruptive threat within the video production industry. Currently, video generation is costly and time-consuming. Sora's ability to generate realistic videos from text descriptions has the potential to streamline and democratize video creation. This could displace professionals like videographers and animators while simultaneously opening new avenues for businesses and individuals who previously lacked resources for high-quality video production.

Chegg, an online education company, has moved slower than Adobe and has suffered. Chegg provides online tutoring for students and relies on human experts to create and review the content that it offers to its subscribers. However, Generative AI products such as ChatGPT have challenged Chegg's business model by offering free, fast, and accurate solutions to student queries using natural language. Many students have switched from Chegg to ChatGPT to get help with their assignments and essays, with Chegg's stock price dropping more than 60% due to its business model being disrupted by AI. ▶ C

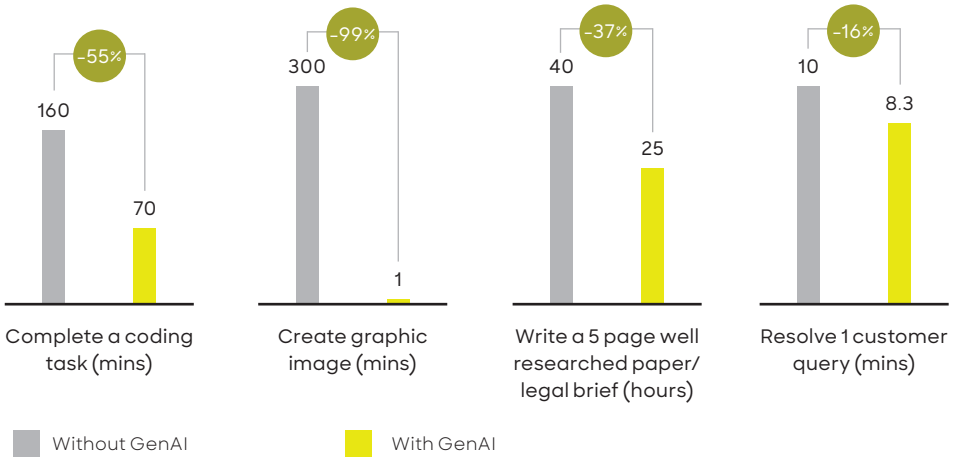
C Stack Overflow | Traffic drop by ~50% after the introduction of ChatGPT



Source: Stack Overflow

Even the ever-buzzing Stack Overflow, the famous online platform programmers use to ask and answer questions, is facing disruption from AI chatbot competitors such as ChatGPT, with traffic down by almost 50%. ChatGPT and its alternatives offer faster, more accessible, and more personalized solutions for coding problems than Stack Overflow. These AI chatbots can also learn from the web and continuously update their knowledge, while Stack Overflow relies on human contributions and moderation. Stack Overflow may need to adapt to the changing landscape of coding assistance and find ways to leverage its community and reputation to remain relevant in the face of AI disruption. ▶ D

D Time to complete knowledge work tasks has seen significant improvements due to GenAI



Source: GitHub, Ark Investment, Nielsen Norman

Workforce Transformation

AI's impact on the workforce will be substantial, especially for roles that generate content or code, analyze data, or deal with customer requests. Companies using AI have experienced a considerable boost in productivity as these tools streamline operations, automate routine tasks, and enable employees to focus on higher-value work.

In addition, AI can reduce or even eliminate human error, and decision-making processes can be significantly optimized.

For example, in the healthcare industry, AI-driven tools are now used to analyze complex medical data, helping doctors make faster and more accurate diagnoses and treatments. AI algorithms have shown promising results in detecting lung cancer. By analyzing vast amounts of data and recognizing complex patterns, AI systems have achieved more diagnostic accuracy and consistency than humans.

Software developers use ChatGPT to write code snippets or documentation, while others use DALL-E to create user interfaces or icons. GitHub Copilot, a generative AI-powered coding assistant, has been activated by over one million developers and adopted by over 20,000 organizations, resulting in over three billion accepted lines of code.

Architects use GenAI tools to generate floor plans or proposals, while others use Dall-E to create 3D renderings or visualizations.

In customer service, AI-powered chatbots and virtual assistants can handle common queries, leaving complex issues to human operators. This synergy between AI and human intelligence allows businesses to deliver better service while improving productivity.

For instance, Klarna, a buy-now pay-later company has used AI to transform its customer service operations. The AI assistant autonomously handles two-thirds of customer inquiries, replacing the work of 700 full-time agents. Klarna claims this has led to improved efficiency (faster resolution times), matching customer satisfaction scores compared to human agents, and a projected $40 million increase in profit.

Legal firms now use AI to draft legal documents, analyze contracts, and provide essential legal advice. This helps to significantly reduce the cost and time associated with these services, making them more affordable and accessible to the average consumer. As a result, access to legal services is now more democratic.

As AI tools continue to be adopted, retraining and redeploy workforces is imperative.

Vulnerability Index of Industries

AI's dual impact through workforce transformation and business model disruption is already bringing substantial changes to the business world. Its influence permeates many sectors, from software industries and media to agriculture and energy. The transformative potential of AI is not limited to any one field; rather, it represents a ubiquitous shift in how industries operate and innovate.

METHODOLOGY

We have derived an entirely new way to quantify AI's impact on multiple industries by measuring the vulnerability of these industries to the core principles of disruption that AI enables. Our vulnerability index considers two dimensions: the impact of AI on workforce productivity and the likelihood of business model disruption in an industry. We have hand-picked 21 sectors with the most economic activity to conduct this exercise.

DIMENSION 1: WORKFORCE PRODUCTIVITY IMPACT (WPI)

To estimate improvements in workforce productivity, we analyzed the composition of the workforce across the selected 21 industries, assessing the change in productivity of each component of their job profile due to AI (Exhibit D for reference). We also estimated each industry's automation efficiency, innovation enablement, and upskilling capabilities. Finally, the Workforce Productivity Impact was derived using the following method.

1. Data Collection: Gathering both historical and recent data on workforce productivity before and after AI adoption across a selection of tasks (Exhibit D for reference) in each industry based on the impact of critical tasks instead of complete job profiles.
2. Normalization: Adjusting the data to ensure consistency and comparability across different metrics and units.
3. Modeling: Using statistical models to understand the relationship between AI adoption and workforce productivity while accounting for other relevant factors.

4. Indexing: Assigning an index score to each industry based on the modeled impact of AI on workforce productivity

DIMENSION 2: BUSINESS MODEL DISRUPTION INDEX (BMDI)

We initially mapped out the value chain components in 21 selected industries to estimate the likelihood of business model disruption in an industry. Then, we analyzed where the most value is created in a particular industry and estimated the probability of disruption of that component due to changes in cost structures, value proposition, or competitive dynamics due to the advent of AI. For example, in the technology industry value chain, most value-add happens at the software layer, which is highly susceptible to disruption due to AI. This was further quantified and indexed following the below process -

1. Literature Review: Looking into past instances of business model disruption within similar technological shifts.
2. Expert Opinions: Gathering insights from industry experts on the potential business model disruption due to AI in each industry.
3. Consensus Building: Using methods like the Delphi Method to build consensus among experts on the likelihood of business model disruption.
4. Probabilistic Modeling: Employing models to quantify the likelihood of business model disruption, using both historical data and expert opinions.
5. Indexing: Assigning an index score to each industry based on the assessed probability of business model disruption.

VULNERABILITY INDEX DERIVATION AND VALIDATION:

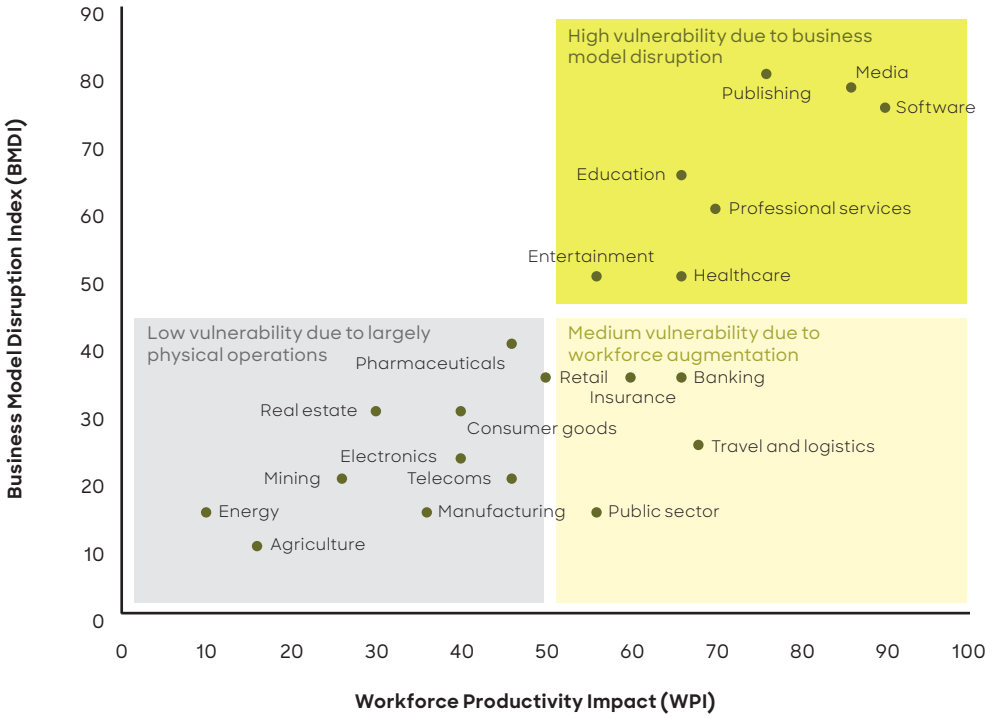
The calculation methodology for deriving the index from both dimensions is as follows:

1. Scoring Algorithm: Creating a scoring algorithm to combine the WPI and BMDI indices into a single Vulnerability Index for each industry.
2. Weighting: Determining the importance of each dimension in assessing overall vulnerability to AI and assigning weights accordingly.
3. Normalization: Adjusting the composite index scores to ensure a consistent scale across industries.
4. Plotting: Displaying the Vulnerability Index scores for each industry on a two-dimensional graph (Exhibit E), with one axis for WPI and the other for BMDI.
5. Validation: Checking the accuracy of the Vulnerability Index using past instances of technological disruption and comparing it with other models or indices.
6. Sensitivity Analysis: Assessing how changes in assumptions, data inputs, and methodological approaches affect the Vulnerability Index.

RESULTS

These dimensions when combined can be plotted across three distinct quadrants, each representing a varying degree of risk for relevant industries. ▶ E

E Relative vulnerability index of industries due to AI



Source: Roland Berger

A. HIGH-RISK QUADRANT

The High-Risk quadrant - where industries are at significant risk of business model and workforce disruption - is dominated by non-physical product and service industries such as software, media, education, and professional services.

AI's influence is particularly pronounced in the software industry, with workforce productivity increasing by an estimated 45%, given the industry's focus on engineering and design talent. AI is reshaping the development process in software companies, automating code generation, and improving debugging practices.

AI will also significantly impact SaaS (Software-as-a-Service) companies by empowering end-user enterprises to construct tailored software solutions without reliance on generic SaaS products. By combining Generative AI tools with their proprietary data, businesses can create applications tailored to their specific requirements, such as payroll or accounting. Consequently, traditional SaaS providers might witness a shift from selling pre-defined solutions to offering AI-driven development tools and platforms, thereby redefining the SaaS marketplace's paradigm. Generative AI will, therefore, kill many SaaS businesses while turbocharging others who can adapt and incorporate AI features and models.

In media and entertainment, algorithms can now recommend tailored content to consumers based on their viewing habits and preferences, improving viewer engagement and satisfaction. Furthermore, AI plays a growing role in content creation, from scriptwriting to visual effects, thus reducing production time and costs.

AI-driven content creation tools are also posing an existential threat to traditional publishing. With algorithms capable of creating credible news articles, op-eds, and even fictional stories, the conventional roles of writers and editors face serious challenges. Companies like OpenAI and Jasper AI offer solutions that can generate long-form content, fundamentally transforming the economics of the publishing industry. We can see this play out in real-time with 11,500 screenwriters from the Writers Guild of America (WGA) going on a strike demanding artificial intelligence tools, such as ChatGPT, to be used only for research or facilitating script ideas and not as a tool to replace them.

Even major publications like The New York Times are suing OpenAI and Microsoft for allegedly using their copyrighted content to train their LLMs without permission, claiming that this practice violates their exclusive rights and harms their business model, which relies on paywalls and subscriptions. Similarly, artists such as Sarah Silverman are taking legal action against OpenAI and Meta, asserting copyright infringement over the unauthorized use of their creative work in AI models. These cases demonstrate how Generative AI is already disrupting the business model in media and publishing and how desperate this industry is to fight back.

In Education, AI technologies like adaptive learning platforms and automated grading systems fundamentally alter the traditional educational landscape. Platforms like Coursera and edX employ AI algorithms to personalize learning paths and democratize education, allowing anyone with internet access to learn almost anything. These platforms undermine traditional educational institutions by offering quality, convenience, and scalability. AI also assists educators by automating administrative tasks such as grading, allowing them more time to focus on pedagogy and student interaction. Systems like automated proctoring during online exams also enhance the ability to scale educational services without a proportional increase in staffing.

Lastly, professional services such as legal research, document review, and even some aspects of legal advice are being automated and enhanced by AI. Platforms like Harvey use AI to sort through legal texts and case law, providing fast and accurate research that would have taken lawyers hours or even days to compile. This threatens many law firms' traditional hourly billing model and the conventional methods of delivering legal services. Tools like LegalSifter and ThoughtRiver offer contract analysis in a fraction of the time it would take a human lawyer, allowing legal professionals to focus more on strategy and client interaction. Similarly, AI-driven predictive analytics can give lawyers insights into how judges rule on cases or how lengthy litigation might take, enhancing legal strategy.

B. MEDIUM RISK QUADRANT

The Medium-Risk quadrant - where business model disruption risk is low, but workforce disruption risk is high - represents sectors like healthcare, travel and logistics, financial services, and the public sector, mainly B2C industries. AI is likely to impact workforce transformation, enhancing human capabilities, improving efficiency, and assisting in decision-making without entirely overhauling existing business models.

Healthcare presents a unique and nuanced scenario in the AI landscape. The industry exhibits a medium risk of business model disruption but has significant potential for workforce transformation, with an estimated 33% increase in workforce productivity. This means that while medicines, treatments, and therapies will continue as they always have, the way they are delivered may be impacted by AI. For example, AI has already begun

changing how healthcare providers diagnose, treat, and manage diseases. AI-driven algorithms can analyze complex medical data, predict patient outcomes, and suggest treatment paths. AI has become an indispensable tool, assisting healthcare professionals in diagnosing diseases with higher accuracy, personalizing treatment plans, and automating administrative tasks. AI-powered systems can sift through vast amounts of data, identify patterns, and provide insights that enhance human decision-making. AI can handle call centers, scheduling, prior authorization, medical coding, revenue cycle management, and even streamline insurance settlement.

AI is also reshaping financial services, particularly in trading, risk management, and customer service. Robo-advisors and fraud detection systems have transformed traditional practices. However, human expertise is still essential in areas such as ethics and compliance. AI-powered automation, such as JPMorgan's COIN system for interpreting commercial loan agreements, enables financial professionals to concentrate on more complex tasks, thus significantly transforming workforce efficiency.

AI is introducing new operational methods in the public sector, especially in service delivery and governance. However, unique challenges related to transparency and democratic values limit a complete disruption of existing models. However, AI-powered tools like chatbots for citizen queries and predictive models in healthcare administration are freeing human resources and enhancing efficiency, thus significantly transforming the public sector workforce.

C. LOW-RISK QUADRANT

Finally, the Low-Risk quadrant encapsulates industries focused on physical products and services, such as agriculture and energy, where AI's impact is confined mainly to physical operations, aiding in tasks like monitoring and maintenance. This integration might increase efficiency but may be fine with current business model paradigms or workforce structures.

While AI's potential to increase productivity and sustainability is often touted in agriculture, practical applications, and overall impact remain limited. Adopting precision agriculture and AI-driven robotics is promising, but high costs, complex technical requirements, and rural connectivity limitations create considerable hurdles. Implementing AI in agriculture also relies heavily on accurate data, which can be challenging due to variable factors such as weather conditions and crop diseases. Therefore, while AI might have its niche applications, the prospect of it revolutionizing agriculture in the short term is overstated.

Similarly, in the energy sector, the tangible benefits of AI have yet to be fully realized. While AI has the potential to optimize energy generation and consumption and aid in the transition to renewable energy, substantial barriers persist. Data privacy concerns, the need for significant infrastructure investments, and the complexity of integrating AI into existing energy systems limit the technology's practical utility. Moreover, while predictive maintenance and AI-driven analytics can theoretically enhance efficiency, these applications often require extensive, high-quality data, which can be challenging to obtain in the diverse and complex energy sector.

AI has unquestionably spurred significant advancements in software and media sectors, driving innovation and catalyzing transformation. However, the degree of AI's impact on more traditional sectors like agriculture and energy is nuanced and dependent on

overcoming considerable challenges. It is crucial to maintain a balanced perspective, recognizing the technology's potential while acknowledging its limitations and the complexities of practical implementation.

3 Conclusion

Understanding the quantitative vulnerability index is more than just an academic exercise in today's business landscape. Instead, it indicates AI's challenges and opportunities, tailor-made for different industries.

For those in software and media, where AI will be highly disruptive, the path forward requires an immediate awareness of the competitive landscape and a clear product strategy that enables a sustainable competitive advantage, much like Adobe has done with Firefly.

In healthcare, travel, financial services, and the public sector, organizations may still need to see significant business model disruption but are soon likely to see the adoption of AI tools by their workforce as a hygiene factor. For example, AI-augmented customer service may quickly result in better service at significantly lower cost, which could have a material impact on banks and insurance companies.

As for agriculture and energy, the AI story is still unfolding. The risks might seem remote, but the potential benefits are there for those willing to tackle the technical and financial hurdles.

The takeaway for executives across these diverse fields is clear: proactive planning and strategic thinking are essential. Embracing AI isn't about chasing the latest trends but aligning them with the specific needs and goals of the business. It is a nuanced process that requires careful consideration and execution, with an eye to both the present needs and future possibilities.

In a world where AI's impact is ever-growing, successful companies will approach it with caution and curiosity, mindful of the risks but also alive to the opportunities. It's not a tale of upheaval but a narrative of steady progress and thoughtful integration. That's the challenge and the promise of doing business in the age of AI.

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