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GLOBAL AI BENCHMARKING STUDY

Understanding the Global AI Industry

January 2024



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Global AI Benchmarking Study



Foreword

The world of technology is transforming before our eyes. Artificial intelligence (“AI”) is creating new paradigms for economic activity and forging alternative conduits of value creation. AI & Partners, since its founding in 2021, has been at the forefront of documenting, analysing and indeed critically challenging that technological transformation.

This Global AI Benchmarking Study is our inaugural research focused on AI. Led by Sean Musch and Michael Borrelli, it is the first study of its kind to holistically examine the burgeoning global AI industry and its key constituents, which include AI Services, AI Products, AI Infrastructure, AI Adopters, and AI Ancillary.

The findings are both striking and thought-provoking. First, the user adoption of AI has really taken off, with billions in investment and thousands of companies estimated by 2023. Second, the AI industry is both globalised and localised, with borderless operations, as well as geographically clustered infrastructure activities. Third, the industry is becoming more fluid, as the lines between services and products are increasingly ‘blurred’ and a multitude of AI types, not just generative AI, are now supported by a growing ecosystem, fulfilling an array of functions. Fourth, issues of privacy and regulatory compliance are likely to remain prevalent for years to come.

We hope this study will provide value to academics, practitioners, policymakers and regulators alike.

Michael Charles Borrelli, and Sean Donald John Musch

Co-CEO/COO, Co-CEO/CFO

AI & Partners

January 2024





Methodology and Report Structure

Methodology

AI & Partners carried out extensive research from March 2021 to October 2023 via recognised online research studies, industry and academic. Each dataset examined was focused on organisations and individuals operating in a specific sector of the AI industry as defined by our taxonomy (specifically AI Services, AI Products, AI Infrastructure, AI Adopters, and AI Ancillary). All research reports were written and distributed in English.

The team reviewed data relating to AI companies across the globe. Over one hundred AI companies and organisations. During the research process, the team communicated directly with external persons, explaining the study's objectives. For cases in which currently active major companies did not contribute to our study, the dataset was supplemented with additional research and web scraping using commonly applied methodologies.

The collected data was encrypted and safely stored, accessible only to the authors of this study. All individual company-specific data was anonymised and analysed in aggregate by industry sector, type of activity, organisation size, region and country. We estimate that our benchmarking study captured between 15% - 20% of the four AI industry sectors covered in this report.

Report Structure

The remainder of this report is structured as follows:

- **Setting the Scene** provides a global overview of AI, introduces the industry and its key constituents, and discusses AI usage and activity.
- The **AI Services** section presents an overview of the **AI Services** sector and the different types of activities.
- The **AI Products** section explores the different types of products.
- The **AI Infrastructure** section provides an overview of the AI infrastructure sector and the different types of components.
- The **AI Adopters** section describes the different types of adopters.
- The **AI Ancillary** section describes the ancillary services and the different types of services.
- **Appendix A:** Brief introduction to AI highlights the general concept of AI and presents their key properties and value propositions.
- **Appendix B:** The AI industry offers a more detailed introduction to the emergence of the AI industry.
- **Appendix C:** The geographical dispersion of AI users discusses the geographical dispersion of AI users and activity.
- **References and Endnotes** provide information on where outside information was gathered and further explanation of how some figures were calculated (e.g., employee figures by sector).



Glossary

Artificial Intelligence (AI): AI refers to the development of computer systems and algorithms that can perform tasks traditionally requiring human intelligence, such as problem solving, learning, and decision making.

Machine Learning: Machine learning is a subset of AI that focuses on the development of algorithms that enable computers to learn from data and make predictions or decisions without explicit programming.

Deep Learning: Deep learning is a subfield of machine learning that utilizes neural networks with many layers (deep neural networks) to process and analyze data, especially suited for tasks like image and speech recognition.

Neural Network: A neural network is a computational model inspired by the human brain's structure, consisting of interconnected nodes (neurons) used in deep learning to process information and make predictions.

Natural Language Processing (NLP): NLP is a branch of AI that focuses on enabling computers to understand, interpret, and generate human language, facilitating tasks such as language translation and sentiment analysis.

Reinforcement Learning: Reinforcement learning is a machine learning paradigm where an agent learns to make a sequence of decisions by interacting with an environment and receiving rewards or penalties based on its actions.

Computer Vision: Computer vision is the field of AI that enables machines to interpret and understand visual information from images or videos, often used in applications like object recognition and autonomous vehicles.

Algorithm: An algorithm is a step-by-step set of instructions or rules designed to solve a specific problem or perform a specific task in AI, guiding the processing of data and making decisions.

Data Mining: Data mining is the process of discovering patterns, trends, and insights from large datasets using various techniques and algorithms, which is often used for knowledge discovery in AI applications.

Natural Intelligence: Natural intelligence refers to the cognitive capabilities of humans and animals that AI aims to simulate or replicate in computer systems, such as reasoning, learning, and problem solving.

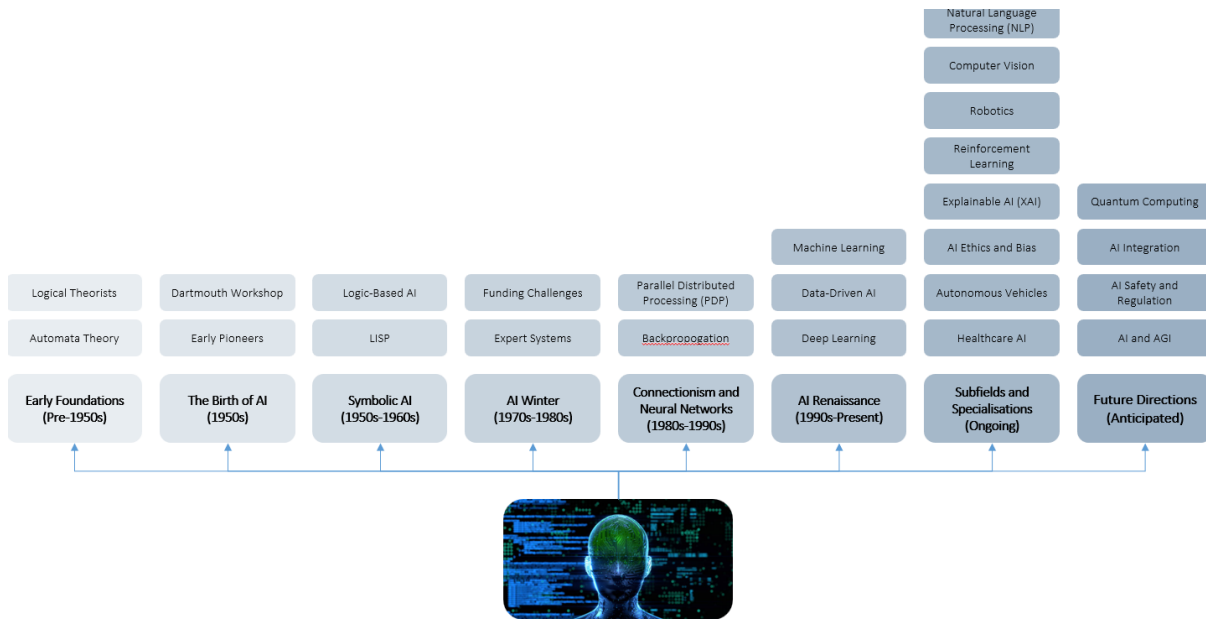


Section 1: Setting the Scene

Global Overview of Artificial Intelligence

Artificial Intelligence (AI) is reshaping industries and transforming the way we live and work. This article delves into the multifaceted world of AI, introducing its key constituents, exploring its widespread applications, and examining its global impact.

Figure 1: Artificial Intelligence’s Genealogical Tree¹



Understanding AI

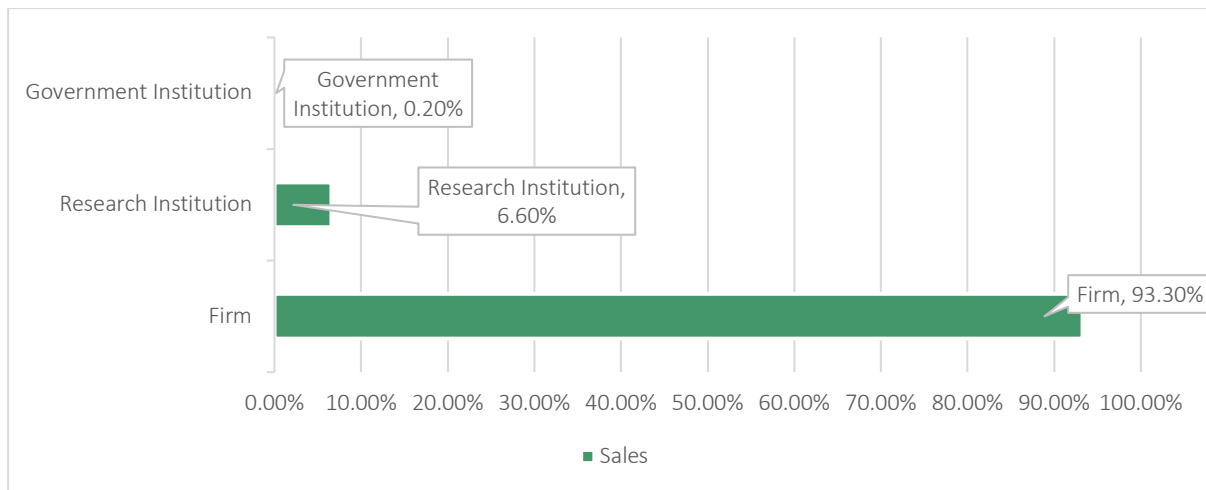
AI is a branch of computer science that aims to create systems capable of performing tasks that typically require human intelligence. These tasks include problem-solving, learning, decision-making, and understanding natural language.

Key Constituents of the AI Industry

1. **Researchers and Academia:** AI development is driven by the brilliant minds in research institutions and universities worldwide. These individuals push the boundaries of AI capabilities.
2. **Tech Giants:** Companies like Google, Amazon, Facebook, Apple, and Microsoft are at the forefront of AI. They invest heavily in AI research and development and integrate AI into their products and services.
3. **Startups and Innovators:** A thriving ecosystem of AI startups is constantly innovating. These companies focus on specific AI applications, from healthcare to autonomous vehicles.
4. **Governments and Regulation:** Governments play a crucial role in AI development, setting policies, regulations, and funding initiatives that shape the industry.



Figure 2: AI Players by Organisation Typeⁱⁱ



AI in Action

AI is more than just a buzzword; it's a technology that's changing the world. Here are some of the key areas where AI is making a significant impact:

Finance:

AI is used for fraud detection, algorithmic trading, and customer service chatbots. It optimizes financial processes and enhances security.

Financial institutions are expanding AI to improve customer experiences and back-office processes. The industry is expected to spend over US\$10 billion in 2023ⁱⁱⁱ.

Manufacturing:

AI-driven robotics and automation improve efficiency and quality control in manufacturing processes.

Manufacturing is expected to spend over US\$8 billion in AI in 2023. Manufacturers are cutting downtime, ensuring high-quality products, and improving operational efficiency. AI offers actionable insights into each level of design and manufacturing. Through predictive learning, AI identifies product or equipment failures well in advance. This helps reduce idle time and improves productivity. Computer vision AI and machine learning tools are bringing revolutionary changes for quality assessmentsⁱⁱⁱ.

Other

Retailⁱⁱⁱ

- Automated customer service agents
- Expert shopping advisors and product recommendations
- Price optimisation
- Cashless checkout
- Supply and logistics, fleet management



Federal Governmentⁱⁱⁱ

- Intelligent case management of application and delivery of benefits
- Intelligence systems: defence, terrorism, investigations
- Urban, transportation, or environmental monitoring and planning

Insuranceⁱⁱⁱ

- Program advisors and recommendation systems
- Smart business innovation and automation
- Automated claims processing
- Financial crime management

Life Sciencesⁱⁱⁱ

- Clinical trial management and recruitment
- Pricing and revenue management
- Drug discovery
- Automated human resources

Educationⁱⁱⁱ

- Adaptive learning
- Student engagement tracking and analysis
- Financial aid management and compliance

Telecommunicationsⁱⁱⁱ

- Automated threat intelligence and prevention systems
- Smart networking
- Automated customer service agents

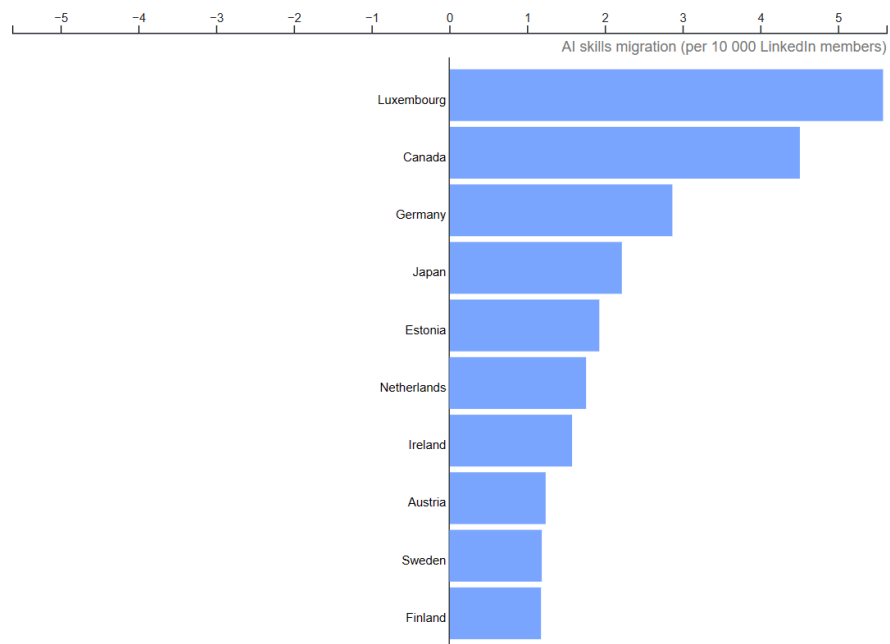
Global Impact of AI

AI is not just a technological advancement; it's a societal shift. It raises questions about ethics, employment, and privacy. Policymakers worldwide are grappling with how to regulate AI while promoting innovation.





Figure 3: Between-country AI Skills Migration^{iv}



Conclusion

Artificial Intelligence is not a future concept; it's a present reality with profound implications for society and industries worldwide. Understanding its key constituents and its global reach is crucial in navigating this AI-driven world.



AI Services Sector



Section 2: AI Services Sector

The field of Artificial Intelligence (AI) is experiencing a seismic shift, with organizations across the globe recognizing its transformative potential. In this article, we will explore the AI services sector, which plays a pivotal role in helping businesses harness the power of AI. We will delve into the different types of activities within this sector, including AI services, deployment support, and advisory services.

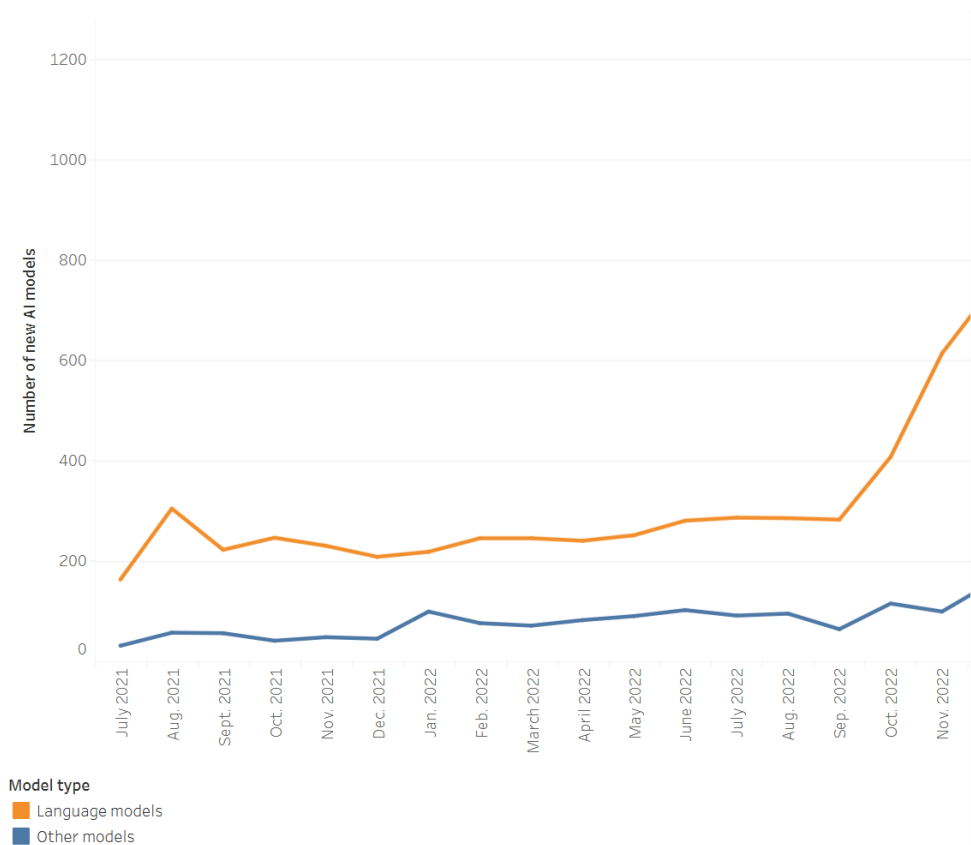
AI Services: Powering Innovation

AI services encompass a wide range of solutions offered by companies specializing in artificial intelligence. These services are the driving force behind the AI revolution, assisting organizations in various ways:

- **AI Consulting:** AI consulting firms provide expert guidance to businesses, helping them identify AI opportunities, develop AI strategies, and navigate the complexities of AI integration. They assess an organization's unique needs and design AI roadmaps.
- **Custom AI Software Development:** Tailored AI software solutions are developed to address specific business challenges. These solutions can range from chatbots and virtual assistants to complex predictive analytics tools.
- **Machine Learning Model Development:** This involves creating and fine-tuning machine learning models to analyze data, make predictions, and automate tasks. Machine learning experts are in high demand in this era of data-driven decision-making.
- **AI Strategy Implementation:** AI strategy firms work with organizations to translate AI visions into actionable plans. They help set up AI infrastructure, data pipelines, and workflows, ensuring that AI strategies align with business objectives.



Figure 4: Evolution of New AI Models from Hugging Face^{iv}



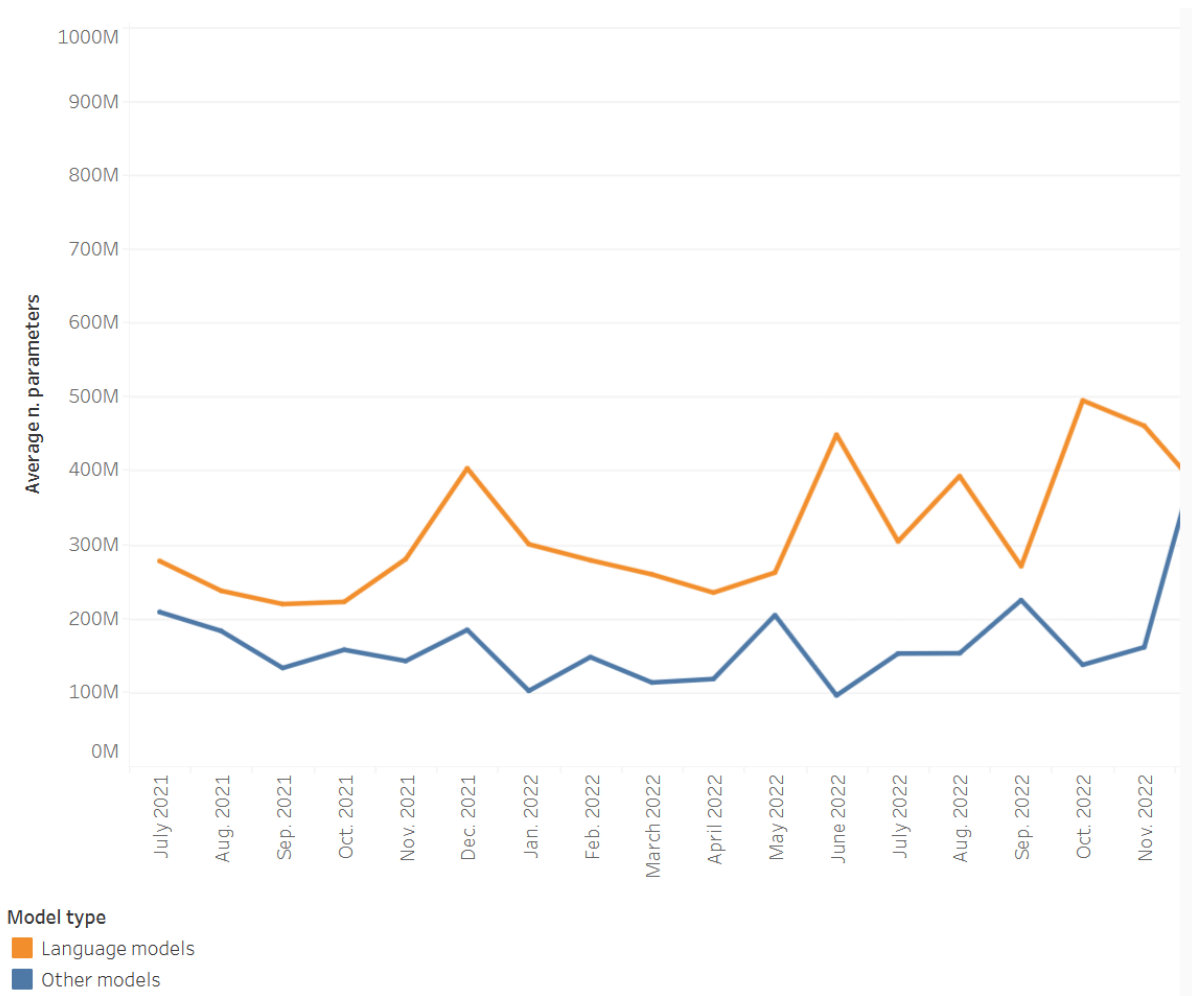
Deployment Support: Bridging the Gap

AI's true potential lies in its effective implementation within an organization's existing infrastructure. Deployment support services bridge this gap:

- **AI System Configuration:** Deploying AI solutions often requires intricate configurations. Deployment support experts configure AI systems to ensure they operate efficiently and effectively.
- **Performance Optimization:** Once deployed, AI systems need constant monitoring and optimization to perform at their best. This involves fine-tuning algorithms, improving accuracy, and reducing errors.
- **Seamless Integration:** Integration of AI solutions into an organization's environment is vital. Deployment support professionals ensure that AI systems work seamlessly with existing software, databases, and hardware.
- **User Training and Support:** Ensuring that employees can effectively use AI tools is crucial. Deployment support services provide training and ongoing support to end-users.



Figure 5: Average Number of Parameters of New AI Models from Hugging Face^{iv}



Advisory Services: Guiding the Way

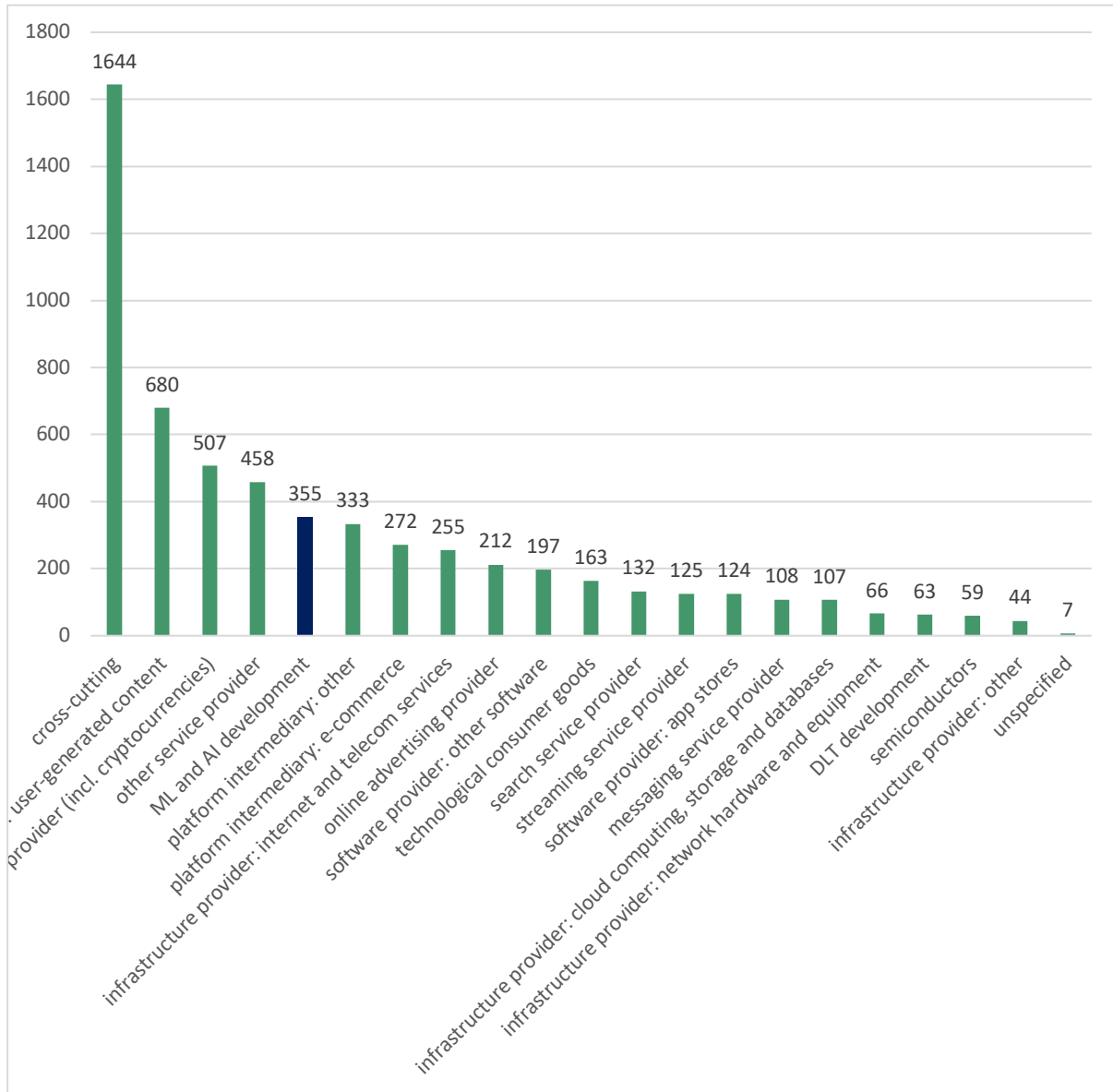
Navigating the AI landscape can be complex, especially when considering strategic planning, risk assessment, and compliance. Advisory services are indispensable:

- **AI Strategy Development:** Advisory firms help organizations craft AI strategies aligned with their business goals. They provide insights into which AI applications to prioritize and how to implement them effectively.
- **Risk Assessment:** AI adoption comes with its set of risks, including data privacy, bias, and security. Advisors assess these risks and propose mitigation strategies.
- **Regulatory Compliance:** As governments worldwide introduce AI-related regulations, businesses must stay compliant. Advisory services keep organizations updated on legal requirements and ensure that AI projects adhere to industry standards and regulations.



- Business Objectives Alignment:** AI should serve a purpose and contribute to an organization's objectives. Advisors ensure that AI initiatives are not just technologically sound but also strategically valuable.

Figure 6: Number of Policy Changes^v



The Evolving Landscape

The AI services sector is constantly evolving, driven by advancements in AI technology and the ever-increasing demand for AI solutions. As organizations across industries recognize the potential for AI to improve operations, make data-driven decisions, and foster innovation, the demand for AI services continues to grow.



Key Players in AI Services

Several key players dominate the AI services sector, including:

- **Tech Giants:** Companies like IBM, Google, and Microsoft offer comprehensive AI services, from consulting to software development.
- **Specialized AI Firms:** Startups and specialized AI firms focus on niche areas, providing expertise in specific applications, such as healthcare or autonomous vehicles.
- **Consulting Firms:** Renowned consulting firms, like Deloitte and Accenture, have established dedicated AI practices to guide their clients in AI adoption.

EY estimate that potential disruption has started to become visible, given the following assessments^{vi}:

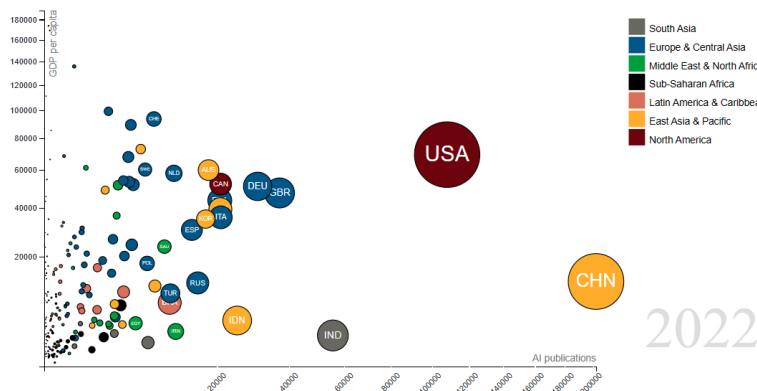
- **50%** time reduction for accountants, auditors, and tax preparers on most tasks – UPenn
- **44%** time saving in professional writing tasks - MIT
- **55%** reduction in programming time - Microsoft

Global Impact of AI Services

The impact of AI services is felt globally, with different regions contributing to its development in unique ways:

- **North America:** Silicon Valley remains a global hub for AI innovation, home to major tech companies and startups that offer AI services.
- **Europe:** The European Union is actively investing in AI research and development, emphasizing ethical AI practices and regulations.

Figure 7: AI research publications vs GDP per capita by country, region, in time^{iv}



Conclusion

The AI services sector is a linchpin in the AI revolution, facilitating the integration and utilization of artificial intelligence in businesses across the world. AI services, deployment support, and advisory services collectively ensure that AI initiatives are not only technologically sound but also strategically valuable, compliant with regulations, and aligned with business goals. The growth of this sector underscores the transformative potential of AI in shaping our future.



AI Products Sector



Section 3: AI Products Sector

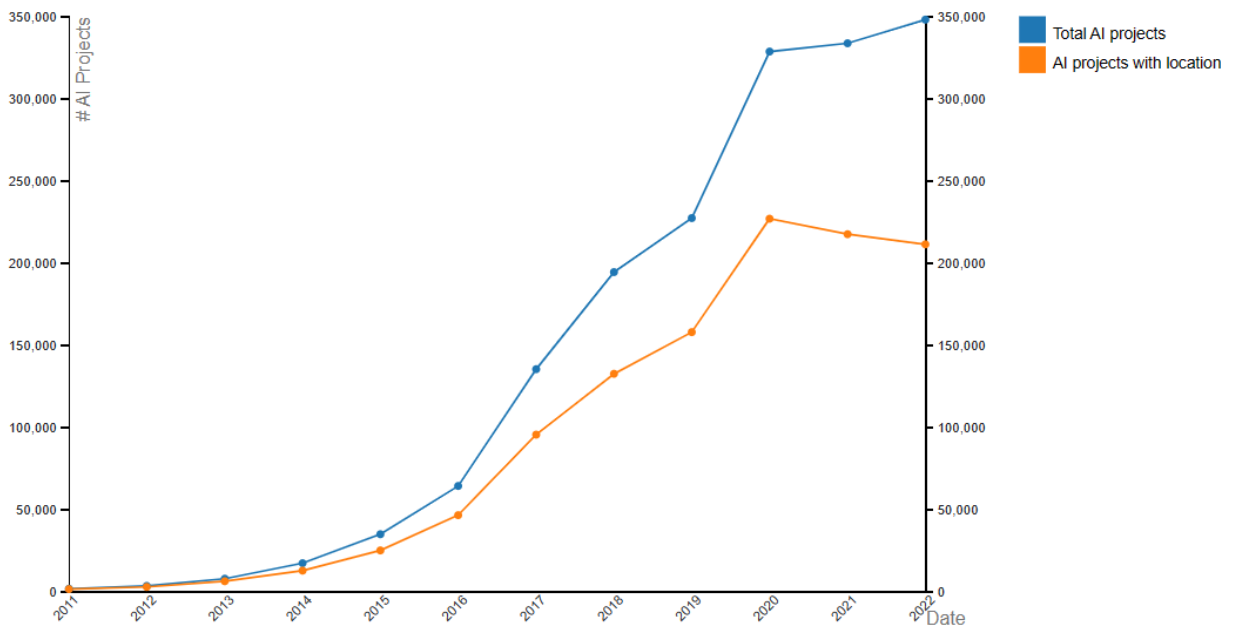
The AI revolution is marked not only by groundbreaking research and development but also by tangible, real-world applications. In this article, we'll delve into the AI products sector, exploring the different types of AI-based solutions that are transforming businesses and industries. We'll focus on AI products, vertical solutions (in-company and in-market), and horizontal solutions.

AI Products: Turning Ideas into Reality

AI products are tangible AI-based solutions and software offerings designed to address specific business or consumer needs. These products leverage the power of artificial intelligence, utilizing machine learning and deep learning algorithms to automate tasks, provide recommendations, and enhance user experiences. Examples include:

- **AI-Powered Applications:** These applications use AI algorithms to improve user experiences. Think of personalized content recommendations on streaming platforms or AI-driven photo enhancement in photography apps.
- **Chatbots and Virtual Assistants:** AI-driven chatbots and virtual assistants are transforming customer service and support, providing instant responses and assistance to users.
- **Automation Tools:** Many businesses use AI products to automate repetitive tasks, from data entry to customer interactions.
- **AI in Healthcare:** AI products help healthcare professionals with diagnostics, drug discovery, and patient care, such as AI-powered medical imaging.

Figure 8: Public AI Projects Worldwide Over Time^{iv}

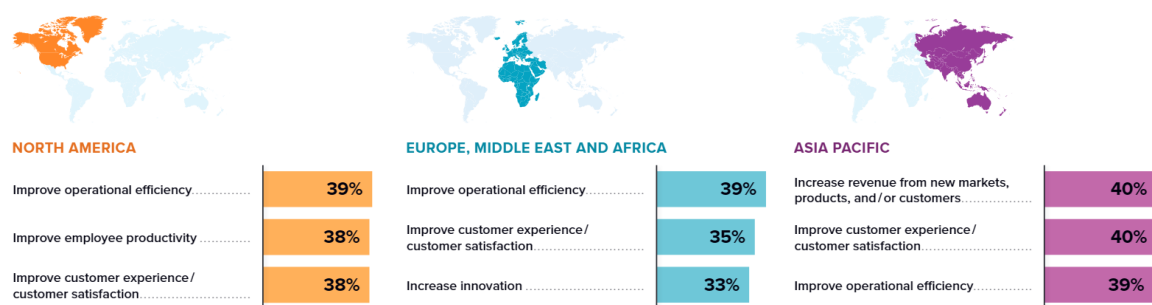


Vertical Solutions (In-Company): Tailoring for Efficiency

Vertical solutions in-company refer to AI software and applications specifically designed to address the unique needs of a particular industry or business within a company. These solutions are customized to enhance in-house operations, streamline processes, and improve decision-making. They are created to meet the specific requirements of an organization or sector, such as healthcare, finance, or manufacturing, and are primarily used internally. Examples include:

- **Manufacturing Optimization:** AI solutions for manufacturing help automate processes, monitor equipment, and enhance quality control.
- **Financial Forecasting:** Banks and financial institutions use AI tools to predict market trends and make data-driven decisions.
- **Healthcare Management:** Hospitals and healthcare providers employ AI systems for patient records, scheduling, and resource allocation.
- **Retail Inventory Management:** AI-driven systems help retailers optimize inventory levels, reducing costs and ensuring products are available when needed.

Figure 9: Primary Business Goals for Using AI in Projectsⁱⁱⁱ



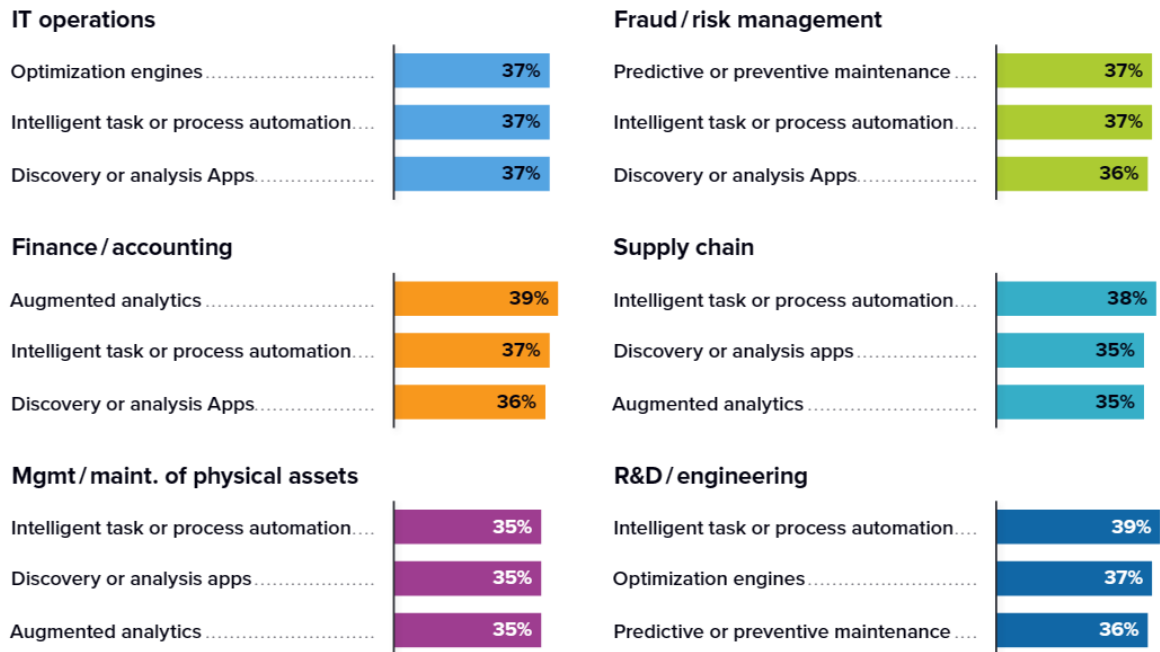
Vertical Solutions (In-Market): Targeting Industries

In-market vertical solutions are AI software and applications designed for specific industries or sectors and made available to a broader market. These commercial products are marketed to a range of businesses within that industry to help them enhance operations, customer experiences, and competitiveness. Examples include:

- **Retail Analytics:** AI solutions for the retail sector offer insights into customer behavior, helping businesses tailor marketing and inventory strategies.
- **Telemedicine Platforms:** Telemedicine services utilize AI to connect healthcare professionals with patients, offering remote diagnosis and treatment options.
- **Smart Cities:** AI solutions for smart cities improve traffic management, energy efficiency, and public safety.
- **Agricultural Technology:** AI-based tools assist farmers with crop management, optimizing yields and resource use.



Figure 10: % Respondents Working on Use Casesⁱⁱⁱ



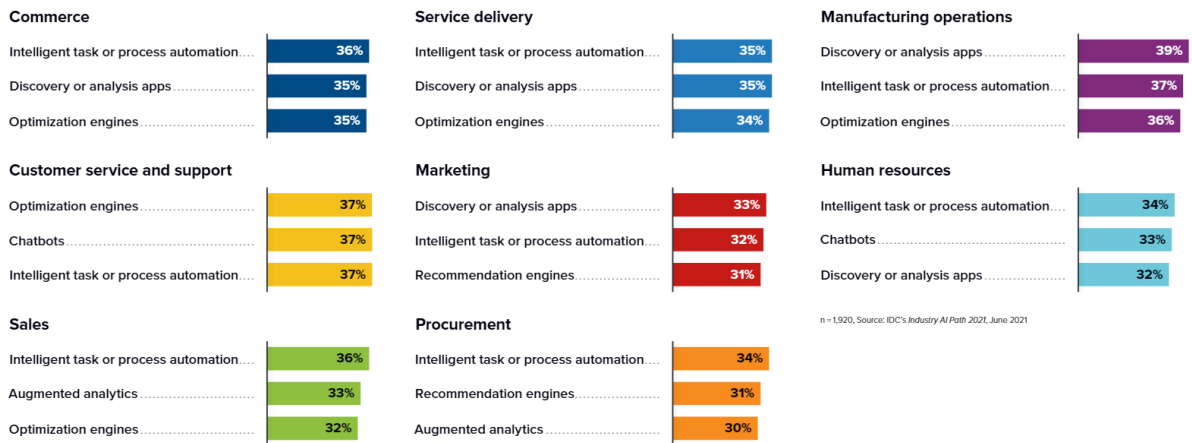
Horizontal Solutions: Widely Applicable AI

Horizontal solutions refer to AI products and applications that are broadly applicable across industries. They are versatile tools that can be customized to suit various business needs, from customer service to data analytics. Examples include:

- **Customer Relationship Management (CRM) Software:** AI-powered CRM systems help businesses manage customer interactions, sales, and marketing.
- **Data Analytics Platforms:** AI-driven data analytics tools are used in diverse industries to extract insights from vast data sets.
- **Natural Language Processing (NLP) Libraries:** NLP libraries are used for language understanding and text analysis in various applications, including chatbots and sentiment analysis.
- **AI-Enhanced Cybersecurity:** AI is applied to cybersecurity to identify and mitigate threats in real-time.



Figure 11: % Respondents Working on Use Casesⁱⁱⁱ



The Impact of AI Products

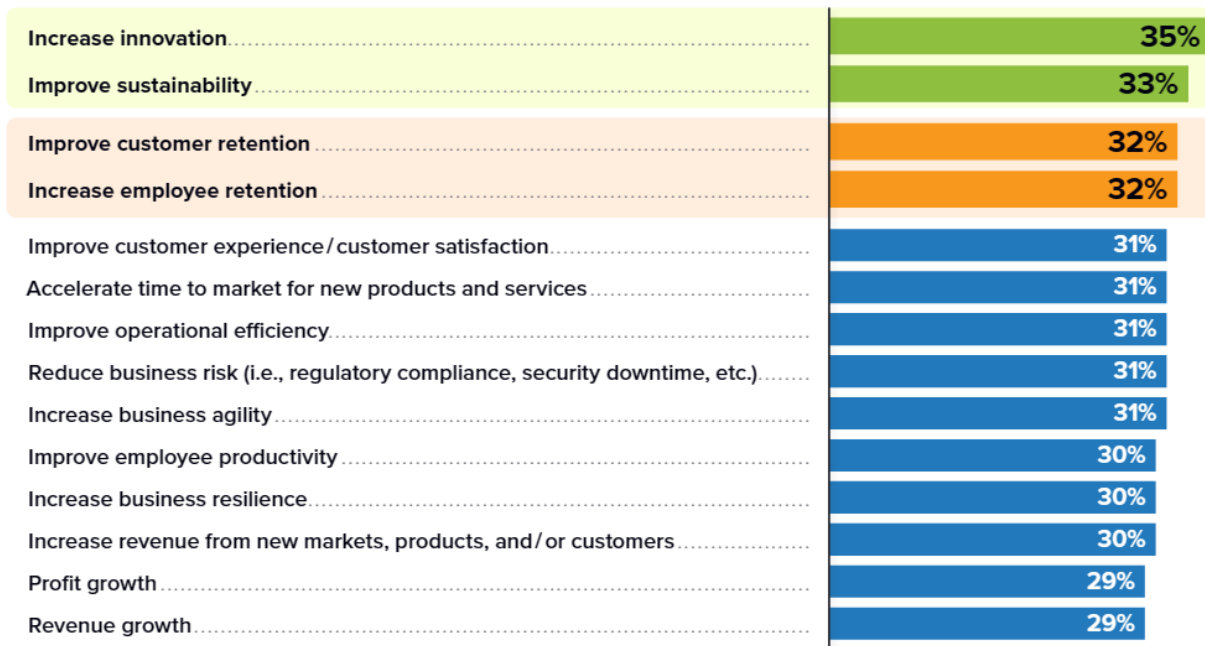
The AI products sector is instrumental in bringing AI out of research labs and into our everyday lives. These products and solutions have a far-reaching impact on industries and society, including:

- **Enhanced Efficiency:** Businesses become more efficient through automation and improved decision-making, thanks to AI products.
- **Personalization:** AI products provide personalized experiences, from content recommendations to tailored healthcare solutions.
- **Industry Transformation:** In-market vertical solutions drive industry transformation, such as the evolution of the retail experience.
- **Versatile Applications:** Horizontal solutions adapt to various business needs, ensuring AI's applicability in diverse domains.

Figure 12: % Improvement Due to AI Investmentⁱⁱⁱ



Improvements Attributed to AI (global responses)



Key Players in AI Products

The AI products sector is diverse, with various companies leading in different niches. Key players include:

- **Tech Giants:** Companies like Google, Amazon, and Microsoft offer a wide range of AI products and solutions for businesses.
- **AI Startups:** Innovative startups focus on niche AI applications, from healthcare to e-commerce, introducing new products to the market.
- **Industry-Specific Providers:** Some companies specialize in creating AI products exclusively for specific industries, tailoring solutions to meet unique needs.

Global Reach of AI Products

AI products are not confined to a single region; their impact is global. Different regions contribute to AI product development in unique ways:

- **North America:** The United States, particularly Silicon Valley, remains a global hub for AI product innovation.
- **Europe:** European countries emphasize ethical AI practices and regulations, influencing AI product development.
- **Asia:** Asian countries, led by China, are aggressively pursuing AI innovation and have a growing market for AI products.

Figure 13: Overview of Regulatory Environment in Europe^{vii}

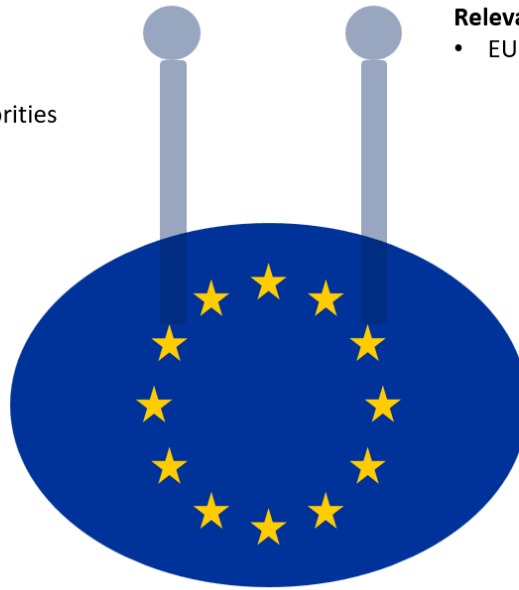


Responsible Regulatory Authorities

- Proposed Future EU AI Board
- Member State AI Authorities
- Member State Data Protection Authorities

Relevant Regulations

- EU AI Act (draft)



Conclusion

The AI products sector represents the bridge between AI research and real-world applications. AI products, vertical solutions, and horizontal solutions are transforming businesses, enhancing efficiency, and shaping industries. As AI continues to evolve, the role of AI products in driving innovation and improving our daily lives will only become more significant.



AI Infrastructure Sector



Section 4: AI Infrastructure Sector

In the world of artificial intelligence, infrastructure is the unsung hero that powers the incredible advancements we witness today. This article explores the AI infrastructure sector, which provides the foundational technology, hardware, software, and platforms essential for the efficient processing and deployment of AI models. We'll discuss the different types of components in this sector, including AI infrastructure, AI framework, software & platform providers, and AI hardware.

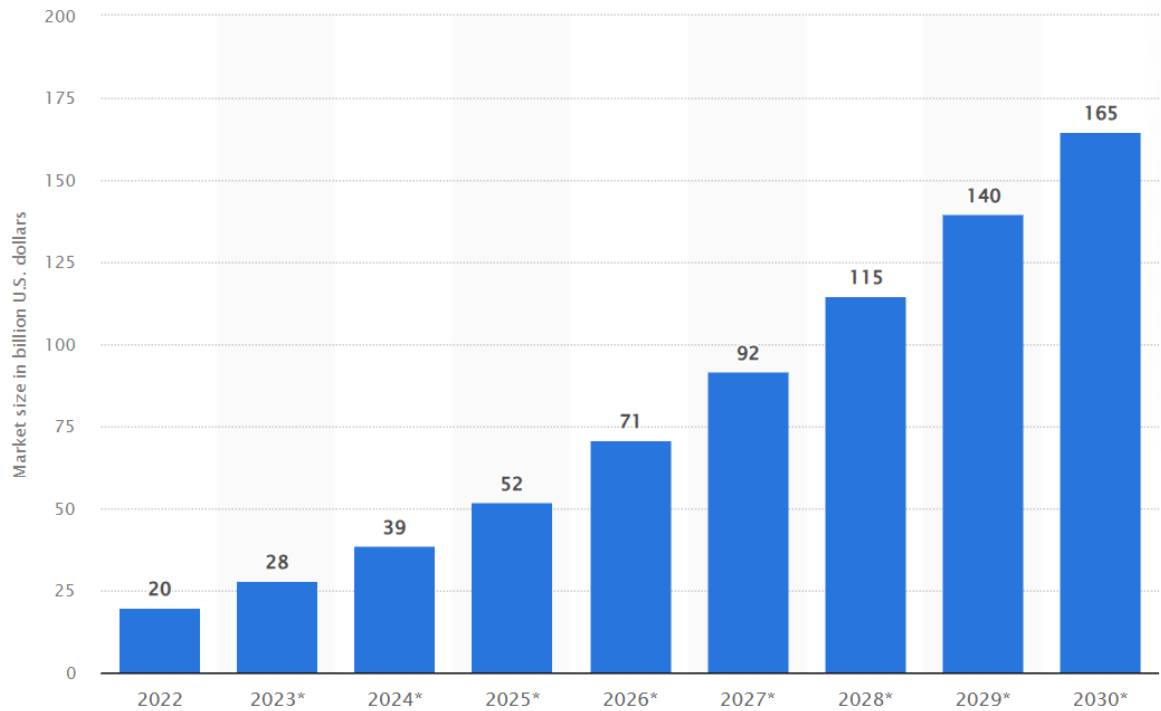
AI Infrastructure: The Bedrock of AI

AI infrastructure encompasses the foundational technology and hardware required to support AI operations. It plays a pivotal role in enabling the processing and deployment of AI models. Key components include:

- **Graphics Processing Units (GPUs):** GPUs are designed to handle the complex computations required by AI models. They accelerate training and inference processes, making AI models faster and more efficient.
- **AI-Optimized Cloud Computing Platforms:** Cloud providers offer specialized AI-optimized infrastructure, allowing organizations to leverage AI capabilities without the need for significant hardware investments.
- **Data Storage Solutions for AI Workloads:** AI generates vast amounts of data. Specialized data storage solutions are designed to handle the unique requirements of AI workloads, ensuring quick access to data for model training and inference.



Figure 14: Artificial intelligence chip market revenue from 2022 to 2030^{viii}



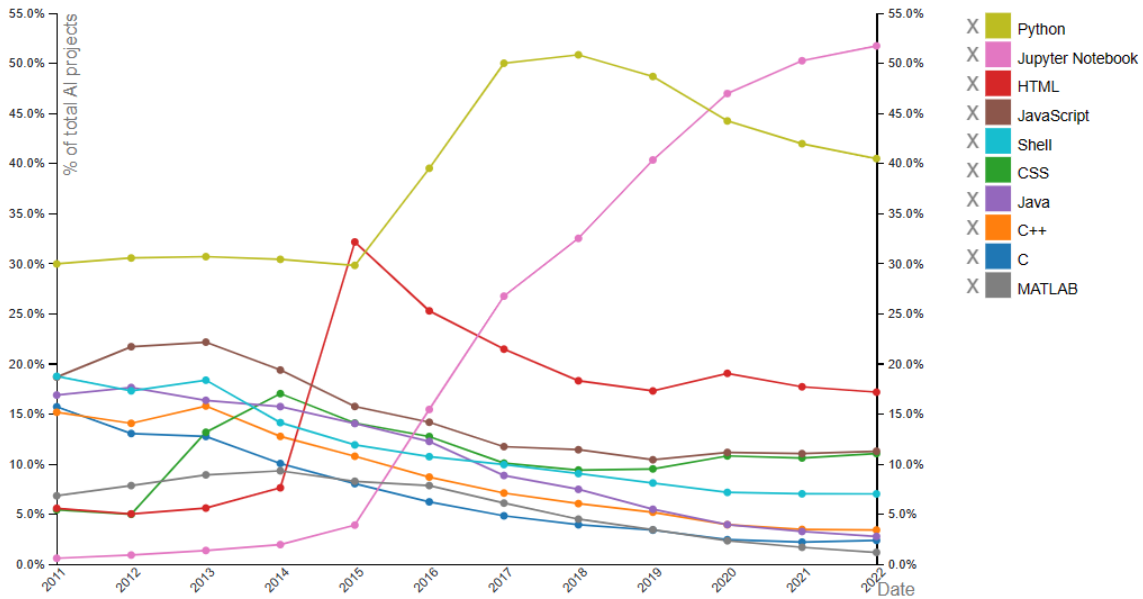
AI Framework, Software & Platform Providers: The Builders

These companies and providers are the architects of AI development, offering the essential building blocks for AI projects. They provide software libraries, machine learning frameworks, and AI development platforms that enable businesses and developers to create, train, and deploy AI models efficiently. Key aspects include:

- **Machine Learning Frameworks:** TensorFlow, PyTorch, and scikit-learn are examples of machine learning frameworks that simplify the development of AI models.
- **AI Development Platforms:** Platforms like Azure ML, AWS SageMaker, and Google AI Platform offer integrated environments for developing, training, and deploying AI models.
- **Software Libraries:** Libraries like Keras and Theano provide tools for building neural networks and deep learning models.
- **AI Development Tools:** These tools simplify the development process, including integrated development environments (IDEs), version control systems, and model deployment solutions.



Figure 15: Public AI Projects by Programming Language or Development Tool^{iv}



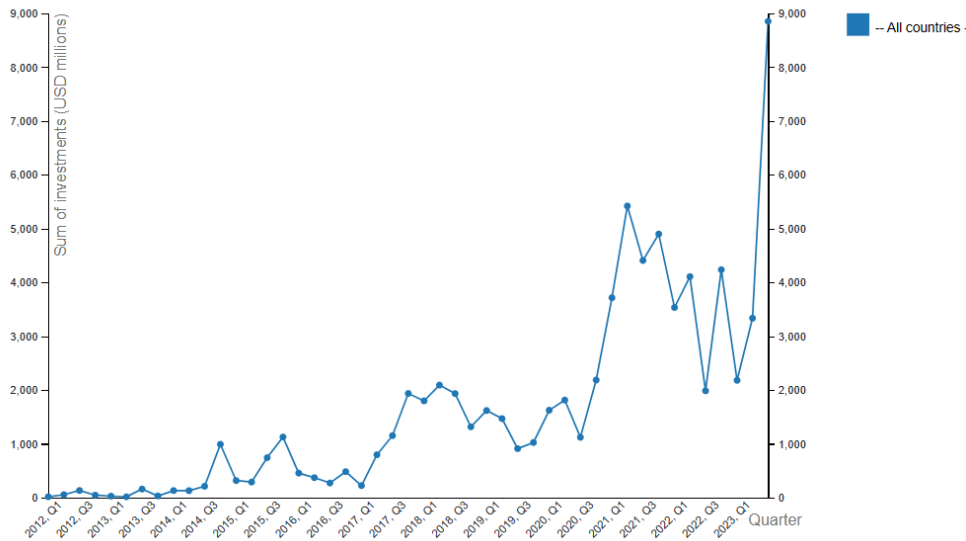
AI Hardware: The Muscle Behind AI

AI hardware refers to the physical components and devices explicitly designed to support AI workloads. These components are engineered to accelerate AI model training and inference, making AI processes faster and more energy-efficient. Key elements include:

- **Graphics Processing Units (GPUs):** GPUs play a dual role, serving as both AI infrastructure components and AI hardware. They are optimized for parallel processing and are crucial for training deep neural networks.
- **Tensor Processing Units (TPUs):** Developed by Google, TPUs are specialized AI hardware designed for deep learning tasks, offering superior performance in specific AI workloads.
- **AI-Optimized Processors:** Companies like NVIDIA, Intel, and AMD design processors tailored for AI tasks, enhancing speed and efficiency.



Figure 16: Worldwide VC Investments in AI Compute^{iv}



The AI Infrastructure Ecosystem

The AI infrastructure sector is an interconnected ecosystem, where each component and provider plays a critical role in supporting AI development and deployment. AI infrastructure paves the way for innovation and facilitates AI adoption across various industries.

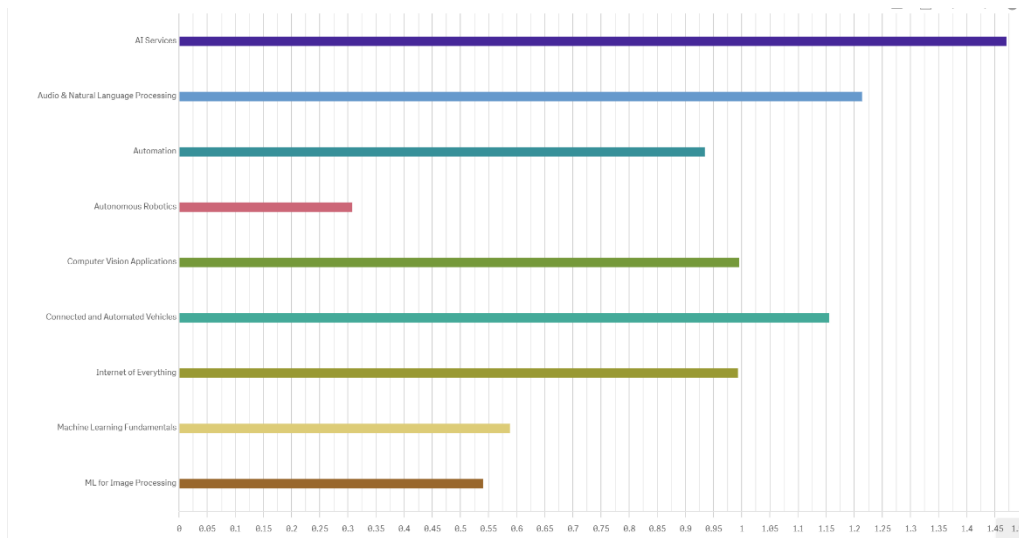
Key Players in AI Infrastructure

Several prominent companies and organizations are at the forefront of AI infrastructure:

- **NVIDIA:** Known for its powerful GPUs, NVIDIA is a leader in AI hardware, providing the foundation for many AI applications.
- **Amazon Web Services (AWS):** AWS offers AI-optimized cloud computing platforms and infrastructure for businesses and developers.
- **Google Cloud:** Google Cloud's AI infrastructure includes TPUs and a wide range of AI services.
- **Intel:** Intel's processors and hardware solutions contribute to AI hardware and infrastructure, supporting AI applications across industries.



Figure 17: Revealed Comparative Advantage (*) by Thematic Area (Global)ⁱⁱ



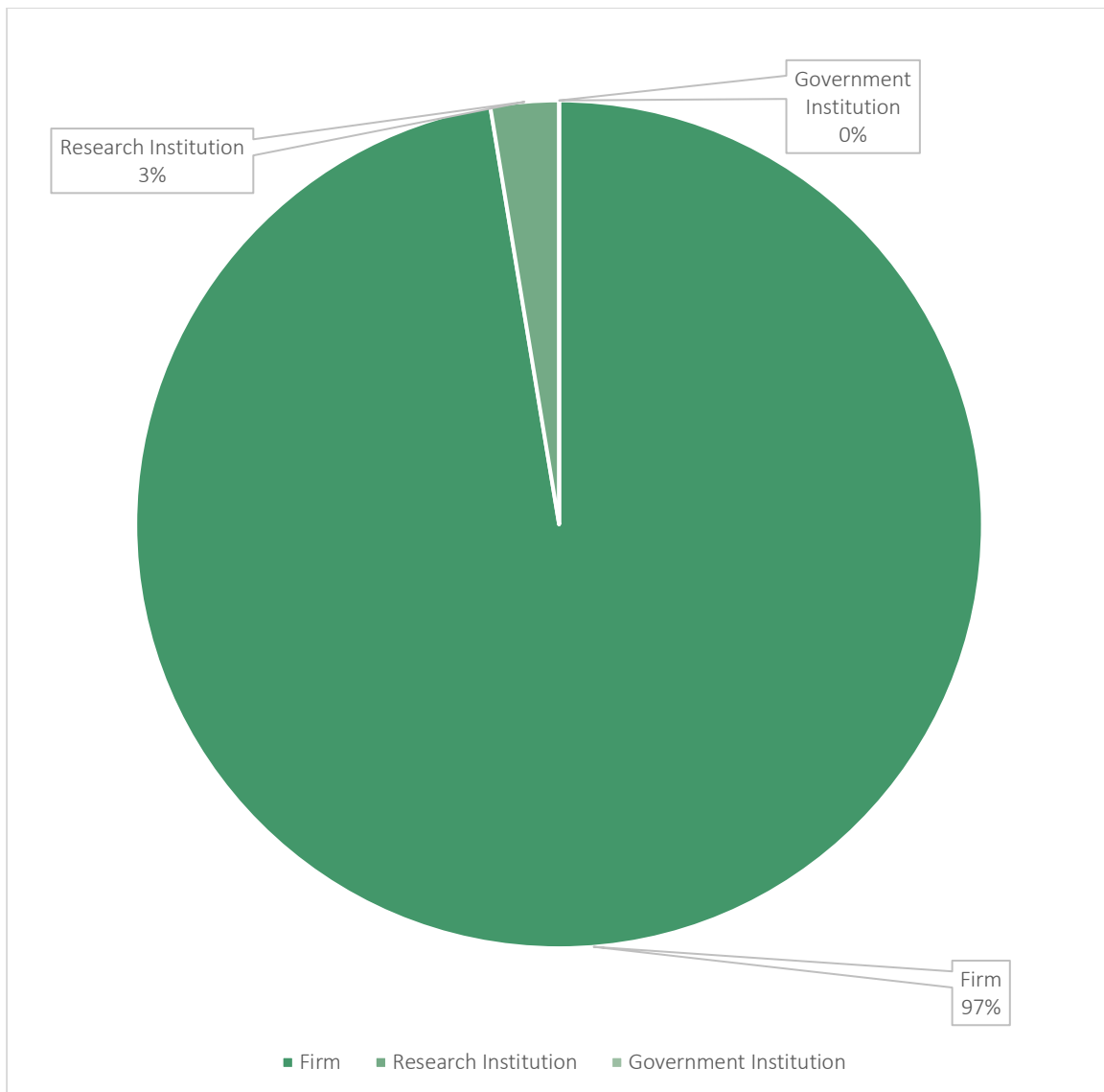
Global Impact of AI Infrastructure

The impact of AI infrastructure is felt worldwide. Different regions contribute to AI infrastructure development in unique ways:

- **North America:** Silicon Valley is the epicenter of AI innovation, home to tech giants that drive AI infrastructure development.
- **Europe:** European countries emphasize AI ethics and regulations, influencing AI infrastructure design and deployment.
- **Asia:** Asian countries, particularly China, are actively investing in AI infrastructure to support their growing AI ecosystem.



Figure 18: AI Players by Organisation Type (United States)ⁱⁱ

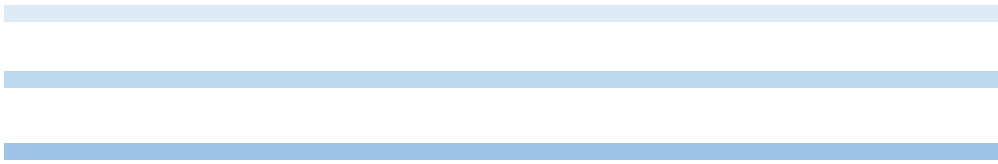


Conclusion

AI infrastructure is the unsung hero that underpins the AI revolution. It includes the hardware, software, and platforms that enable the development and deployment of AI models. The AI infrastructure sector is critical for making AI accessible and efficient for businesses and developers, fostering innovation, and driving AI adoption across industries and around the world.



AI Adopters Sector



Section 5: AI Adopters Sector

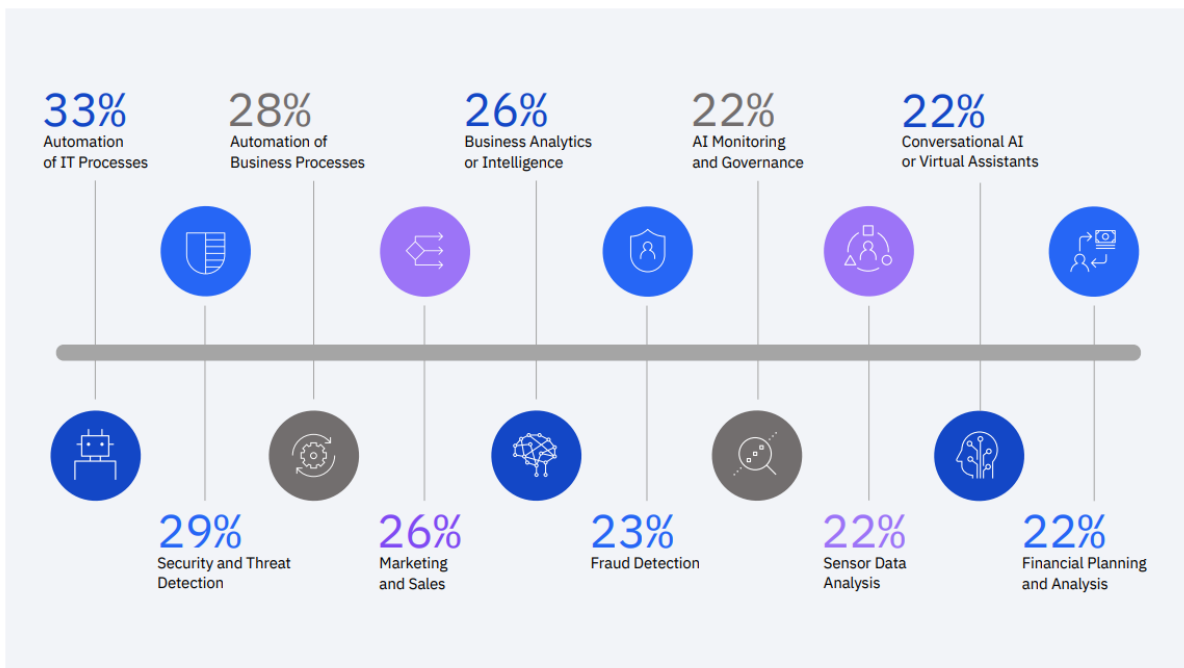
In the ever-evolving landscape of artificial intelligence, AI adopters are the pioneers who harness AI technologies to enhance efficiency, optimize decision-making, improve customer experiences, and gain a competitive edge. This article explores the AI adopters sector, shedding light on the different types of organizations and businesses that integrate AI into their operations and the impact they have on AI sector growth and innovation. We will delve into AI adopters, productivity-focused organizations, those transforming their business models, and entities deploying off-the-shelf AI solutions.

AI Adopters: Driving AI Innovation

AI adopters represent organizations and businesses across various industries that have embraced AI technologies to transform their operations and services. These entities are at the forefront of AI innovation, integrating AI into their products, processes, and services to gain a competitive edge. Key aspects include:

- **Enhancing Efficiency:** AI adopters utilize AI to streamline operations, automate tasks, and improve efficiency. By doing so, they optimize resource allocation and reduce manual effort.
- **Optimizing Decision-Making:** AI enables data-driven decision-making by providing valuable insights and predictions. AI adopters leverage these capabilities to make informed and strategic decisions.
- **Improving Customer Experiences:** AI-driven personalization and automation enhance customer experiences, fostering loyalty and satisfaction.
- **Competitive Advantage:** By staying at the forefront of AI adoption, these organizations outperform competitors and stand out in the market.

Figure 19: How Organisations Are Using AI Today^{ix}

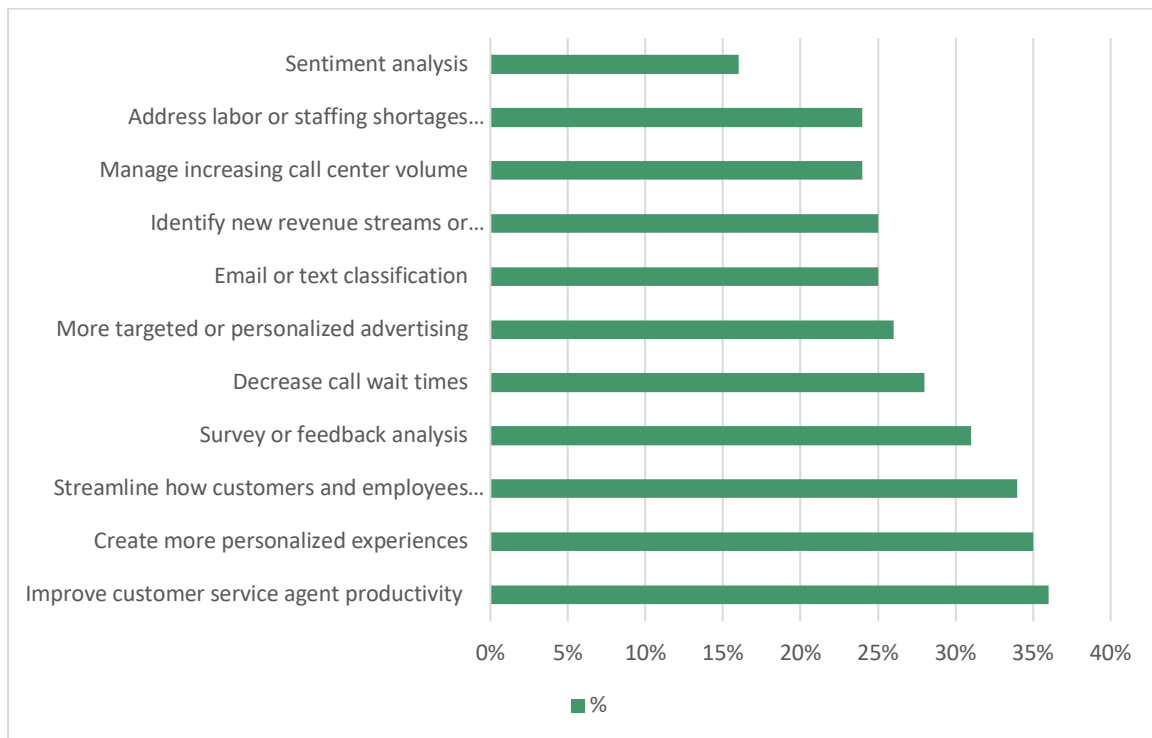


Productivity-Focused Organizations: Streamlining Operations

Some AI adopters focus on productivity, aiming to enhance operational efficiency and overall output. These organizations leverage AI technologies to:

- **Streamline Processes:** AI automates routine tasks and processes, reducing human intervention and speeding up workflows.
- **Resource Optimization:** AI helps optimize resource allocation, ensuring that assets are used efficiently.
- **Cost Savings:** By automating and streamlining operations, these organizations achieve significant cost savings.
- **Increased Output:** Improved efficiency and automation result in higher productivity.

Figure 20: How Are Organisations Using AI to Improve Customer and Employee Care^{ix}



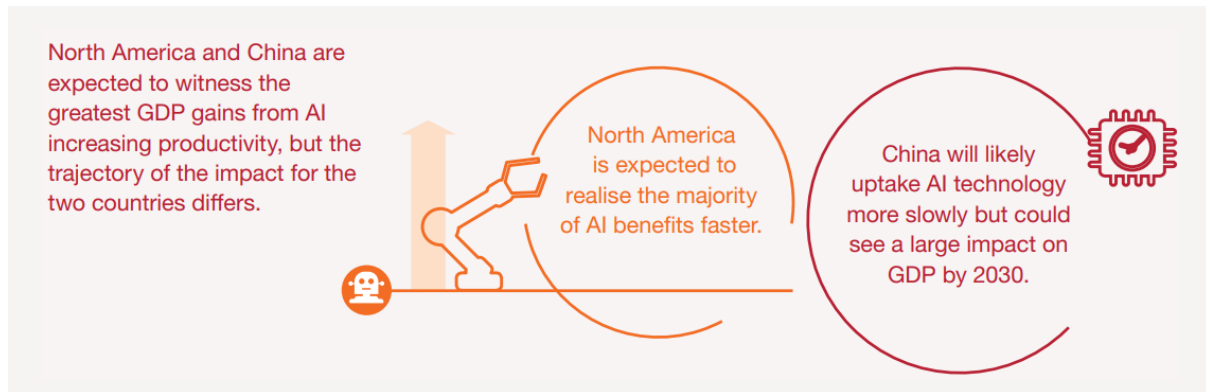
Business Model Transformation: Redefining Strategies

For some AI adopters, AI is more than a tool; it's a strategy. These organizations recognize the potential of AI to reshape their business models, create new revenue streams, and adapt to evolving market dynamics. Key aspects include:

- **Revenue Diversification:** AI adopters explore new opportunities and revenue streams, often beyond their traditional offerings.
- **Industry Redefinition:** AI transforms how these organizations engage with their industry, offering unique services and experiences.
- **Adaptation to Digital Age:** In a rapidly changing digital landscape, AI-powered business model transformations keep these organizations competitive.



Figure 21: How Quickly will AI Impact Productivity^x



OTS Deployment: Quick Integration of AI Solutions

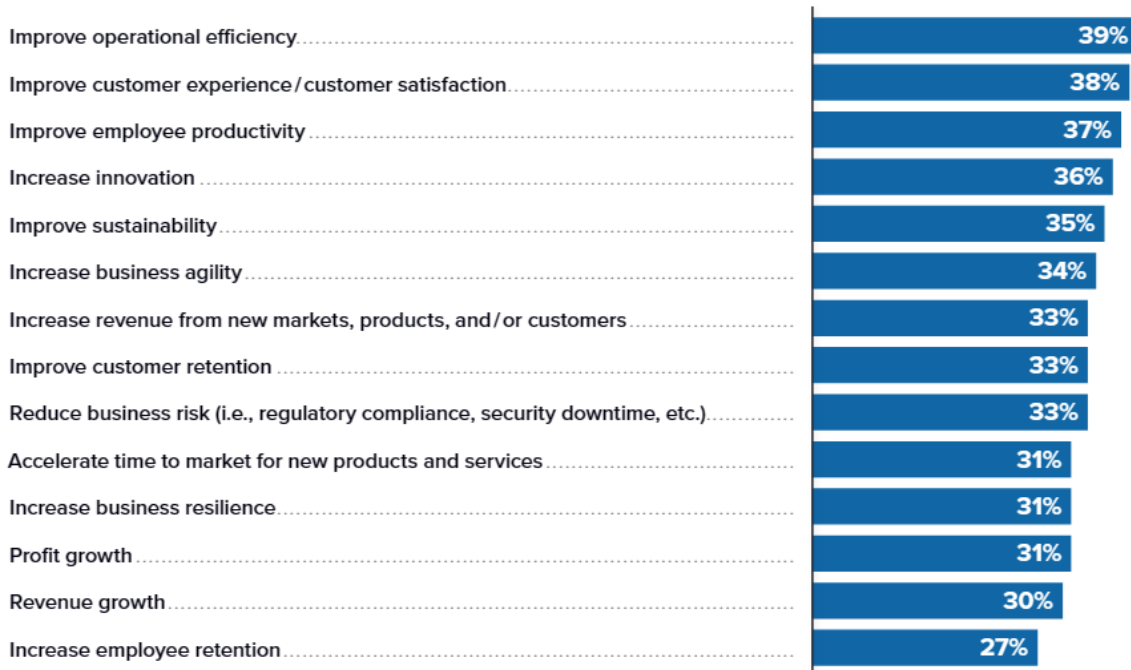
Off-the-shelf (OTS) deployment is a strategy that involves the integration of ready-made AI solutions and tools available in the market. AI adopters choose to implement existing AI products, applications, or services to address specific business needs. Key aspects include:

- **Expedited Deployment:** OTS solutions allow organizations to quickly adopt AI for their operations without the extensive development efforts required for custom solutions.
- **Competitive Edge:** Swift adoption of AI technologies provides a competitive edge in the market.
- **Cost-Effective:** Off-the-shelf solutions often offer cost-effective options for AI integration.

Figure 22: Primary Business Goals for Using AI in Projects/Initiativesⁱⁱⁱ

Q. What are the primary business objectives for using AI for your projects/initiatives?

AI Business Objectives (global responses)



Impact on AI Sector Growth

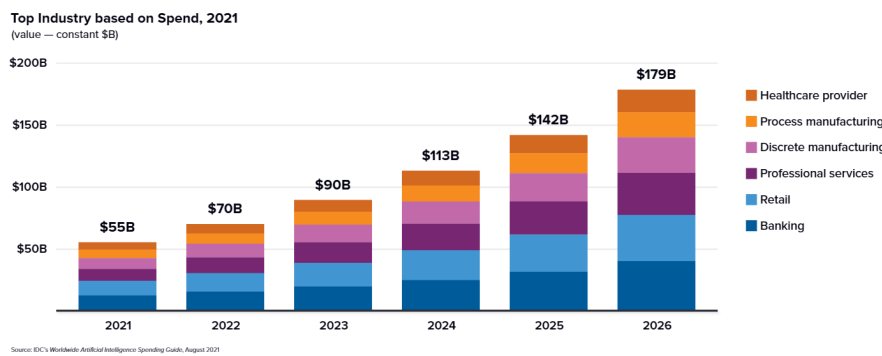
AI adopters are not only beneficiaries of AI but also crucial drivers of the AI sector's growth. Their adoption fuels innovation, encourages the development of new AI technologies, and leads to a broader range of AI applications.

Key Sectors of AI Adoption

AI adoption is widespread across various sectors:

- **Healthcare:** AI is used for diagnostics, drug discovery, and patient care.
- **Finance:** AI powers fraud detection, algorithmic trading, and personalized financial services.
- **Retail:** AI enables personalized recommendations, inventory management, and e-commerce advancements.
- **Manufacturing:** Automation and predictive maintenance are key applications of AI in manufacturing.

Figure 23: Top Industry Based on Spend, 2021ⁱⁱⁱ

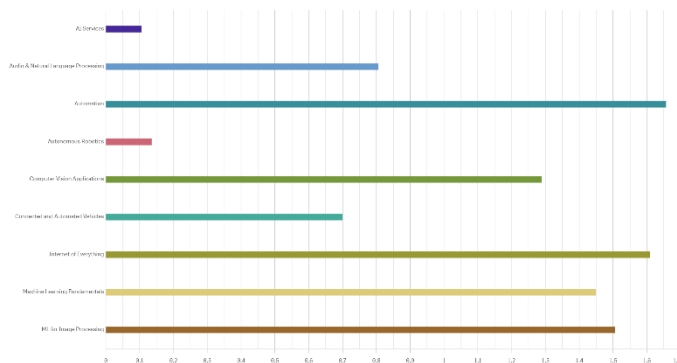


Global Impact of AI Adopters

AI adopters span the globe, with different regions contributing to AI adoption in unique ways:

- **Asia:** Asian countries, notably China, are actively investing in AI technologies and applications.

Figure 24: Revealed Comparative Advantage (*) by Thematic Area (China)ⁱⁱ



Conclusion

AI adopters represent the trailblazers who understand the transformative potential of AI. Whether enhancing efficiency, transforming business models, or expediting AI integration with OTS solutions, these organizations drive AI sector growth and innovation. Their adoption fosters a world where AI is not just a tool but a strategy for reshaping industries, improving operations, and redefining the business landscape.



AI Ancillary Sector



Section 6: AI Ancillary Sector

In the realm of artificial intelligence, AI ancillary services play a pivotal role in ensuring the seamless integration, operation, and ongoing optimization of AI across various sectors. This article explores the AI ancillary sector, shedding light on the different types of services that are essential for the responsible, efficient, and secure deployment of AI. We'll delve into data governance and compliance, model interpretability and explainability, security and vulnerability assessment, ethical and bias auditing, performance monitoring and optimization, licensing and intellectual property protection, supply chain integration and optimization, risk management and liability services, and standards and certification.

AI Ancillary Services: The Backbone of AI Integration

AI ancillary services represent the backbone of AI adoption, providing the support and mechanisms necessary for the ethical, efficient, and secure use of AI technologies. These services are essential for organizations across various industries, as they navigate the complex AI landscape. Key aspects include:

- **Data Governance and Compliance:** Ensuring AI systems comply with data protection and privacy regulations while facilitating secure data management. This includes data labeling, cleansing, and audit.
- **Model Interpretability and Explainability Solutions:** Making AI models more interpretable and explainable, helping organizations understand and explain AI model decisions, promoting transparency and trust.
- **Security and Vulnerability Assessment:** Identifying and addressing potential security threats and vulnerabilities within AI systems, safeguarding against data breaches and malicious attacks.
- **Ethical and Bias Auditing Services:** Conducting ethical audits and bias assessments on AI models, identifying and rectifying biases to promote fairness and responsible AI deployment.
- **Performance Monitoring and Optimization:** Continuously monitoring AI systems to enhance performance, accuracy, and efficiency, ensuring that AI solutions are operating at peak levels.
- **Licensing and Intellectual Property Protection:** Safeguarding AI innovations and intellectual property, helping AI companies protect their proprietary technologies and navigate licensing agreements.
- **Supply Chain Integration and Optimization:** Integrating AI into supply chain processes and optimizing its use for better efficiency and decision-making in logistics, inventory management, and production.
- **Risk Management and Liability Services:** Addressing AI risk management and liability concerns, assessing the risks associated with AI implementations and providing guidance on mitigating potential liabilities.
- **Standards and Certification Services:** Establishing AI standards and certifications to ensure that AI solutions meet industry-recognized standards for quality and safety.

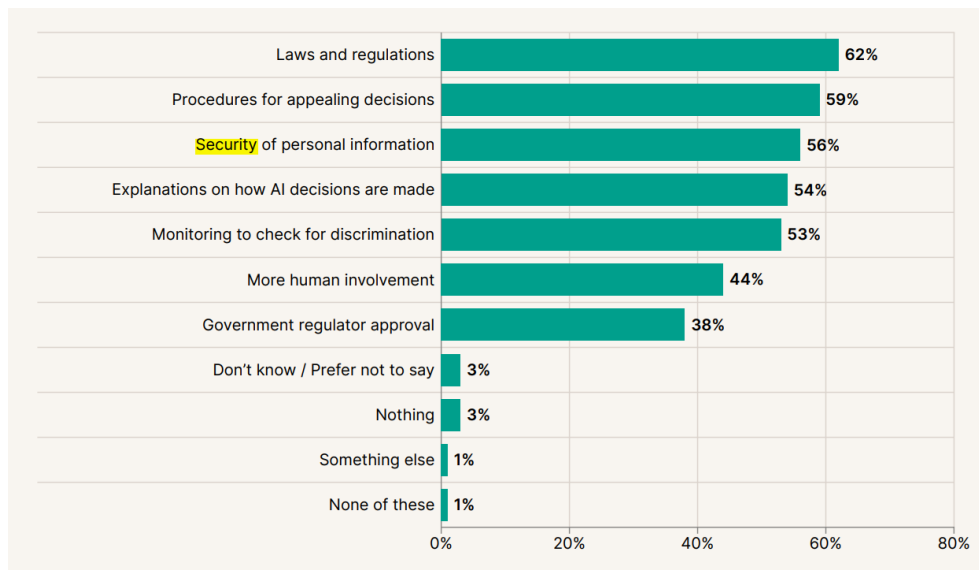


The Impact of AI Ancillary Services

AI ancillary services are essential for a variety of reasons:

- **Responsible AI Adoption:** Ethical and bias auditing, data governance, and compliance services ensure that AI is deployed in a responsible and unbiased manner.
- **Security and Trust:** Security and vulnerability assessment, along with model interpretability, promote trust in AI systems.
- **Optimized Performance:** Performance monitoring and optimization services enhance the efficiency and effectiveness of AI applications.
- **Intellectual Property Protection:** Licensing and intellectual property protection services safeguard innovation and investments in AI.

Figure 25: Increasing People’s Comfort with the Use of AI^{xi}



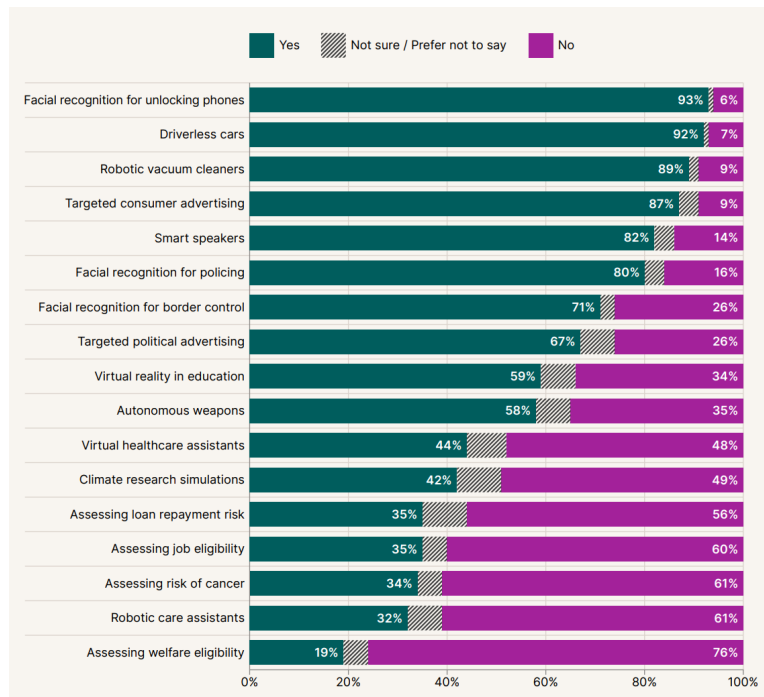
Key Sectors Utilizing AI Ancillary Services

AI ancillary services find applications across numerous sectors:

- **Healthcare:** Ensuring ethical AI practices and securing patient data are crucial in the healthcare sector.
- **Finance:** Risk management and liability services play a significant role in financial applications of AI.



Figure 26: Awareness of Uses of AI^{xi}



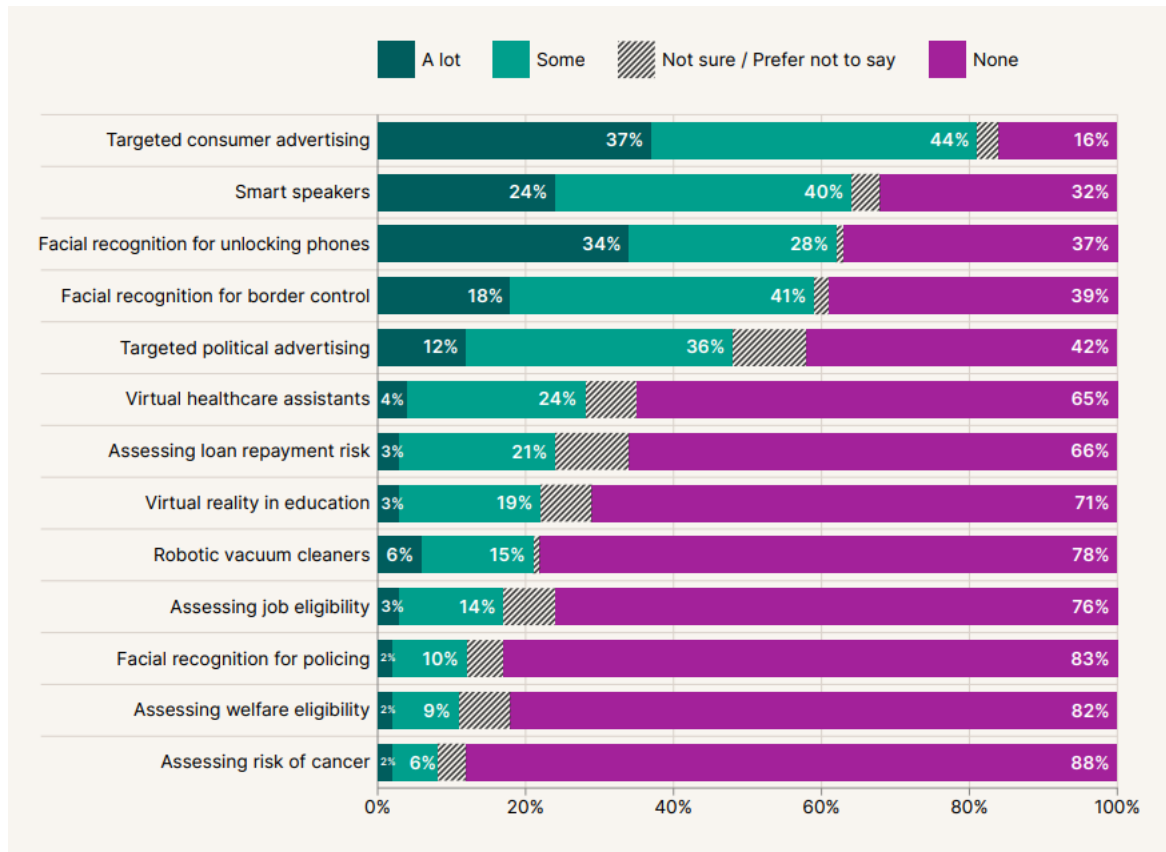
Global Reach of AI Ancillary Services

AI ancillary services are not confined to specific regions; they have a global impact:

- **North America:** AI ancillary services are in high demand in North America, particularly in sectors like finance and technology.
- **Europe:** European countries emphasize data privacy and compliance, making data governance and ethical auditing services critical.
- **Asia:** Asian countries, including China, are actively investing in AI ancillary services to support their growing AI ecosystems.



Figure 27: Experience with AI^{xi}



Conclusion

AI ancillary services are the unsung heroes of responsible, efficient, and secure AI adoption. These services are integral to ensuring that AI technologies are integrated into organizations and industries in an ethical and transparent manner. They are key enablers for trust, performance, security, and innovation in the AI landscape. As AI continues to reshape various sectors, AI ancillary services will play an increasingly vital role in its responsible and successful integration.



Appendix A: A Brief Introduction to AI

Artificial Intelligence (AI) is one of the most transformative technologies of our era. It encompasses a wide range of approaches and techniques that enable machines to simulate human intelligence, including the ability to learn, reason, problem-solve, and adapt. In this appendix, we'll provide a concise introduction to AI, its history, core concepts, and its pervasive influence in various industries.

A Brief History of AI

AI's roots can be traced back to ancient history when humans first contemplated the idea of creating machines that could mimic intelligent behavior. However, modern AI as we know it began to take shape in the mid-20th century (See **Figure 1**).

- **1950s and 60s:** The birth of AI is often attributed to the work of computer scientists like Alan Turing, John McCarthy, and Marvin Minsky. This period saw the development of early AI programs and the introduction of the term "artificial intelligence."
- **1970s and 80s:** AI research experienced both significant advancements and setbacks. Expert systems, which mimicked human decision-making, gained attention, but expectations often exceeded capabilities.
- **1990s to Early 2000s:** AI faced a period of reduced funding and optimism, known as the "AI winter." However, this phase paved the way for more realistic and practical approaches.
- **Mid-2000s Onward:** The resurgence of AI came with the development of machine learning techniques, particularly deep learning. It led to breakthroughs in natural language processing, computer vision, and other AI domains.

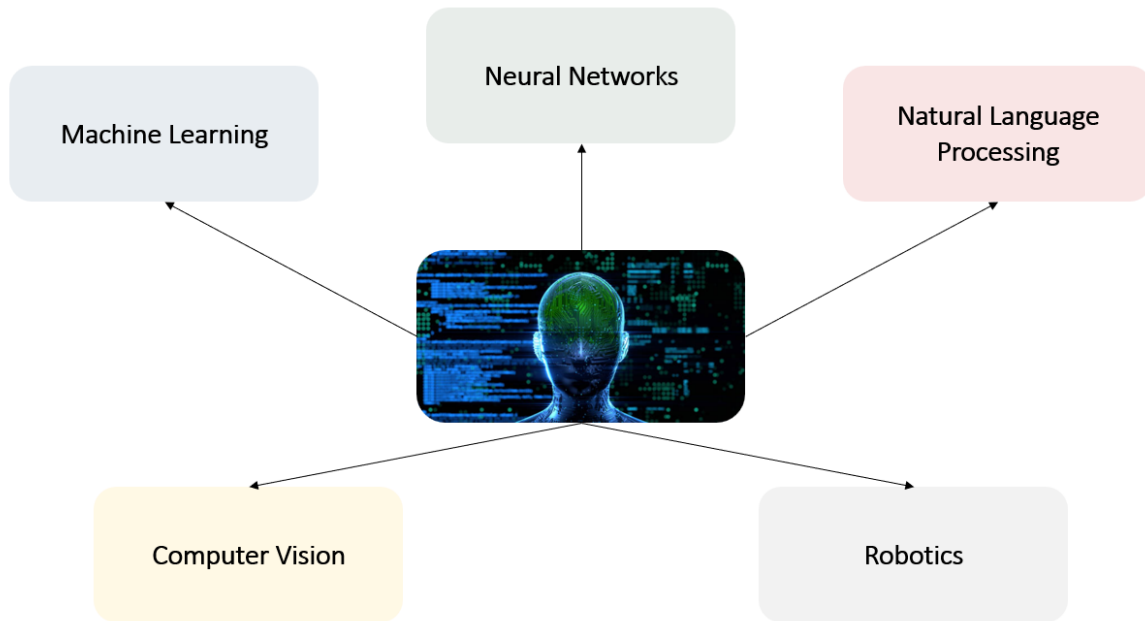
Core Concepts of AI

AI relies on several core concepts and technologies:

- **Machine Learning (ML):** Machine learning is a subset of AI that focuses on enabling machines to learn from data. This approach has revolutionized AI, making it possible for systems to improve their performance over time.
- **Neural Networks:** Neural networks are models inspired by the human brain. Deep neural networks, in particular, have powered many AI applications, including image and speech recognition.
- **Natural Language Processing (NLP):** NLP allows machines to understand, interpret, and generate human language. It's the foundation of chatbots, language translation, and sentiment analysis.
- **Computer Vision:** Computer vision enables machines to interpret and make sense of visual information, making it integral to fields like autonomous vehicles and facial recognition.
- **Robotics:** AI-driven robots can perform various tasks, from manufacturing to healthcare. They incorporate machine learning and computer vision to navigate the physical world.



Figure 28: Core Concepts of Artificial Intelligence

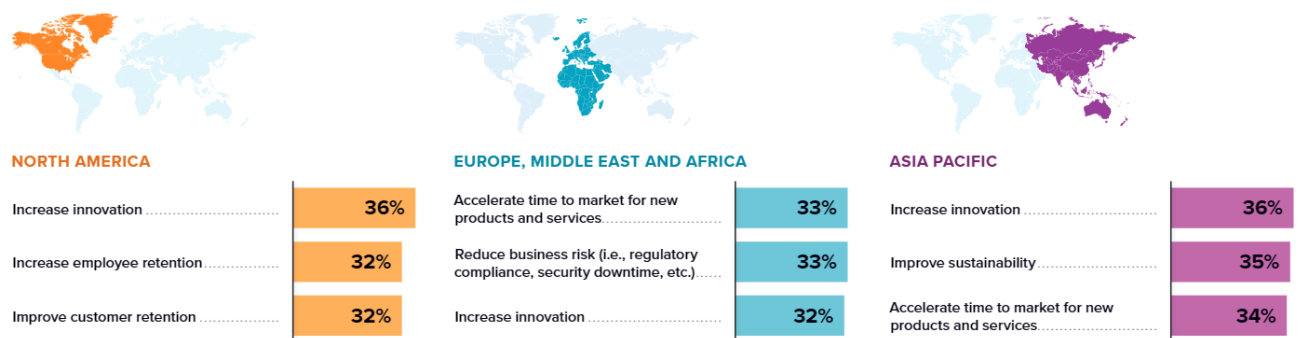


AI's Influence Across Industries

AI's impact transcends boundaries, and it is actively reshaping various industries:

- **Healthcare:** AI is improving diagnosis, drug discovery, and personalized treatment. It's also used in predictive analytics for patient care.
- **Finance:** AI is revolutionizing financial services, with applications in fraud detection, algorithmic trading, and personalized financial advice.
- **Retail:** Retailers use AI for inventory management, personalized recommendations, and chatbots for customer support.

Figure 29: % Improvement Due to AI Investmentⁱⁱⁱ



n = 2,053. Source: IDC's AI StrategistView 2022, May 2022

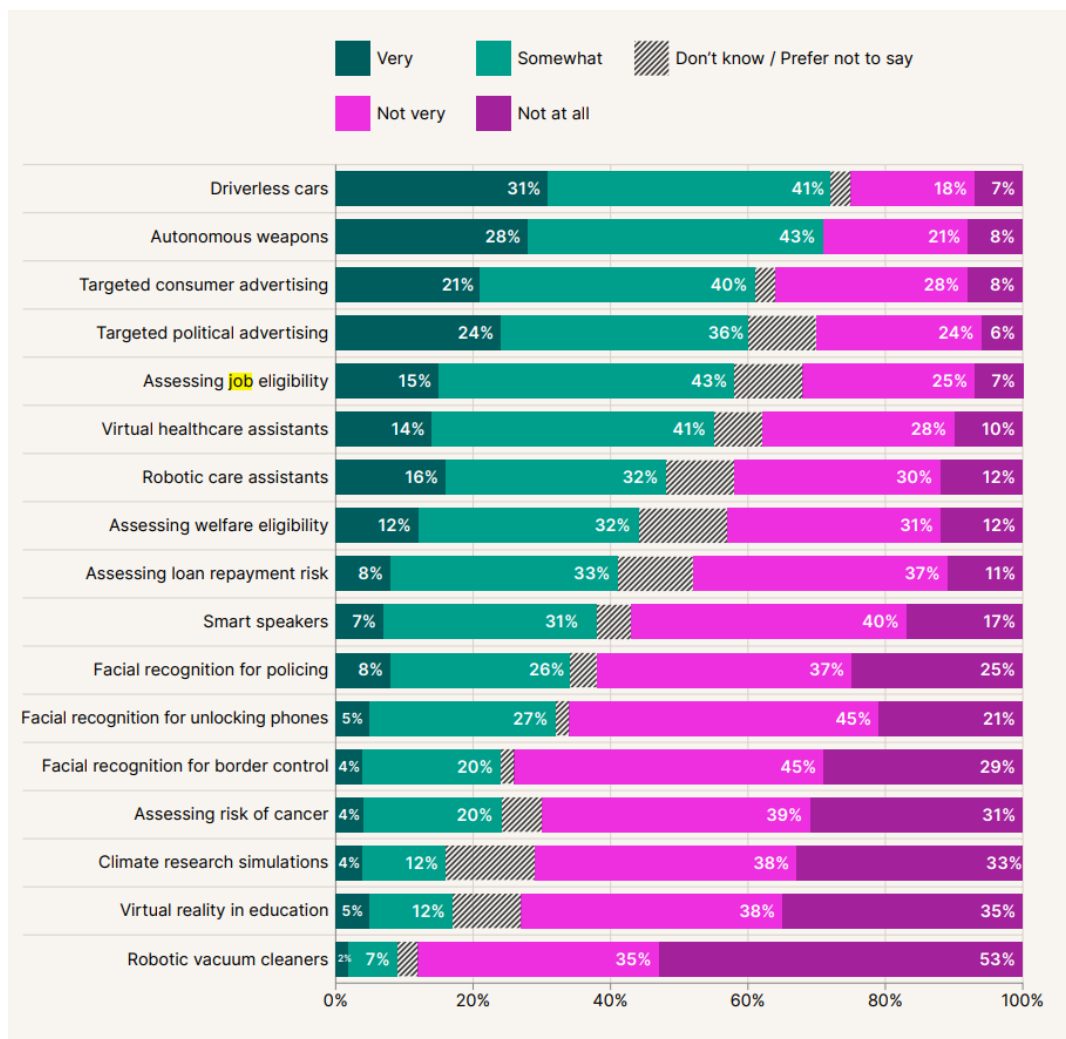


Challenges and Ethical Considerations

AI's rapid growth raises important challenges:

- **Data Privacy:** The use of data for AI can lead to concerns about privacy and security.
- **Bias and Fairness:** AI systems can perpetuate biases present in training data, leading to ethical concerns.
- **Job Displacement:** Automation powered by AI may lead to job displacement, necessitating workforce adaptation.
- **Regulation and Accountability:** The need for ethical and legal frameworks to govern AI's use and accountability for AI decisions.

Figure 30: The Extent to Which each AI Use is Perceived as Concerning^{xi}



In conclusion, AI represents a profound shift in how we interact with technology and solve complex problems. Its far-reaching implications and broad applications make it one of the most exciting and impactful fields of our time. AI's journey has been marked by periods of growth, stagnation, and resurgence, and it continues to evolve rapidly, shaping our future in ways that we are only beginning to comprehend.



Appendix B: The AI Industry

Artificial Intelligence (AI) has emerged as a transformative force, reshaping industries and redefining the boundaries of technology. In this appendix, we provide a concise overview of the AI industry, its growth, key components, and its impact on various sectors.

The AI Industry: An Overview

The AI industry represents a multifaceted landscape that encompasses various sectors, technologies, and applications. It has grown exponentially over the past few decades, driven by advances in machine learning, neural networks, and data processing. Key elements of the AI industry include:

- **Machine Learning:** Machine learning is the foundation of AI, enabling systems to learn and adapt from data without explicit programming. It includes supervised learning, unsupervised learning, and reinforcement learning.
- **Deep Learning:** Deep learning, a subset of machine learning, focuses on neural networks with multiple layers. It powers applications such as computer vision, natural language processing, and speech recognition.
- **Natural Language Processing (NLP):** NLP allows machines to understand and generate human language. This technology underlies chatbots, virtual assistants, and language translation.
- **Computer Vision:** Computer vision enables machines to interpret and understand visual information, making it vital for applications like facial recognition, autonomous vehicles, and medical image analysis.
- **Reinforcement Learning:** This branch of AI focuses on training algorithms to make sequences of decisions, as seen in autonomous robots and game-playing agents.

The Growth of the AI Industry

The AI industry has experienced explosive growth in recent years, fueled by several factors:

- **Advances in Algorithms:** Innovations in machine learning and deep learning algorithms have led to significant improvements in AI capabilities.
- **Big Data:** The availability of large datasets has enabled AI models to learn and make more accurate predictions.
- **Increased Computing Power:** The development of powerful GPUs and TPUs has expedited the training of complex neural networks.
- **Industry Adoption:** Various sectors, including healthcare, finance, retail, and manufacturing, have embraced AI to enhance efficiency and decision-making.
- **Startups and Research:** A surge in AI startups and research initiatives has further accelerated the industry's growth.

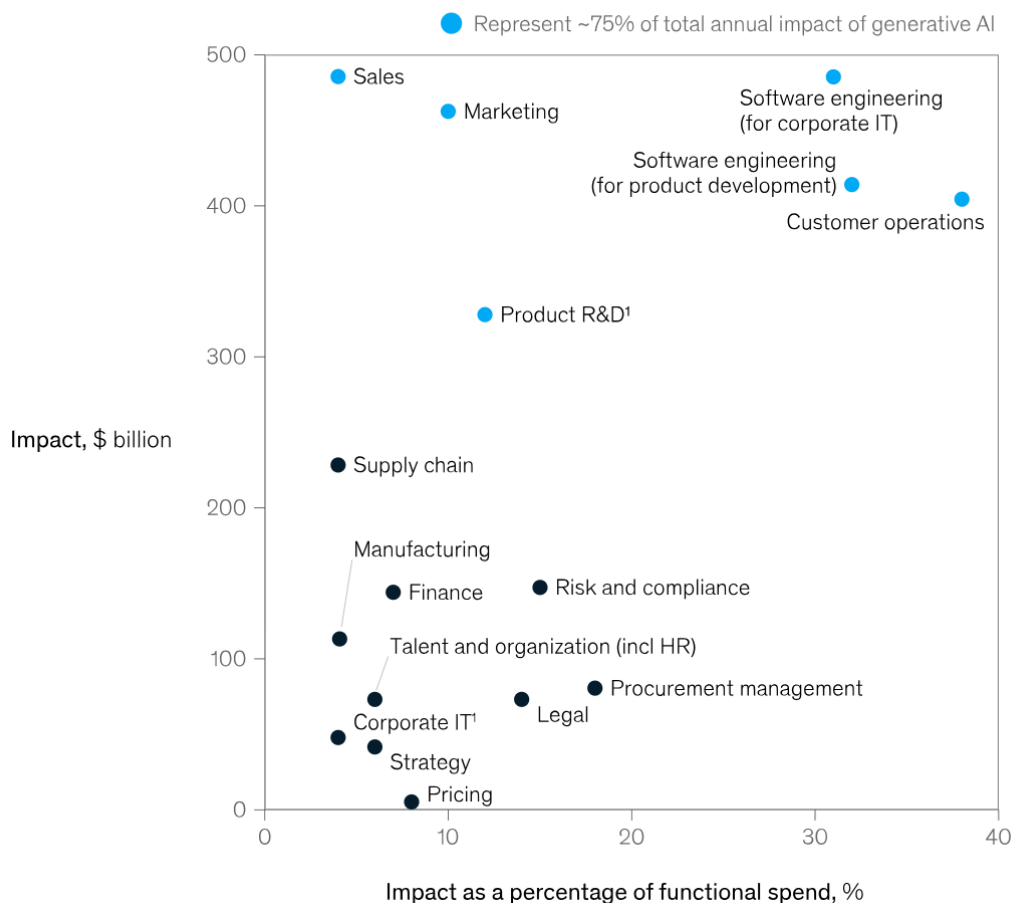


AI's Impact Across Industries

The influence of AI extends to numerous sectors:

- **Healthcare:** AI assists in diagnostics, drug discovery, and personalized treatment, improving patient care.
- **Finance:** AI is pivotal in fraud detection, algorithmic trading, and risk assessment in financial services.
- **Retail:** AI personalization enhances customer experiences, and automation optimizes inventory management.
- **Manufacturing:** AI-driven automation and predictive maintenance improve productivity and reduce downtime.
- **Transportation:** Autonomous vehicles, traffic management, and logistics optimization are AI-driven advancements.
- **Entertainment:** AI contributes to content recommendation algorithms and computer-generated imagery.
- **Energy:** AI optimizes energy consumption and grid management, making it more sustainable.
- **Agriculture:** Precision agriculture utilizes AI to maximize crop yields and minimize resource use.

Figure 31: Generative AI Impact Across Different Industry Uses^{xii}



Challenges and Ethical Considerations

The growth of AI has given rise to important challenges and ethical considerations:

- **Data Privacy:** AI relies on data, raising concerns about data privacy and security.
- **Bias and Fairness:** AI systems may perpetuate biases present in training data, leading to concerns about fairness and ethics.
- **Job Displacement:** Automation powered by AI may lead to job displacement, necessitating workforce adaptation.
- **Regulation and Accountability:** The need for ethical and legal frameworks to govern AI's use and accountability for AI decisions.

Conclusion

The AI industry is a dynamic and influential sector that continues to shape the world in unprecedented ways. Its growth has been driven by technological advances, industry adoption, and the transformative potential of AI across sectors. As AI's influence expands, the industry faces challenges related to data privacy, bias, job displacement, and the need for regulation. Understanding the AI industry's scope and impact is essential in navigating the ever-evolving landscape of artificial intelligence.





Appendix C: Geographical Dispersion of AI Actors

The global landscape of Artificial Intelligence (AI) is characterized by a diverse and widespread presence of AI actors—individuals, organizations, and institutions actively contributing to the development, research, and adoption of AI technologies. In this appendix, we provide insights into the geographical dispersion of AI actors, highlighting regions and countries at the forefront of AI advancement and examining the unique characteristics of their AI ecosystems.

North America: The Silicon Valley Innovation Hub

North America, particularly the United States, stands as a global leader in AI innovation. Silicon Valley, located in the San Francisco Bay Area, is a renowned hub for tech giants, startups, research institutions, and venture capital firms driving AI development. Key features of North America's AI landscape include:

- **Tech Giants:** The United States is home to tech giants such as Google, Apple, Facebook, and Amazon, which heavily invest in AI research and development.
- **Research Excellence:** Leading universities like Stanford and MIT contribute significantly to AI research, attracting top talent from around the world.
- **Venture Capital:** Silicon Valley's venture capital firms fuel AI startups, making it a hotspot for AI entrepreneurship.
- **Diverse Applications:** AI is deeply integrated into various sectors, from autonomous vehicles to healthcare and finance.

Europe: A Focus on Ethics and Regulation

Europe places a strong emphasis on ethics, regulation, and responsible AI development. Several European countries, including the United Kingdom, Germany, and France, are AI leaders. Key aspects of Europe's AI ecosystem include:

- **Ethical AI:** European countries prioritize the ethical use of AI, emphasizing transparency, fairness, and accountability.
- **Regulatory Initiatives:** The European Union's General Data Protection Regulation (GDPR) and AI Act set high standards for data privacy and AI system transparency.
- **AI Hubs:** Cities like London, Berlin, and Paris host thriving AI hubs with startups and research institutions.
- **Collaboration:** European countries often collaborate on AI research and development, promoting a unified approach.

Asia: Rapid Investment and Development

Asia, particularly China, has become a global AI powerhouse with significant investments in AI research, development, and applications. Key features of Asia's AI landscape include:

- **Government Support:** China's government has allocated substantial funding and resources to AI development, aiming to lead in AI by 2030.
- **AI Adoption:** Asian countries like South Korea, Japan, and Singapore actively adopt AI in various sectors, including robotics and healthcare.



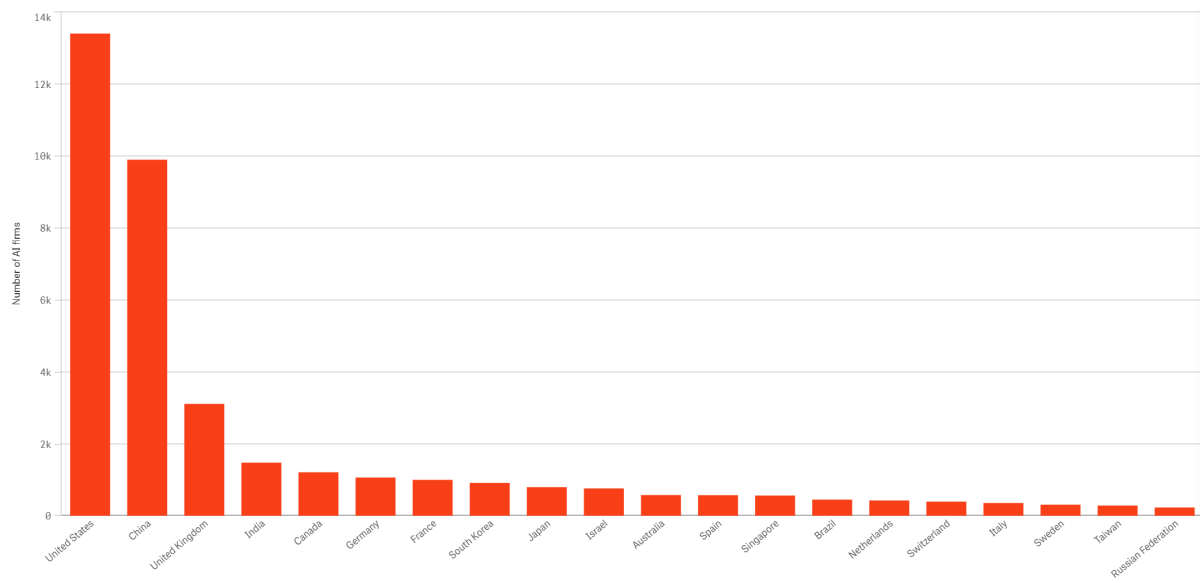
- **Tech Innovation:** Companies like Alibaba, Tencent, and Baidu are at the forefront of AI innovation and application.
- **Startups:** Numerous AI startups across Asia are gaining international recognition.

Other Regions: Emerging AI Hubs

Beyond the primary AI hubs, other regions are also emerging as AI centers. Notable developments include:

- **Canada:** Canada, particularly Toronto and Montreal, has seen growth in AI research, aided by world-class universities.
- **Israel:** Israel is known for its cybersecurity expertise and is increasingly investing in AI.
- **Australia:** Australia is making strides in AI, with research and commercial applications in healthcare and mining.
- **Nordic Countries:** Nordic countries like Sweden and Finland have AI expertise in areas like robotics and autonomous systems.
- **India:** India is a growing AI hub with a focus on AI development and research.

Figure 32: Firms in the AI Landscape by Country (Top 20)ⁱⁱ



Conclusion

The geographical dispersion of AI actors highlights the global nature of AI development. North America's Silicon Valley remains a pioneer in AI innovation, while Europe places strong emphasis on ethics and regulation. Asia, led by China, is rapidly investing in AI and achieving notable milestones. Additionally, other regions are emerging as AI hubs, indicating that AI's transformative potential is being realized worldwide. Collaboration and knowledge sharing between these regions contribute to the ongoing advancement of AI technologies and applications across the globe.



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