

Week1

Sam - Drug discovery

Advancements in Artificial intelligence

Artificial intelligence (AI) has been responsible for virtual screening which has shown increased progress due to recent advancements in computational power. The two primary techniques to virtual screening which include utilising known databases for protein structures and confirmed active compounds. This initially boosted the efficiency and decreased overall costs for pharmaceutical companies but this was below the expected capability of AI. (Amit Gangwal and Lavecchia, 2024)

Therefore more advancements in computational power and AI allowed the software to start machine learning (ML) based decision making models which incorporated deep learning (DL) techniques which are crucial for drug discovery as ML with DL can handle large datasets, determine hidden patterns and can predict future data. This then evolved in recent years to deep generative models (DGM). DL finds relationships between molecules, DGM analyses personalised medicine which can predict optimal treatment which both in tandem increases efficacy, reduces toxicity, time and costs. (Amit Gangwal and Lavecchia, 2024)

The aforementioned benefits are more theoretical than practical due to current limitations of the AI softwares being used, which have had clinical setbacks. One of the major issues arising from the AI software is data representation, data labelling, data privacy and small sample sets in which the software needs improvements (Qureshi et al., 2023). The areas in which the AI excels such as target identification, generative chemistry and compound interaction predictions are overshadowed by the sheer complexity to produce results even for single target drug design (Cichońska, Ravikumar and Rahman, 2024)

The early stages of implementation raises questions surrounding the benefits from using the AI and has discouraged stakeholders when using AI for the whole process (Amit Gangwal and Lavecchia, 2024). However when the AI software is utilised as an aid in different internal processes, the software performs highly (Qureshi et al., 2023).

The AI softwares inherits the limitations and faults from the databases that the AI has been trained on (Amit Gangwal and Lavecchia, 2024). Other limitations occur when AI training is subjected to a specific data set, then when external data is applied the software reduces in reliability. A solution would include more data from various sources which holds its own legal and ethical barriers (Khan et al., 2021)

Market trends and competitor analysis

The projected global AI market in drug discovery from 2023 to 2032 had a positive outlook - see Figure 1 - when the AI in the pharmaceuticals shown success in small scale projects within a drug discovery process. However, the funding massively declined from 2021 to 2023 from 4.7 billion US dollars to 0.3 billion US dollars - see Figure 2. This rapid decline can be implied to stem from the clinical setbacks discouraging global investors. In terms of investors, the United States of America is the leading country to invest into AI software in the drug discovery industry with a 55.2% of overall global investments, while other fully developed countries such as the United Kingdom, Canada, and Australia sit at less than 15% as shown in Figure 3.

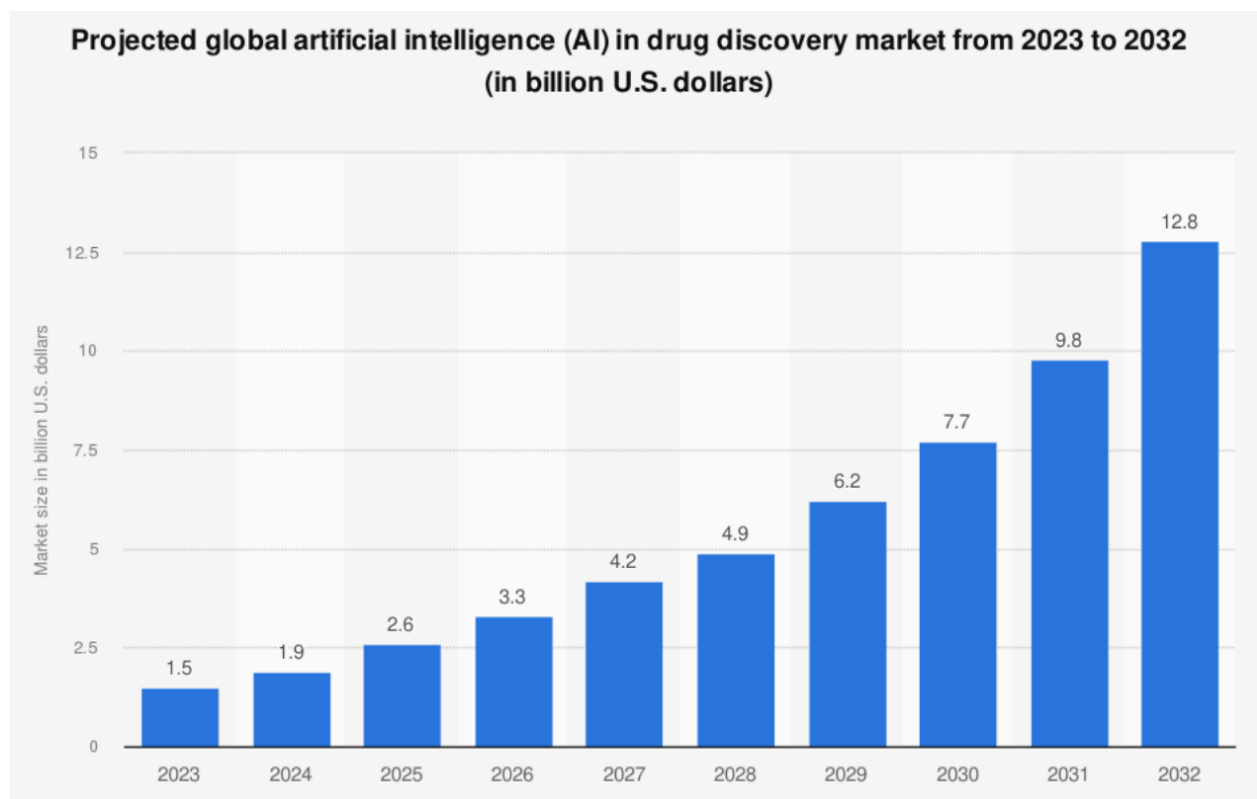


Figure 1 - Projected global artificial intelligence (AI) in drug discovery market from 2023 to 2032 (in billion U.S. dollars) sourced from statista (Market.us., 2023)

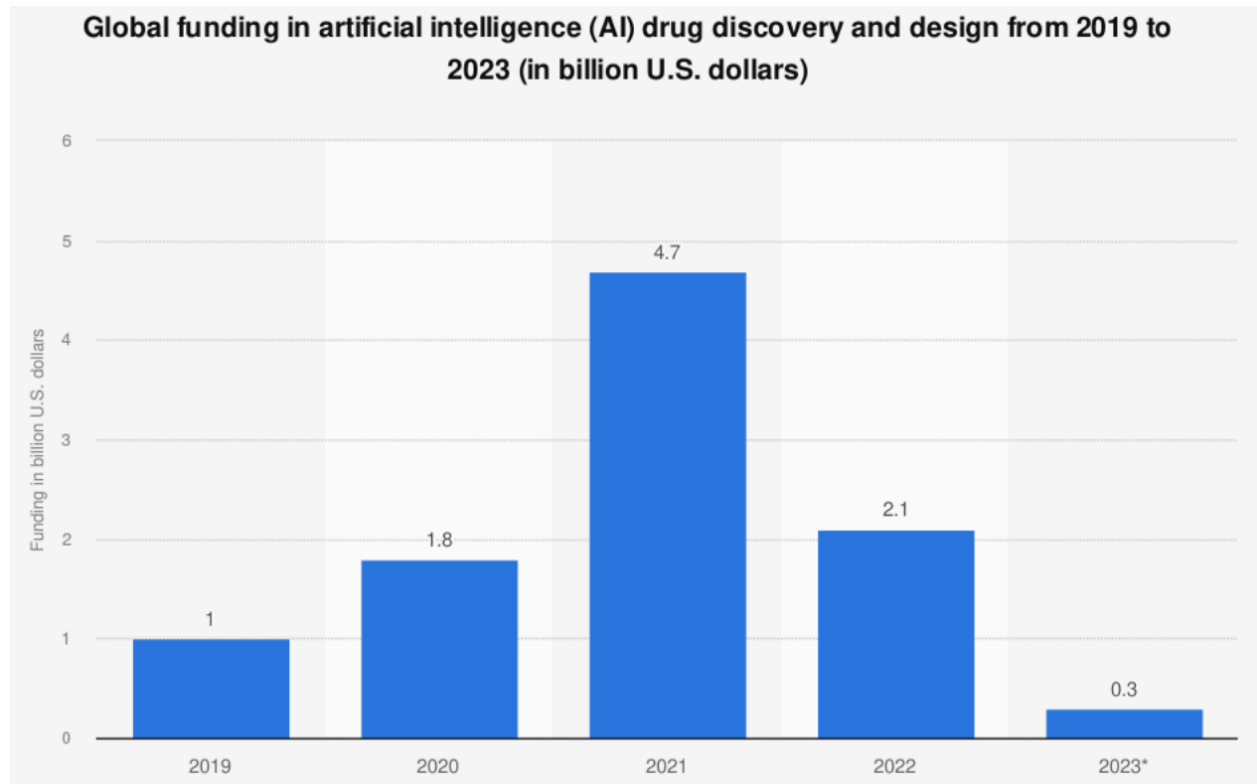


Figure 2 - Global funding in artificial intelligence (AI) drug discovery and design from 2019 to 2023 (in billion U.S. dollars) sourced from statista (CB Insights., 2023)

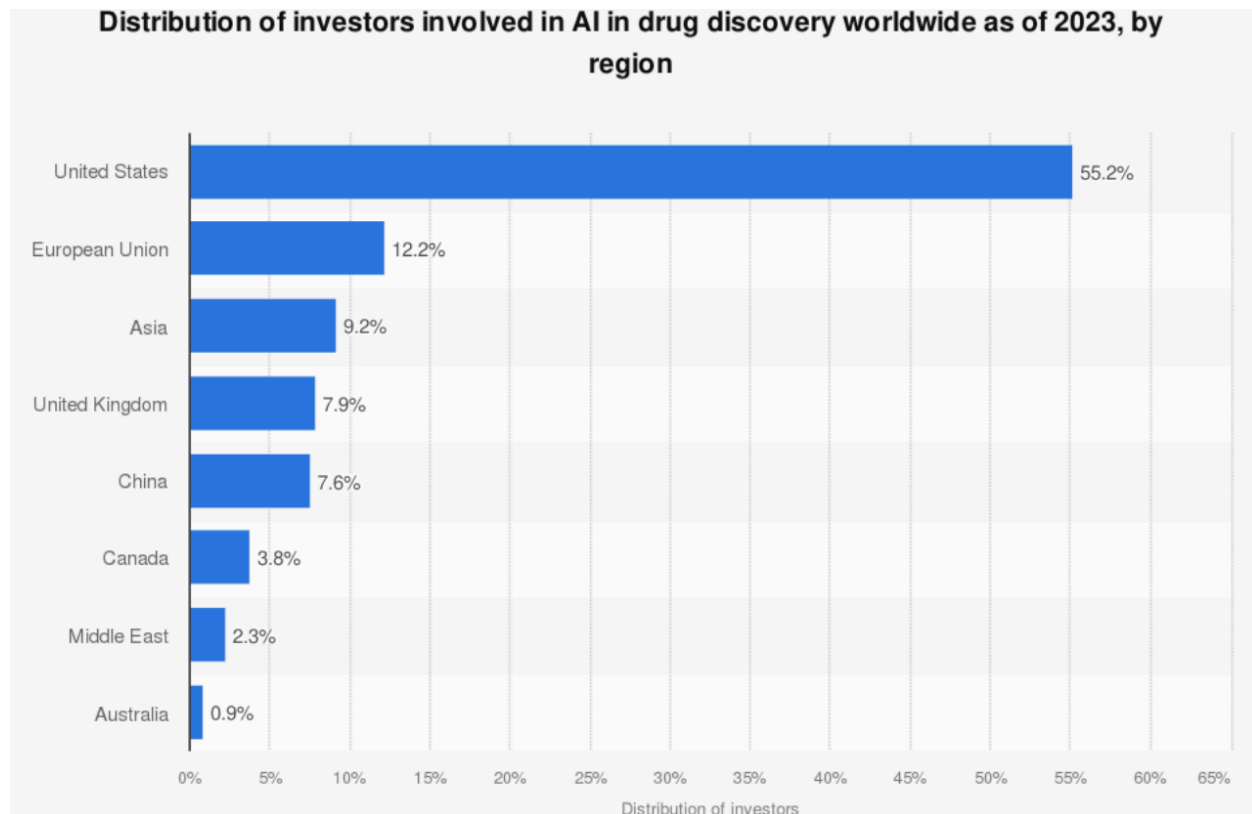


Figure 3 - Distribution of investors involved in AI in drug discovery worldwide as of 2023 sourced from statista (Deep Knowledge Group (Deep Pharma Intelligence)., 2023)

When discussing competition within this sector, to stand out and get noticed, a company needs to utilise the investments given to shorten the time and costs associated with curating pharmaceuticals. This can be achieved by implementing and testing a fully capable AI software to design, clinically test and validate the safety, efficacy and toxicity of the produced drug. To implement completely new software into existing systems can be a challenge of logistics and be very costly to upgrade hence new start up companies that already implement AI software, assuming the AI software is fully functional, may surpass pre-existing companies in the global market. However, starting a brand new business with the pharmaceutical sector has many barriers to overcome such as funding, gaining trust among consumers, gaining trust among distributors, lengthy process to discover a new drug, regulations etc.

Ethical concerns

- Data privacy and usage - The AI software may misuse data by using it in such a way that the provider was not notified how it was getting used
- The AI designed drugs with present advancements may not increase success rates which may harm people that are tested
- The drug may be toxic
- The drug may just be a placebo
- Is the AI lying or incorrect

- Main ethical challenges evolve around the people that use the AI rather than the AI itself
- AI branding may cause ethical issues HOW?

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NUOYI (Sandy) - Manufacturing

Data on AI applications in manufacturing processes

- 93% of manufacturing business leaders say that AI is at least moderately functional in their organization. ([KPMG](#))
- More than half of the European manufacturers (51%) are implementing AI solutions, with Japan (30%) and the US (28%) following in second and third. ([Capgemini](#))
- Maintenance (29%) and quality (27%) form the majority of all [AI implementations among top manufacturers](#). ([Capgemini](#))
- 20% of leading manufacturers will rely on embedded intelligence (using AI, the internet of things and blockchain applications) to automate processes and speed up execution times by up to 25%. ([IDC](#))
- Manufacturing businesses in the US using AI are performing 12 % better than those that aren't. ([Microsoft](#))

Market trends and major players

- **Market trends**
 - The global AI in manufacturing market was valued at \$3.2 billion in 2023 and is projected to grow to \$20.8 billion by 2028 ([World Economic Forum](#)). This growth reflects the industry's recognition of AI's pivotal role in enhancing efficiency, productivity, and innovation.
 - According to the latest report published by [Emergen Research](#), the global Artificial Intelligence in Manufacturing Market size was USD 2.60 Billion in 2022 and is anticipated to reach a CAGR of 44.5% over the assessment period. The growing demand for automation in the manufacturing industry is anticipated to boost the industry share as AI is becoming a significant tool to help manufacturers improve efficiency, reduce costs, and enhance quality.
- **Major players**
 - **Microsoft** - Leading technology provider, Microsoft, provides a number of AI-powered solutions for the manufacturing industry including its Intelligent Supply Chain Solutions, Connected Field Service Solutions, Azure IoT Connected Factory and PTC ThingWorx.
 - **IBM** - with its pioneering AI technology, IBM Watson offers a portfolio of business-ready tools, applications, and solutions to allow users to reduce costs and hurdles of AI adoption while optimising outcomes and responsible AI. With its integrated approach, IBM enables manufacturers to accelerate digital transformation by applying AI, hybrid cloud and automation to achieve new levels of agility, efficiency, quality and sustainability.

- **Siemens AG** - manufacturers of power and energy solutions, serve a number of industries including healthcare, mobility and finance. The company provides a number of industry-specific solutions and its AI-based analysis enables predictive maintenance, provides the basis for reducing downtimes and assures a high level of quality through early anomaly/error detection during the ongoing production process.
- **Intel** - With a broad choice of smart solutions, [Intel](#) aims to enable everyone to infuse AI into their applications. With solutions designed for the Industrial Internet of Things (IIoT), Intel's solutions use AI and robotics to help improve product quality and factory operational efficiency in real time.

Ethical implications of AI use

The ethical implications of artificial intelligence pertain to the ethical challenges, dilemmas, and consequences that arise from the deployment and application of AI technologies. This encompasses ethical considerations regarding the use of AI in decision-making, potential biases within AI systems, accountability for machine-generated outcomes, and the overall impact of AI on individuals and society.

The significance of the ethical implications of artificial intelligence is rooted in its profound influence on the development, deployment, and societal integration of AI technologies. Ethical implications serve as a guiding framework for AI development, ensuring that AI technologies operate within ethical boundaries and reflect the values and interests of diverse stakeholders.

Real-world examples and applications:

- **Ethical implications in autonomous vehicles**
 - In the domain of autonomous vehicles, ethical implications are exemplified in the development of decision-making algorithms that govern the behaviour of self-driving cars in critical situations.
 - For instance, ethical considerations come to the forefront when determining how autonomous vehicles prioritize the safety of passengers, pedestrians, and other road users, thereby illustrating the ethical complexities of AI in the context of automotive technologies.
- **Ethical considerations in healthcare AI**
 - In healthcare, the ethical implications of AI are demonstrated in the deployment of AI technologies for medical diagnosis, treatment recommendation, and patient care.
 - Ethical considerations encompass issues related to data privacy, patient consent, and fair allocation of healthcare resources, emphasizing the need for AI systems to align with medical ethics and uphold patient welfare.

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MARY - Fintech

Use of AI in financial services and fintech innovations

- crowdfunding, online customer acquisition, mobile wallets, P2P lending, MPOS, MSME services, personal financial management, private financial planning, Blockchain and cryptocurrencies etc.
- Financial services providers are making efforts to adopt AI for mundane task automation, consistent customer services, deep-dive behaviour analysis, as well as efficient fraud finding (Deloitte China, n.d.).
- AI-powered chatbots for customer support: the operational cost savings from using chatbots in banking has reached \$7.3 billion globally by 2023. Chatbot integration in mobile banking apps will be the dominant channel for chatbot-driven customer communications, accounting for 79% of successful interactions in 2023 (Juniper Research, n.d.) e.g. provide answers for common questions, process critical feedback, assist with internal IT support, provide consulting service to customers' finance (such as 'Erica' of Bank of America).
- Insurance Claims Assessment: AI will have a highly disruptive impact on insurance claims management, leading to cost savings of almost \$1.3 billion by 2023, across motor, life, property and health insurance, up from \$300 million in 2019. Chatbots can automate post-incident data collection, with AI used to analyse the details/images provided using computer vision. These methods will not only save money for insurers, but they will also reduce the time to claim settlement, improving customer loyalty (Juniper Research, 2019).
- Process Automation: AI helps with Customer onboarding, Security checks, Trade finance operations and loan application process, Inbound calls related to routine queries such as account statements and transactions, Credit card, account closure, and mortgage

processing. JPMorgan Chase's chatbot 'COiN' completed 360,000 hours of finance work in seconds (Dave, 2023).

Market trends and key players

Ethical Concerns

- As AI systems learn from historical data, there's a genuine risk of these biases being amplified (Adel, 2023)
- Transparency: AI analyzes a variety of factors including online shopping habits and social media activities, which regular people would not be clear with the decision-making process (Adel, 2023)
- data privacy: Concern about data breaches and profound questions regarding data ownership and sovereignty (Adel, 2023)

Summary of AI applications in fintech

AI has significant influence in fintech industry, such as automation in customer service, fraud detection, and insurance claims. However, AI's reliance on biased data raises ethical concerns on transparency and privacy in decision-making.

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+add case study, scandal, news, about data breach/privacy issues
Existing legal case?

LUANNE - Healthcare

Report on AI in healthcare diagnostics and treatment

The integration of artificial intelligence (AI) into healthcare diagnostics and treatment is revolutionising the medical field, offering unprecedented advancements in accuracy, efficiency, and personalised care (Patel et al., 2008). AI systems can be utilised to minimise errors in diagnostics and therapy that are unavoidable in human clinical practice (Graber, Franklin and Gordon, 2005). Furthermore, AI not only enhances the quality but also reduces the cost for patient care (Neill, 2013).

AI's effectiveness in healthcare is derived from its ability to learn from extensive medical datasets and clinical activities. This capability is primarily facilitated by machine learning (ML) algorithms, which analyse structured data, and natural language processing (NLP) techniques, which extract information from unstructured data (Jiang et al., 2017).

According to Jiang (2017), AI has been utilised across various medical fields, primarily in neurology, cardiology, and the diagnosis and treatment of cancer. In neurology, an AI system has been developed to restore movement control in quadriplegic patients (Bouton et al., 2016), while an offline man/machine interface has been tested to use the discharge timings of spinal motor neurons to control upper-limb prostheses (Farina et al., 2017).

In cardiology, AI applications are used extensively across multiple domains. These include imaging, where deep learning (DL) techniques enhance echocardiogram interpretation (Madani et al., 2018), segment left ventricles and calculate ejection fractions (Ouyang et al., 2020), and aid in disease diagnosis such as hypertrophic cardiomyopathy and pulmonary arterial hypertension (Zhang et al., 2018). In electrocardiography, AI models excel in detecting arrhythmias and predicting conditions like left ventricular dysfunction (Attia et al., 2019). Furthermore, AI enhances clinical risk scoring by improving accuracy compared to traditional methods, utilising electronic medical records for better prognostication (Danilov and Aronow, 2023).

AI is integral to precision oncology, targeting and characterising individual tumour cells. AI and big-data analytics, combined with next-generation sequencing (NGS), enable the identification of specific molecular targets, aiding in precise cancer diagnosis, early detection, and personalised treatment (Iqbal et al, 2021).

In digital pathology, AI applications include using deep learning (DL) systems for high-resolution tumour imaging and developing novel biomarkers, which can improve diagnostic accuracy and aid in understanding biological complexities in tumour cells (Hou et al., 2018). Furthermore, AI helps in drug discovery by identifying new biomarkers and developing precision oncology drugs (Mukhopadhyay et al., 2018). In the surgical field, AI applications involve machine learning models that predict high-risk cancer lesions, assist in image-guided biopsies, and provide real-time surgical support (Iqbal et al, 2021).

Competitor analysis report

1. GE Healthcare

- FDA Approvals: Leading with 58 FDA-approved AI-based medical devices.
- AI Applications: Focus on ultrasound imaging (Caption Health, BK Medical acquisitions), MRI, CT, and PET scans.
- Strategic Initiatives: Developing Edison digital health platform for AI-driven data collection and analytics.

2. Siemens Healthineers

- FDA Approvals: 40 AI-based devices approved.
- AI Applications: AI-Rad Companion for automating post-processing in radiology (chest CT, brain MR, prostate MR).
- Strategic Initiatives: Expansion of AI solutions across various imaging modalities and body regions.

3. Canon Medical Systems

- FDA Approvals: 20 FDA-cleared AI products.
- AI Applications: Deep learning algorithms for image noise reduction in CT and MR, anatomical landmark detection.
- Strategic Initiatives: Introduction of Altivity brand line for workflow streamlining and personalized treatments.

4. Philips

- FDA Approvals: 20 FDA-approved AI products, including ultrasound solutions from DiA Imaging acquisition.
- AI Applications: CT, MRI, PET, ultrasound software for scan planning, patient positioning, image improvement, and analysis.
- Strategic Initiatives: Integration of AI into consumer products (skin care, shaving, toothbrushing).

5. Aidoc

- FDA Approvals: 19 FDA clearances, specializing in cardiovascular and neurological conditions.
- AI Applications: Algorithms for detecting intracranial hemorrhages, vertebral compression fractures.
- Strategic Initiatives: Coordination of AI applications through a dedicated operating system, partnerships with Mayo Clinic and Cedars-Sinai.

6. Google

- AI Applications: Med-PaLM 2 for medical domain language models, DeepVariant for genetic variation identification, AI for acute kidney injury diagnosis.
- Strategic Initiatives: Development of deep learning models for electronic health record analysis and diagnosis prediction.

7. Merative

- AI Applications: Merge AI for radiological image analysis (breast, neurology, thoracic, musculoskeletal imaging).
- Strategic Initiatives: Collaboration with partner companies to expand AI imaging applications.

8. Microsoft

- AI Applications: Microsoft Fabric for healthcare analytics, DAX Copilot for drafting visit summaries.
- Strategic Initiatives: Adoption by healthcare providers like Northwestern Medicine and Singhealth for integrated patient care solutions.

9. NVIDIA

- AI Applications: GPUs for diagnostic imaging, digital pathology, digital surgery, and patient monitoring.
- Strategic Initiatives: Inception Program supporting healthcare startups with AI-based diagnostic tools.

List of ethical and compliance issues in healthcare AI

Data privacy: The use of AI systems to predict outcomes is done on the learning from existing patients' data. Patients trust healthcare providers to protect sensitive information like age, sex, and health records, which should not be accessed without authorization to prevent potential psychological harm. The increasing use of big data in healthcare raises ethical questions about using personal data without consent, which can hinder medical research and patient care. Wearable devices and the Internet of Medical Things (IoMT) also pose security risks, such as data breaches and ransomware attacks, threatening patient confidentiality and trust in healthcare technology.

Explainability and transparency: Explainability in AI systems is important in healthcare to allow patients to understand why a particular decision or prediction was made. This understanding occurs at two levels: first, comprehending how the system reaches conclusions in general terms, and second, understanding the specific training processes that inform the system's outputs. Achieving explainability is not only a technological challenge but also a legal one, influencing issues such as informed consent and liability in medical settings. AI models often operate as black boxes, making decisions without clear explanations, which may hinder trust and raise ethical issues.

Accountability: Doctors can make mistakes due to biases, leading to incorrect diagnoses and patient harm. AI can help mitigate these errors, provided the data is accurate and representative. However, AI systems are complex and can be hard to understand, making it difficult to hold someone responsible when things go wrong.

Patient-doctor relationship: Integrating AI into all areas of healthcare is challenging due to the uniquely human emotions involved in medical care. Physicians and care providers rely on empathetic and compassionate interactions, which are essential for effective patient treatment and recovery. Autonomous robotic systems lack these human attributes, which may lead to potential loss of patient trust.

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CHIAN (Cheryl) - IT

AI trends in IT industry and new developments

The IT industry is currently experiencing a notable trend with the incorporation of sophisticated language models into robotics, which improves the adaptability and engagement of robotic systems. These advancements are strengthening robots' ability to make decisions by integrating them with essential IT systems and increasing their mechanical functionalities. This has a special bearing on automated IT operations and services since robots can carry out difficult jobs more effectively and connect with people in more natural ways. *(AI Index, 2024)*

The IT sector is also changing as a result of generative AI, particularly in fields like software development, content management, and user experience design. This technology automates processing including personalising user interactions on digital platforms, optimising system speed, and generating code. More complex activities like software debugging and security enhancement are being covered by generative AI as it improves at comprehending and creating content that resembles that of a human. *(What's next for AI in 2024, 2024)*

Network administration, cybersecurity, data analysis, and customer service are just a few of the repetitive and complicated tasks that AI-driven automation is automating, completely changing IT workspaces. Employee emphasis may be directed towards strategic projects as a result of this automation, which is increasing productivity and decreasing human error. Within the IT sector, workforce development techniques are undergoing major changes due to evolving roles and skill demands. *(8 AI trends to look out for in 2024, 2024)*

With AI becoming more and more integrated into IT, ethical issues and regulatory compliance become more and more important. IT businesses are forced to implement strict standards to guarantee that their AI systems be used responsibly and transparently, with a particular focus on data security and privacy due to strict global rules and elevated public expectations. *(Bergmann, D., 2024)*

Notable advancements have been made in autonomous AI systems, which are intended to function autonomously and carry out tasks like automated system updates and predictive maintenance. The efficiency and dependability of IT operations are being improved by their capacity to adapt and learn from data without the need for human intervention. Similar to this, deep learning techniques are being used to improve network management and IT security, offering the ability to identify anomalies, forecast problems, and maximise network traffic. *(AI Index, 2024)(What's next for AI in 2024, 2024)*

Furthermore, AI is enhancing system interconnectivity and efficiency by simplifying the integration of IT services across several industries. AI helps with the administration of IT frameworks for telemedicine in the healthcare industry and the creation of smart industrial systems in the manufacturing sector. For operational efficiency, cross-sector cooperation is proven to be quite beneficial. *(8 AI trends to look out for in 2024, 2024)*

Strategic business activities such as supply chain management, customer interface automation, and logistics optimization are using generative AI more and more. Businesses may customise apps to meet unique demands thanks to its scalability and agility, which significantly improves service and operational efficiency. *(2024 AI business predictions)*

These observations demonstrate how AI is transforming the IT sector, supporting technological advancements, and tackling obstacles to change how businesses operate and provide services.

Competitor analysis

Established technological behemoths and specialised AI companies that are reshaping the competitive environment are the main rivals in the AI sector of the IT industry. Important companies like IBM, Intel, Microsoft, Google, and Amazon Web Services are important because of their vast resources, all-encompassing AI solutions, and worldwide presence. These businesses work with advanced AI-driven analytics and automation technologies, as well as cloud-based AI services. *(Artificial Intelligence (AI) market - size, share & industry growth)*

Companies like OpenAI, C3.ai, H2O.ai, DataRobot, and Snowflake also play important roles in addition to these industry titans. Microsoft is a major supporter of OpenAI, which focuses on general AI developments and is well-known for its innovations like GPT-4 and DALL-E. Industry-specific AI solutions from C3.ai make it easier to implement AI in industries like manufacturing and defence. With technologies that allow AI applications across a range of business operations, H2O.ai aims to make AI accessible to businesses without deep AI experience. A cloud-independent AI platform called DataRobot makes it easier to analyse data and create machine learning models. Finally, storing and evaluating massive data sets—which are essential for AI processing—is how Snowflake helps AI operations. *(Hiter, S., 2024)*

These companies are at the forefront of advancing AI technology; each has a distinct approach and area of expertise that influence how AI is applied and incorporated into many industries.

Ethical challenges in AI use

The IT industry faces several intricate ethical challenges related to AI, including those involving bias, privacy, accountability, and the wider societal effects of technology. The following are a few of the major moral dilemmas that were found:

- **Bias and Discrimination:** In important domains like lending, recruiting, and law enforcement, biased data sets can be used to train AI systems, which can reinforce preexisting social biases and produce unfair results. Fairness-aware machine learning techniques must be used as a result in order to detect and reduce biases throughout the development stage. *(Top 15 challenges of artificial intelligence in 2024, 2024)(Parsons, L, 2024)(Simpson, I. and Rivett, C.)*
- **Privacy Concerns:** Individual privacy is seriously at danger when AI technologies handle ever-larger volumes of personal data. It is essential to make sure AI systems adhere to strict confidentiality guidelines and data protection legislation. To safeguard sensitive information, this entails following guidelines such as data minimization and

anonymization. (Top 15 challenges of artificial intelligence in 2024, 2024) (Simpson, I. and Rivett, C.)

- **Lack of Transparency (Explainability):** Artificial intelligence (AI) systems frequently function as "black boxes," making decisions that are difficult for humans to comprehend. Particularly in crucial industries like healthcare and banking, this lack of openness can erode confidence and responsibility. To close this gap and win users' trust, explainable AI must be developed to make AI decision-making processes more transparent and intelligible. (Trotta, A., Ziosi, M. and Lomonaco, V., 2023) (Top 15 challenges of artificial intelligence in 2024, 2024)
- **Accountability:** Developing and putting into practice frameworks that guarantee AI systems are responsible for their activities is a continuous challenge, particularly in the event of failures. This entails defining precise rules on who bears accountability for the results of AI choices and making sure these organisations are prepared to handle any problems that may emerge. (Top 15 challenges of artificial intelligence in 2024, 2024) (Parsons, L, 2024)
- **Societal and Ethical Implications:** As AI technologies become increasingly prevalent in decision-making, they impact many facets of life and the workplace, raising serious ethical and societal issues. These comprise the possibility of heightened surveillance, the reduction of employment prospects resulting from automation, and the wider influence on social justice and unity. (Ethical challenges and implications of ai, 2023) (Parsons, L, 2024)

A complex strategy is needed to address these ethical issues, including strict adherence to the law, moral AI development procedures, ongoing stakeholder involvement, and the creation of moral standards and guidelines for the use of AI. In order to ensure that AI maximises advantages while minimising harm, developers, regulators, and the international community must work together. (Top 15 challenges of artificial intelligence in 2024, 2024) (Parsons, L, 2024) (Simpson, I. and Rivett, C.)

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MOHAMMAD (AN AQIN) - Retail

AI in retail:

AI has been used in multiple different ways in the retail sector. A few examples include:

- German Sparkling Wine producer **Rotkäppchen-Mumm** who have implemented the use of AI to dynamically change promotional content on digital signs in their stores based on sales data and retail analytics. This helps promote and sell products which are in stock and ensures that products which are out of stock or low in inventory are not advertised (Intel, 2022).
- **Lee's Famous Recipe chicken** used a conversational AI in their drive throughs to take orders and upsell new items. This transition has reportedly led to a 95% order accuracy and happier customers. This was used to circumvent their staffing shortage (Intel, 2022).
- **Ebay** has used generative AI to help customers find products that they are looking for. This bot works by allowing users to converse with a generative AI bot to find the right deal among the humongous number of listings provided by Ebay through text, voice or photo input. (Marr, 2024)
- **Google** is using generative AI to visualise how clothing might look like on certain body types, emphasising how it would cling or drape more accurately on those body sizes. This virtual try-on technology is available for brands like Anthropologie and H&M. (Marr, 2024)
- **SHEIN** uses AI to personalise customers' online shopping experience by fueling product recommendations for customers. This is done through analysis of customer browsing/buying behaviour. (Thomas, 2023)

- **Gopuff** uses AI throughout its operations, such as route mapping, to optimise delivery of their snacks, drinks and home essentials directly to their customers' homes. This allows them to find the most efficient and optimal paths for the fastest deliveries and highest customer satisfaction. (Thomas, 2023)
- **IBM** has created an AI tool called Watson which is used to help retail companies create a more personalised purchasing experience for their customers. It does this through the use of real-time data that can accurately reflect a customer's current buying habits. This tool is used by businesses such as **Frito-Lay, Home Depot** and others to streamline their supply chain operations and personalise shopping experiences for each customer. (Thomas, 2023)
- **Upliance.ai**, a smart appliances brand, has integrated ChatGPT into its products. Specifically, a smart cooking assistant product they call DelishUp can now recognise speech and generate AI-assisted recipes through the use of ChatGPT. (Fortune Business Insights, 2024)

Focus on personalization (SAP, 2024):

- **Assortment Planning:** AI can analyse customer data and identify patterns and relevant variables, which would otherwise be considered impossible to spot, this can be used to keep up with constantly changing customer preferences and behaviour. This can be used by fashion retailers for targeted assortments.
- **Personalising Shopping:** Through the analysis of buyer browsing history, AI can be used to help create personalised shopping experiences for customers. This can drive a customer's loyalty to a retailer's platform and ensures the highest customer interest on a per person basis.

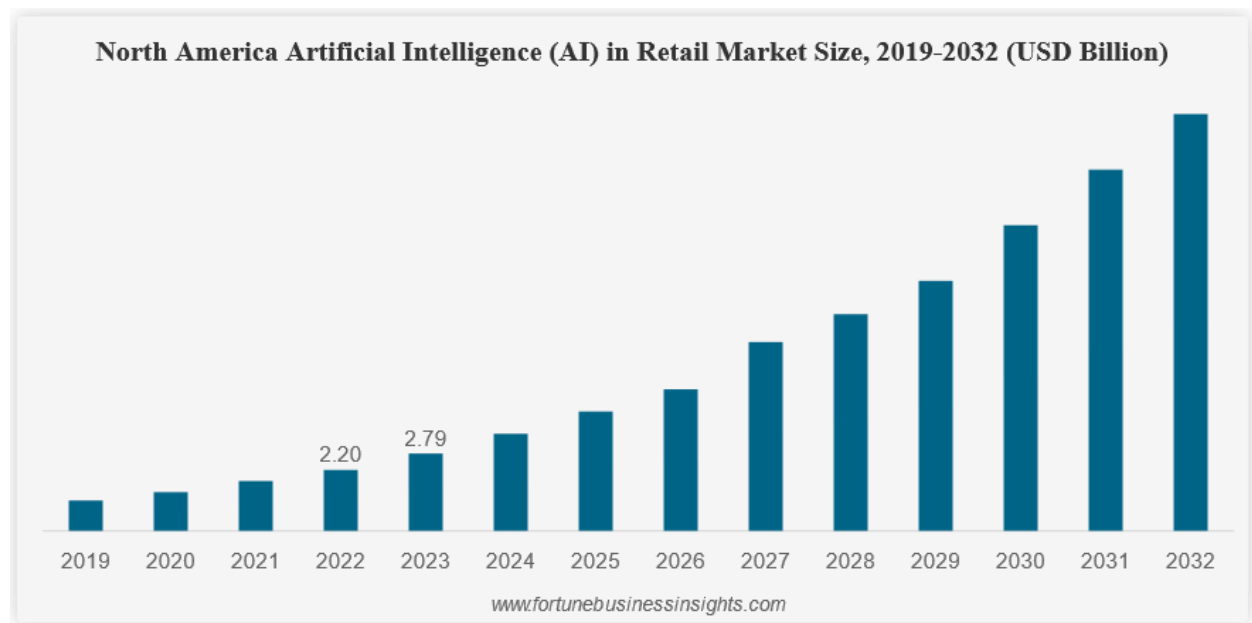
Focus on supply chain management (SAP, 2024):

- **Inventory management:** Using customer purchase history alongside supply chain analytics AI can predict future buying trends, align stocks and can be helpful in spotting and eliminating inefficiencies within the retail chain which reduce profits
- **Demand forecasting:** AI systems can examine past sales data and the current market state to create accurate demand predictions. This information can be used to limit overproduction and optimise inventory for the best profitability.
- **Route Planning:** AI can be used to overhaul delivery routes to optimise fuel consumption, delivery times and overall customer satisfaction. This is done through the use of real time data. This can help companies manage changing conditions and avoid service disruptions caused by logistical routing.
- **Price Optimization:** Pricing strategy is key to success in a competitive industry. AI systems can analyse broad market trends, buyer behaviour, demand flows and internal costs to determine competitive pricing to adapt prices and maintain profitability.

Market Trend Analysis:

USD 7.14 Billion is the size of the AI in the retail market in 2023. By 2024, this number is projected to increase to USD 9.36 Billion which is roughly a CAGR 31.8% increase during the forecast period. The increasing use of AI-powered voice and image processing to improve

customer's experience will surely boost the shopping experience, leaving the 2032 prediction for global AI in retail market size at USD 85.07 Billion. (Fortune Business Insights, 2024)



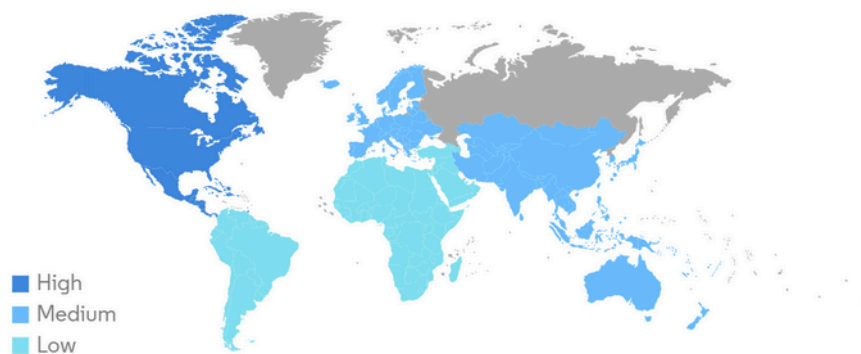
This growth is largely driven by AI-powered chatbot assistants which are growing very quickly into the retail industry because of its highly efficient customer service. Chatbots provide dedicated and personalised responses based on customer input and their troubles. Chatbots work through the use of Natural Language Processing and Machine Learning technologies. They are used to provide real-time insights about customer preferences and also help the chatbot understand what the customer actually wants along with their behavioural patterns. (Fortune Business Insights, 2024)

The main restraining factor of AI in retail is the lack of infrastructure required to implement these AI tools as well as the high implementation costs. Larger global companies such as Google and Walmart have already implemented AI technology for in-shop operations because they have vast resources available to invest into the hardware required to operate this new technology. However, for smaller companies or startups, it would be difficult to adopt this business optimising technology due to the high entry cost of the hardware. (Fortune Business Insights, 2024)

According to both (Fortune Business Insights, 2024) and source (www.mordorintelligence.com, n.d.), North America holds significant market share for AI within the retail sector (Largely retailers within the United States and Canada). Many retailers within the North American region have already implemented these AI-based solutions to manage and maintain their customers through personalised shopping experiences, inventory management and optimization and supply chain optimization.

According to source (www.mordorintelligence.com, n.d.), the AI in Retail market leaders are quite fragmented, meaning that there are lots of companies holding significant amounts of market share. This is likely due to how new AI technologies are; providing newer businesses the opportunity to seize market share as most businesses are yet to employ these newer technologies. This is especially true for the South American and African markets which have the smallest market CAGR (www.mordorintelligence.com, n.d.).

Artificial Intelligence in Retail Market : Market CAGR (%), By Region, Global



Source: Mordor Intelligence



Key Players:

We can see that the above statements about North America being the pioneer in the use of AI in retail through the key players in AI retail.

According to source (Fortune Business Insights, 2024) key players for AI in retail include:

- Amazon.com, Inc. (U.S.)
- Google LLC (U.S.)
- IBM Corporation (U.S.)
- Intel Corporation (U.S.)
- Microsoft Corporation (U.S.)
- Nvidia Corporation (U.S.)
- Oracle Corporation (U.S.)
- SAP SE (Germany)
- Salesforce.com, Inc. (U.S.)
- Talkdesk, Inc. (U.S.)

Identify Ethical Issues:

- **Search Privacy:** When it comes to personalisation, if consumers are not properly informed about a platform's use of their buying/search history, it could be considered an invasion of privacy as not all users are in line with the idea that companies should have free use of the information regarding their buying habits.
- **Copyright Material:** In training AI models, it is vital that the input learning data is of substantial volume. This can cause ethical concerns about where this learning data is sourced from as it is known that a lot of models are trained using copyright material

(Ryan, 2023). This could also be a cause for privacy as private customer spending habits can be used for training purposes (Filipsson, 2024).

- **Output Bias:** In terms of product recommendations in personalisation algorithms using AI, there is a chance that the AI algorithm used can have bias towards a company or product regardless of customer preferences or needs (Filipsson, 2024). This is a result of the data used to train the AI model, as a model is representative of the materials used to train it. This can negatively affect the market as it could lead to the loss of sales for other products of competitors, resulting in a possible monopoly or overstock of certain products which are not recommended.
- **Group Bias:** Management AI could possibly have discriminatory behaviour such as unequal pricing, targeted advertising towards certain groups or ethnicities (Filipsson, 2024). This, like the previous bias, can occur due to the quality of training data, or lack of measures used to prevent such outputs from occurring by the AI model.

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Week 2

Summary of EU AI Act

Information on the AI act (Group Compiled Research):

The EU AI is the first-ever legal framework on AI which aims to address the risks of AI and the role that Europe as a whole has to take in order to lead anew for AI. These regulations seek to reduce the administrative and financial burdens for businesses that aim to develop/deploy AI technologies. (1, Anaqin source)

The EU AI act is part of a wider package of policy measures that includes the AI Innovation Package and the Coordinated Plan on AI (1, Anaqin source):

- **AI Innovation Package** (2, Anaqin): The Large Ai Grand Challenge was launched to give AI startups the financial support and supercomputing access that is necessary to develop trustworthy AI. This package includes a proposal to provide privileged access to supercomputers for AI startups and the broader innovation community. It includes:
 1. An amendment of the EuroHPC Regulation to set up AI Factories to become a new pillar for EU's supercomputers joint undertaking activities. This includes but is not limited to acquiring, upgrading and operating AI-dedicated supercomputers to provide fast machine learning and training of General Purpose Artificial Intelligence.
 2. The decision to establish an AI Office within the commission to ensure that AI policy is properly developed and coordinated at European level. Furthermore, to supervise the implementation and enforcement of the AI act.
 3. EU AI Start-Up and Innovation Communication key activities include: Financial support from the Commission dedicated to generative AI. This package will generate an additional overall public/private investment of around 4 Billion Euros until 2027, Initiatives to strengthen EU generative AI talent pool (education, training, skilling and reskilling activities.), Encouragement of public and private in AI start-ups and scale-ups, accelerated development and deployment of "Common European Data Spaces" to enable vast amounts of training data for new AI.
- **Coordinated Plan on AI:** aims to achieve accelerated investment in AI, implement AI strategies and programmes and align AI policy to prevent fragmentation within Europe.
- **Compliance of High risk AI systems (EU Artificial Intelligence Act, 2024):** The regulations of the EU AI act with the enforcement from the AI office ensures that high risk AI systems follow these regulations by implementing risk management systems, data governance, technical documentation, record keeping, instructions for use, human oversight, accuracy, robustness, cybersecurity and a quality management system within companies that operate high risk AI systems.
 - For an AI system to become high risk, generally the AI system conducts some form of individual profiling or has access to data of aspects of a person's life. If an AI system is

believed to be not high risk but handles this data must be assessed before becoming operational

- Prohibited AI systems: any AI system that is subliminal, manipulative, deceptive, exploit vulnerabilities, social scoring, etc. 'Real time' remote biometric identification in publicly accessible spaces for law enforcement unless there substantial and imminent threat to life or identifying suspects in serious crimes such as murder, narcotic, organised crime, etc

- **General purpose AI:**

Compiled Information References:

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Mary - Spain

The impact of the EU AI act on Spain

There are currently no specific laws or regulations in Spain that directly regulate AI. The EU AI Act is Spain's central general and cross-sectoral AI legislation, but Spain also published some guidelines for their own country (Calvo, Soberon and Pena, 2024).

Challenges faced by non-tech companies in Spain in complying with the AI act

- The awareness, dissemination and promotion of training, development, and responsible, sustainable and reliable use of artificial intelligence
- Advise and assist society and other actors with the development and use of AI
- Collaborate and coordinate efficiently with other national and supranational authorities for supervision
- The promotion of real test environments to reinforce user protection and avoid discriminatory biases
- Meeting safety standards for commercial use

(Calvo, Soberon and Pena, 2024)

- The penalties for non-compliance with the AI Act can range from €7.5 million to €35 million or from 1 % to 7% of the company's global annual turnover, depending on the severity of the infringement (Norton Rose Fulbright, 2024).

The steps a company in Spain needs to follow to implement the AI Act.

- Establish appropriate governance and monitoring measures, which include risk assessments, governance, and maintaining documentation, public registration and conformity assessments and declarations, to ensure that their AI systems comply with the AI Act. AI systems with potential high risk must also undergo a conformity assessment
- Meet transparency obligations which require individuals to be informed where they are interacting with AI systems or AI generated content
- Compile an inventory of their current AI systems and models. Organisations without inventory should still assess their current status to understand their potential exposure. Initial identification can begin from an existing software/applications catalogue or, in its absence, through surveys conducted among various departments, in particular IT and risk departments. Then organisations should classify AI systems and models according to risk levels and the organisation's role, raise awareness, establish where key stakeholders will fit in and what information they need, assign responsibilities as required, create a library of legal risks with playbooks to allow some evaluation by non-experts, stay up-to-date on developments, and establish an ongoing governance processes.



(Norton Rose Fulbright, 2024)

- According to the act, systems in the category of 'unaccepted risk' are prohibited. Examples include the use of real-time remote biometric identification in public spaces or social scoring systems and the use of subliminal influencing techniques which exploit vulnerabilities of specific groups. High-risk systems are permitted but must comply with multiple requirements and undergo a conformity assessment (Meier and Spichiger, 2024).

GIVE EXAMPLES OF THE ACTIVITIES IN EACH OF THESE RISKS

Regulatory bodies and guidelines in Spain

Spanish Agency for the Supervision of Artificial Intelligence

Guidelines

- Charter of Digital Rights (July 2021) (the "Charter"): establishes a set of non-binding principles and rights that may influence the interpretation of Spanish laws
- National Artificial Intelligence Strategy (the "National AI Strategy") (November 2020), which may inform the country's regulatory efforts.

Reference:

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Chian (Cheryl) - Netherlands

The impact of the EU AI act on Netherlands

Based on my study, the EU AI Act is a groundbreaking legislative framework that aims to control the moral application of AI and establishes an international norm for AI governance. The Act, which is anticipated to be fully implemented by 2026, promotes the ethical and responsible use of AI technologies throughout Europe while addressing the many concerns related to them. The Netherlands is proactively complying with the rules of this legislation, given its direct impact as an EU member state.

Impact on the Netherlands:

1. **Regulatory Alignment:** Businesses in the Netherlands who create or use artificial intelligence (AI) technology must make sure their systems abide by the new rules, especially those that are deemed high-risk. This entails abiding by strict guidelines for data governance, transparency, and human monitoring in order to reduce risks and safeguard fundamental rights. (*Decoding the EU Artificial Intelligence Act*)
2. **Support for AI Innovation:** Initiatives under the EU AI Act, such the AI Innovation Package and the Coordinated Plan on AI, are probably going to be beneficial to the Netherlands. With the use of funding, supercomputing resources, and the creation of

AI-focused infrastructures like AI Factories, these programmes seek to promote the development of reliable AI. *(Decoding the EU Artificial Intelligence Act) (Jogen, H. et al)*

3. **Enhanced Consumer Protection:** Increased security requirements for AI applications would help Dutch consumers by guaranteeing that these systems are transparent, secure, and non-discriminatory. Consumer confidence in AI technologies will increase as a result of the Act's emphasis on fundamental rights. *(Decoding the EU Artificial Intelligence Act)*
4. **Economic Opportunities:** The AI Act offers a controlled environment for innovation while guaranteeing adherence to ethical standards for both established and startup Dutch AI businesses. This might strengthen the Netherlands' standing as the world's frontrunner in the development of moral AI. *(Jogen, H. et al)*
5. **Educational and Training Programs:** The AI Innovation Package's focus on education and skill development will provide the Dutch labour force the tools it needs to prosper in an AI-driven economy. This is in line with the Dutch emphasis on excellent education and lifelong learning in the technology industry. *(Jogen, H. et al)*

All things considered, the EU AI Act offers a thorough framework that will materially impact the development, application, and regulation of AI technology in the Netherlands. Dutch companies and legislators may leverage AI's potential for economic and societal good in addition to reducing the risks that come with it by making sure the Act is followed.

The challenges faced by non-tech companies in Netherlands in complying with the AI Act

Non-tech companies in the Netherlands encounter many obstacles when it comes to adhering to the EU AI Act, mainly because of the intricate regulations that encompass legal, ethical, and technical aspects:

1. **Understanding AI Regulations:** It's possible that a lot of non-tech businesses lack the in-depth knowledge of regulations and technology needed to completely comprehend the ramifications of the AI Act. This entails knowing what constitutes a high-risk AI system as well as the particular responsibilities that come with it, like maintaining data integrity, openness, and human supervision. *(Decoding the EU Artificial Intelligence Act)*
2. **Technical Expertise:** It can be difficult to implement the extensive technical documentation and compliance procedures mandated by the AI Act. It might be difficult for non-tech organisations to effectively analyse and manage AI risks since they frequently lack internal AI expertise. *(Decoding the EU Artificial Intelligence Act) (Dharmabalan, A., 2023)*
3. **Cost of Compliance:** Following the strict guidelines set forth by the AI Act may necessitate a substantial financial outlay. For non-tech businesses, this could entail spending a significant amount of money to create or acquire compliant AI technologies, train employees, and perhaps engage outside advisors to guarantee legal compliance. *(Decoding the EU Artificial Intelligence Act) (Dharmabalan, A., 2023)*
4. **Cultural Adaptation:** Organisational culture must adapt as we move towards AI-driven processes. It could be difficult for non-tech organisations to incorporate AI into their

conventional operations and persuade stakeholders of its advantages. For AI to be adopted effectively and used ethically, a cultural transformation is necessary. *(Decoding the EU Artificial Intelligence Act)*

5. **Innovation vs. Compliance:** One of the biggest challenges is striking a balance between innovation and compliance. Non-tech businesses must use AI to innovate while making sure they don't violate any laws. To maximise AI's benefits without running afoul of the law, this equilibrium is essential. *(Fair lending in the Digital age)*

The Netherlands' non-tech companies should concentrate on developing their own internal resources or collaborating with AI expertise providers in order to address these issues. To successfully comply with the EU AI Act, investing in technical infrastructure and pursuing ongoing education on AI legislation are essential steps.

The steps a company in Netherlands needs to follow to implement the AI Act

Companies in the Netherlands should adhere to these procedures in order to successfully implement the EU AI Act, bearing in mind that this is a high-level framework that may need to be customised to unique corporate needs and the AI technology they use:

1. **Conduct an AI Mapping Exercise:** Make a list of all the general-purpose AI models and systems that your company is working on or has already implemented. This will assist in ascertaining whether aspects of your business operations are impacted by the AI Act. *(Apostle, J. and Schaedler, S., 2024)*
2. **Understand and Assign Roles:** Determine the role(s) that your company plays in the AI value chain, including that of distributor, importer, deployer, and supplier. According to the AI Act, every job has distinct obligations. *(Apostle, J. and Schaedler, S., 2024)*
3. **Determine the Scope of the AI Act's Applicability:** Determine if the AI Act needs to be followed by your models and systems of AI. Knowing if these systems are marketed or implemented in the EU, or if the EU uses their output, is necessary to do this. *(Apostle, J. and Schaedler, S., 2024)*
4. **Risk Classification:** Assign each AI system a classification based on the risk categories specified in the AI Act. This classification will specify the particular requirements that your business must fulfil, particularly if any of the systems are considered high-risk or are prohibited. *(Apostle, J. and Schaedler, S., 2024)*
5. **Review and Adapt Contracts and Due Diligence Processes:** Include AI Act compliance standards and clauses in your contract updates and due diligence procedures. Managing connections with outside parties, such as partners and vendors, who might also communicate with your AI systems, requires taking this step. *(Apostle, J. and Schaedler, S., 2024)*
6. **Implement Compliance Measures:** Ensure that high-risk AI systems follow the essential technical documentation and regulatory standards by developing and implementing quality management systems and other compliance procedures. *(Bhavsar, P., 2023)*

7. **Establish a Quality Management System:** Regulatory compliance, design control, risk management, and post-market monitoring plans should be included, and they should be customised for the particular AI systems your business utilises. (*Bhavsar, P., 2023*)
8. **Prepare for Post-Market Monitoring and Reporting:** In order to meet ongoing regulatory obligations, set up methods for ongoing monitoring and reporting of AI system performance. Additionally, be ready to handle any incidents or issues related to noncompliance. (*Bhavsar, P., 2023*)
9. **Regular Training and Awareness:** Make sure that all of your employees, particularly those in management and deployment roles involving AI, receive regular training and are informed about the AI Act's obligations as well as your company's compliance protocols. (*Apostle, J. and Schaedler, S., 2024*)

Companies in the Netherlands can guarantee compliance with the EU AI Act and put themselves in a position to use AI technology ethically and effectively by implementing these measures.

The regulatory bodies and guidelines in Netherlands

The EU AI Act and other frameworks, in particular, place significant emphasis on the regulatory bodies and guidelines that supervise AI compliance in the Netherlands. A brief synopsis of the regulatory landscape is provided below:

1. **Netherlands AI Coalition (NL AIC):** Even though it isn't a regulatory agency, the NL AIC is important for coordinating national AI plans and encouraging public-private sector cooperation. Its goal is to make sure that advancements in AI are consistent with moral principles and societal norms. (*Ai Watch: Global regulatory tracker - OECD: White & Case LLP, 2024*)
2. **EU AI Act:** The EU AI Act, which establishes a uniform legal framework for AI throughout member states, is applicable to the Netherlands as a component of the European Union. With a particular emphasis on high-risk applications, the Act divides AI systems into risk-based categories and specifies precise compliance criteria for each category. (*Turner, A., 2024*) (*myTwitterAccount*)
3. **Sector-Specific Guidelines:** Other industry-specific regulations may also affect AI use. For instance, the European Banking Authority (EBA) in the financial industry offers rules on AI use, which include standards for moral and open AI practices. (*KPMG trusted AI and the regulatory landscape*)

Any organisation using AI technology in the Netherlands must comprehend and follow these regulations in order to ensure that their applications are both cutting edge and adhere to ethical and legal norms.

VERY GOOD EXPLANATION WITH NETHERLANDS

Three main consulting company approaches to EU AI Act compliance

1. Deloitte

- Services Offered: Deloitte offers regulatory compliance support, AI system categorization, and full risk assessment services that are customised to meet the requirements of the EU AI Act.
- Methodology: In order to guarantee that AI systems comply with the requirements of the EU AI Act, Deloitte uses a systematic compliance framework that incorporates ethical considerations related to AI from the design stage through deployment and monitoring.
- Case Study: With the help of Deloitte, a Dutch fintech company was able to successfully navigate the regulatory landscape created by the AI Act and establish an AI governance model that reduced its compliance processes without impeding innovation.

2. KPMG

- Services Offered: KPMG provides training programmes pertaining to the AI Act, compliance audit services, and strategic consultancy services with an emphasis on AI governance.
- Methodology: In order to comply with the AI Act's standards, their strategy places an emphasis on early interaction throughout the AI system design phase and focuses on integrating accountability and transparency into AI systems.
- Case Study: Redesigning its AI systems to promote openness and justice, especially in automated decision-making processes, was one of the ways that KPMG helped a global organisation adapt to the AI Act.

3. PwC

- Services Offered: Services provided by PwC include risk management, post-implementation assistance for AI systems, and legal and compliance advice related to the EU AI Act.
- Methodology: In order to anticipate and incorporate any changes in regulations into its continuing AI activities, PwC employs a proactive compliance technique.
- Case Study: A Dutch healthcare provider improved patient data privacy and system accuracy by enhancing its AI-driven diagnostic tools to comply with the AI Act's high-risk AI system standards thanks to PwC's assistance.

ANY SMALLER COMPANY?

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Nuoyi (Sandy) - France

Impact of the EU AI Act on France

- Since June 2023, France has repeatedly argued that certain provisions of the bill could **stifle innovation** and **hinder European AI start-ups** – like France's Mistral AI, LightOn or Hugging Face, which seek to compete with the American companies OpenAI or Google
- **Regulatory Compliance**
 - French companies developing AI technologies, especially those categorized as high-risk, will need to comply with the new regulatory framework. This includes undergoing conformity assessments, maintaining transparency about AI system operations, and ensuring that their AI products adhere to the ethical and safety standards outlined in the Act
- **Innovation and Market Dynamics**
 - While the Act introduces additional constraints, it also provides clarity and a unified regulatory environment across the EU. This could benefit French startups and smaller AI

companies by creating a more predictable market, thereby fostering innovation within a well-defined legal framework Focus on Foundation Models

- **Focus on Foundation Models**

- The agreement among France, Germany, and Italy emphasizes mandatory self-regulation for foundation models. This implies that developers of foundational AI models in France must establish and adhere to detailed model cards, ensuring accountability and transparency in their AI development processes

The challenges faced by non-tech companies in France in complying with the AI Act

- **Lack of Technical Expertise**

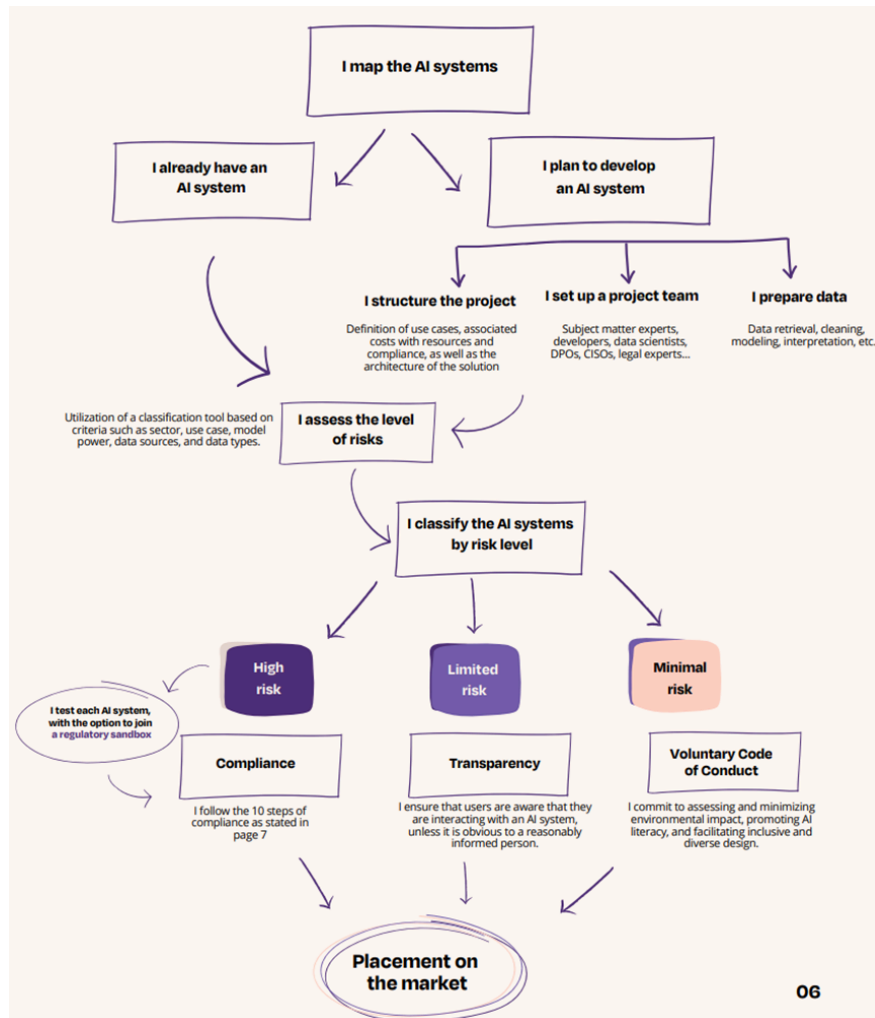
- Non-tech companies often lack the in-house technical expertise required to understand and implement AI technologies effectively. This skills gap is a significant barrier, as companies may struggle to find and hire AI specialists in a highly competitive market

- **Cost of Compliance**

- Implementing AI technologies and ensuring they meet the regulatory standards of the EU AI Act can be costly. Non-tech companies need to invest in new technologies, hire specialized personnel, and possibly undergo external audits to demonstrate compliance. These additional costs can be a significant burden, particularly for small and medium-sized enterprises (SMEs)

The steps a company in France needs to follow to implement the AI Act

The AI Act applies to both existing(legacy) systems and new solutions. You will find below a standard guide to help you understand what you need to do to be compliant.



06

The 10 steps of compliance for high-risk AI systems:

1. Risk Management System
2. Data and Data Governance
3. Technical Documentation
4. Traceability
5. Human Supervision
6. Accuracy, Robustness and Security
7. Quality Management System
8. EU Declaration of Conformity
9. CE Marking

10. Registration

Specific regulatory bodies and guidelines in France

Currently, France does not have a dedicated law regulating artificial intelligence (AI) or the AI industry. Since 2017, the CNIL has actively been engaging in identifying ethical and legal issues related to AI, overseeing cases involving its use, publishing tools and resources to improve the understanding of AI, and managing associated risks as part of this mission.

Moreover, the CNIL is likely to continue to take a leading role in AI regulation in France, as the French Supreme Administrative Court has recommended that the CNIL continue to be the primary regulatory authority for AI upon the adoption of the EU AI Act.

In January 2023, the CNIL created a dedicated AI Department (AID) comprising five CNIL agents, including legal experts and engineers. The main missions of the AID will be:

1. Improving the understanding of AI systems
2. Strengthening the CNIL's expertise for the identification and prevention of privacy risks related to the implementation of AI systems
3. Preparing for the implementation of the future EU AI Act
4. Developing relationships with other stakeholders in the AI ecosystem

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Mohammad (Anaqin) - Sweden

Impact of the EU AI act on Sweden

Before the EU AI act was even imposed, Sweden had already taken a large initiative in establishing their interest in AI. This can be seen through the Swedish government's "National Approach for Artificial Intelligence", created in 2018. (5) This outlined Sweden's interests and their plan to move forward in AI:

Human Capital: Education institutions were required to start providing AI education and training, which included the further education for professionals. Swedish universities have started proposing both bachelor's and master's programs in the AI field including Data engineering, machine learning and statistics, image analysis and machine learning and others. (5)

From the lab to the market: The development, use and deployment of AI solutions is largely dependent on the opportunities to research in the field of AI and the available support for bringing innovative ideas into fruition. Hence the Swedish government has emphasised the need for a strong basic and applied research environment in AI, strong relations with leading international AI research environments, the use of pilot projects, testbed and environments for AI development and lastly, efforts to prevent and manage risk associated with AI. (5)

Networking: Sweden has expressed its belief in the importance of building networks and partnerships to fully harness the benefits of new AI technologies. They emphasise that this is important for Sweden as a country with a relatively limited domestic market. Teaming up with prominent players within or across borders in other member states or beyond the EU is crucial to extending the possibilities for developing AI solutions. (5)

Regulation: It is an integral part of every Member States strategy to enforce the proper regulation. This includes the recommendations for the development of legislation to foster the development of AI. (5)

Infrastructure: Sweden has recognised the importance of strong data infrastructure to accommodate the development of AI. Through this they have concluded that they need to review the needs for digital infrastructure to allow for the harnessing of AI capabilities and they need to continue work on making data widely available to serve as infrastructure for AI training use. (5)

Through the years, Sweden has been steadily establishing their interest in AI and we can see that through the following:

- In 2019, AI Sweden was established. It is the Swedish national centre for applied artificial intelligence. AI Sweden has been able to focus on developing and applying AI for the modern day through their competitiveness. They are broadly funded by a large number of partners from both the private and public sector. (2)
- AI Sweden's mission is to accelerate and use AI for the benefit of their society. Through this they were able to develop the first large Nordic language model: GPT-SW3. They were also able to innovate projects in AI within healthcare, energy, and the public sector.(1)

Some examples of local companies using AI include:

- **Spotify** and their use of AI as a DJ. It is a personalised AI guide that knows you and your music taste so well that it can choose the right music to play for you. It is currently in beta. (6)
- **H&M** has integrated generative AI into their print-on-demand merchandise service. The AI tool allows anyone to mock up and produce garments using AI-generated visual artworks based on input text. It works like stable diffusion or Dall-E. (7)

Challenges faced by non-tech companies in Sweden in complying with the AI act

Resource Limitations: Many Cultural Heritage Institutions (CHI: Museums, Archives, Libraries etc) lack the adequate resources both in funding and skilled personnel required to effectively implement AI/ML. (3)

Technical Expertise: There are significant gaps in technical knowledge required by professionals to implement AI. (3) Non-tech companies need to support continuous upskilling of employees in order to keep up with the rapidly changing AI scene. (4)

System Interoperability: Different CHIs use varying systems which are not always compatible, causing complication in the integration and development of AI tools (3)

Slow Staff Turnover: Low staff turnover in Sweden results in slower renewal of skill sets, which can delay the adoption of new technologies particularly like AI and Machine Learning.

Data Access: The best AI implementations require access to the best quality data for training and this is often hampered by regulatory and ethical concerns regarding privacy, data security and ownership. Non-tech companies struggle to uphold regulations while acquiring the data required for AI training. (4)

Understanding regulations and developing ethical AI solutions: Due to the vast amount of regulations, many organisations are hesitant to start working towards AI development. This is largely due to the newness of the technology and the ambiguity of being ethical and fair in AI relative to their original business (13)

Transitioning from pilots to Production: Business leaders have agreed that they struggle to get past the pilot graveyard. Most pilot projects become learning experiences and are put aside. (13) This is likely due to the big learning curve and the difficulty of getting a newly trained AI to do what you want it to do. Alongside that, there are also the countless regulations that the businesses will have to comply with in order to implement their solutions.

Steps a company in Sweden can take to follow the AI act

1. **Understanding the Risk-Based Reporting:** The EU AI act highly emphasises a risk-based regulatory approach, targeting a large variety and range of entities. This will help companies to distinguish between the AI applications and the level of risk they pose ranging from unethical and unacceptable to minimal risk applications. The knowledge of such information will be vital in adhering to the EU AI act. (11)
2. **Use of the EU AI Act Compliance Checker:** The EU AI act implements new obligations to entities located within the EU. Companies can use the EU AI Act compliance checks to assess the risks involved with their ideas. (12) It is important to note that for further clarity, professional legal advice is advised to ensure all laws are within compliance.
3. **Engaging with regulators and advisors:** As described by the previous step, it is important to engage with the local regulators to ensure that the company's AI tool is in line with the EU AI act and local laws. Doing this can also provide companies with guidance towards the ethical means of gathering data and protecting privacy when it comes to training AI.

Regulatory Bodies in Sweden

1. **European Commission's AI Office (8).**
2. **Swedish Authority for Privacy Protection (9).** AI Sweden requires that any data that is shared complies with all applicable regulations. In this case, Swedish Authority for Privacy Protection will enforce the General Data Protection Regulation (14)
3. **Swedish AI Commission (10)**

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Sam - Germany

Impact of the EU AI act on Germany

The EU AI act has impacted Germany's business regulations, societal views, governmental procedure and overall ethics regarding the usage of data within cyberspace. Germany had politically considered AI ethics and implementation before the EU AI act was made in march of 2024 with the National AI Strategy in 2018. This strategy discussed setting Germany as a central AI hub in Europe by promoting responsible development with a cautious attitude and was revised in 2020 (Wagner, 2023), (ai-watch.ec.europa.eu, n.d.). Even though these strategies were being developed and revised, the EU AI act still solidified regulations within Germany. The specific impacts of the AI act guidelines are as follows:

1. **Restricted innovation and unused potential:** The latest revision of the National AI Strategy or the AI Action plan in 2023 emphasises the need for balance between guidelines and over regulation which has potential to limit innovation as new developments must conform to IT and cyber security, product safety, transparency and the availability and quality of data (www.whitecase.com, 2024)
2. **Germany conducting further revisions:** The Federal Anti-Discrimination Commissioner has identified discrimination risks within AI as a high priority which they have requested for improved statutory protections. Meanwhile the Federal Commissioner for Data Protection and Freedom of Information expressed concerns regarding personal data protection and the GDPR (General Data Protection Regulation) (www.whitecase.com, 2024). This implies that people of authority are trying to exceed the legal requirements set out by the EU AI act.
3. **Businesses may suffer under the complex regulations:** More specifically the employment process within businesses has been impacted since the AI system used is considered high risk in the EU AI act. Hence, these employers are expected to conform to the AI act by implementing competent human oversight and informing affected

individual's data prior to entering the AI system with an emphasis on human intervention in accordance with the GDPR. However, The European Court of Justice has stated that in extreme or exceptional cases the AI systems may carry out automatic procedures without human intervention further increasing complexity (Hoganlovells.com, 2024).

4. **Liability:** If in the event that an EU AI act regulation is broken, who is accountable to receive justice. The Ethics Counsel's published report details that AI should not diminish human capability, authorship and diffusion of responsibility but widen it instead (deutschland.de, 2023). This implies that people shouldn't lose responsibility if the AI is faulty and does not conform to regulations.

Challenges to non-tech companies in Germany

The regulations and guidelines set out by the EU AI act pose challenges and barriers to non-tech companies that are looking to adapt to using AI systems. These challenges come in different forms that the companies have to overcome to be able to use AI without the certainty that the System will positively impact business and profits. A non-exhaustive list has been curated to identify and evaluate the aforementioned challenges:

1. **Current AI standards are incomplete:** As AI systems are relatively new when standards are concerned compared to manufacturing standards for example. Due to the incomplete nature, enforcement becomes inconsistent which jeopardises the EU AI act's legal certainty. In addition to legal uncertainty, compliance costs become more expensive to comply and adapt to more standards being developed which undermines small and medium businesses (Pouget and Zuhdi, 2024)
2. **Barriers to implement risk assessment:** AI developers are struggling to determine 'which fundamental rights to consider, how to assess severity of violations to these rights and what constitutes an acceptable risk-benefit trade-off' discussed by Pouget,H and Zuhdi,R. This concept is then inherited by non-tech companies that use these systems as the AI product's management system will face similar problems which may lead to incomplete risk assessments for products that could endanger life in which the company is liable.
3. **Lack of concise verification:** Due to the subjective nature of AI when evaluating risk mitigation, when a product that has been influenced by AI needs verification against specific design criteria there is uncertainty, because of the ambiguity of proposed standards, of whether the AI aspect has conformed to criteria or has reduced/mitigated previously determined risks. This is due to the lack of specific quantitative and measurable tests to determine whether the AI aspect has passed as different circumstances of the use of AI can lead to different values of risk mitigation and compliance (Pouget and Zuhdi, 2024). Non-tech companies would not have the necessary expertise to evaluate AI's quality and risk mitigation which can lead to incorrect verification.

4. **Identifying and using General purpose AI (GPAI):** As non-tech companies lack AI expertise, a company may not realise that they are using an AI system that has more compliance, risk management and legal uncertainty than AI systems that are designed for specific purposes. This may lead to unintentional misuse and violating regulations as GPAI systems are too ambiguous for standards to effectively regulate as GPAI can perform very basic tasks such as predicting the next word in a sentence with AI like GPT-4 (Pouget and Zuhdi, 2024)

To conclude, non-tech companies are faced with uncertain standards, regulations and guidelines surrounding AI systems in which a lack of expertise can lead to incorrect product information and risks to violating regulations because of legal uncertainties. Therefore, non-tech companies are in the dark due to a concise and informative set standards to regulate AI systems within businesses

Implementation process

Even Though, the challenges faced by businesses leave uncertainty around regulating AI systems, there are some implementation techniques being suggested to help businesses through the implementation process. These techniques are as follows

1. **Educating the populace about AI in business:** Leading companies are aware of the responsibility 'to forge a future that upholds our values and principles' in which the 'German government's AI strategy is aimed at intensifying societal dialogue and education about artificial intelligence' (www.deutschland.de, 2024). This education is presented through professorships in the field of AI, the National skills strategy to promote advanced vocational training, formation of regional centres of excellence, online course on Elements of AI (ai-watch.ec.europa.eu, n.d.). These schemes are to educate and train future employees in AI skills which can bridge the knowledge gap in non-tech companies
2. **Informing the consumers about used AI systems in their product to conform with standards:** The german company Irights.lab has suggested a labelling format to be applied to AI systems to give people the information regarding a specific AI system. The suggested format utilises six dimensions of variables: transparency, accountability, privacy, justice (non-discrimination), reliability and sustainability which is represented similar to the European energy efficiency label (Stuurman and Lachaud, 2022)
3. **Researching innovations, security and accessibility:** The German Government is investing into research labs which 'foster the growth of AI startups', collaborating with industrial businesses to close the gap between research and application and a 'launch of a Reality Lab for Artificial Intelligence in civil protection' which connects AI researchers and industry to 'make AI more accessible and useable for practitioners' (ai-watch.ec.europa.eu, n.d.)
4. **A baseline to implement Risk assessment and mitigation in AI systems taken from established sectors:** For companies to assess risk, they need to determine and document responsibilities, risk management steps and methods used in assessing and

evaluating risks. Most commonly this can be achieved by a table of severity of risk levels and likelihood of risk levels. To mitigate risks, the companies need to design inherently safe products, ensure protective measures are put in place and provide clear safety information to the consumer (Pouget and Zuhdi, 2024)

The German Government is taking steps to improve quality of life for implementing and utilising AI systems within companies by giving guidance and investing in research to standardise and communicate regulations to industry.

Main consultancy companies for Germany

1. **TechGDPR:** This consultancy company based in Berlin give services to help businesses to comply with the General Data Protection Regulation (GDPR) through a 3-step GDPR compliance process - Discovery workshop, Data mapping, Analysis and report - appointing TechGDPR as a data protection officer or as a GDPR representative, anonymity assessment, etc. These services guide and consult companies through implementing compliance against the GDPR in a variety of industries such as Health-Tech, Software as a Service and International technology companies (TechGDPR, n.d.)
2. **Hannover Messe:** This company holds events to connect businesses with other consultancy companies such as TechGDPR to spread information and support for topics such as 'AI Ethics and Compliance Consulting'. Hannover Messe allows businesses to become involved with AI and AI ethics while pointing them to the correct company to handle their compliance and usage of AI. (<https://www.hannovermesse.de>, n.d.)
3. **Ethos AI:** Provide consulting services for pre-audit EU AI Act compliance, AI governance, frameworks, policy and regulation and ethical AI strategy development. Ethos AI also provides personalised services with flexible formats. More specifically Ethos AI conducts comprehensive risk assessments to close compliance gaps, assess companies' AI systems against global standards, guarantee to align a company's data protection complies with GDPR and identify biases, inaccuracies and ethical concerns to ensure data integrity (ACADEMY, n.d.)

Regulatory bodies for Germany

- **The European commission's AI office** (European Commission, 2023)
- **German Data Ethics commission** (Daten ethik kommission) (Federal Ministry of the Interior and Community, 2023)
- **The Federal Ministry for Economic Affairs and Climate Action and the Federal Ministry of Justice**, which were involved in negotiations on the EU AI Act (www.whitecase.com, 2024)
- **The Federal Ministry for Digital and Transport**, which is, inter alia, engaged in the G7 Hiroshima Process on Generative Artificial Intelligence (www.whitecase.com, 2024)

- **The Federal Ministry of Education and Research**, which has recently published the 2023 AI Action Plan as well as significantly increased public funding for AI initiatives (www.whitecase.com, 2024)
- **The German Ethics Council**, Discuss and address ethical questions particularly in life sciences and their application to humanity. The body is separated from any federal parliament and or government in which the Ethics Council must provide a 'variety of ethical approaches and a pluralist spectrum of opinions' (www.ethikrat.org, n.d.)

Future/Potential regulatory bodies (www.whitecase.com, 2024):

- Federal Network Agency
- Federal Office for Information Security
- Federal and state data protection authorities

Specific laws/regulations for Germany

A few laws in germany that affects the development or use of AI (www.whitecase.com, 2024):

- The German Civil Code (BGB)
- The Product Liability Act (ProdHaftG)
- The Copyright Act (UrhG), in particular Sections 44b and 60d concerning text and data mining
- Intellectual property laws that may affect several aspects of AI development and use

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Luanne - Italy

Study the impact of the EU AI Act on Italy.

At present, Italy does not have any specific laws, statutory rules, or regulations that directly govern AI, and it is not expected to create its own comprehensive AI regulation. Instead, Italy, like all EU Member States, will likely rely on the EU AI Act as the primary general and cross-sectoral legislation for AI.

The Italian Data Protection Authority (DPA), also known as the Garante, has set up a special organisational unit specifically for artificial intelligence in 2021. Around March 2024, DPA's chairman made a statement indicating that the authority has the required skills and independence to enforce the EU AI Act. This enforcement aims to ensure that fundamental rights are highly protected.

Implementation Process: Describe the steps a company in Italy needs to follow to implement the AI Act.

Based on a 2019 judgement, algorithmic decision-making process in administrative procedures has to follow a few principles:

1. Transparency: Authorities must be clear about the presence of an automated decision-making process and provide information on the logic used in the algorithm.
2. Human oversight: If the automated decision has legal effects or significantly impacts a person, human involvement in the decision-making process is required.

3. Non-discrimination: Adequate technical and organisational measures must be implemented to ensure that the decision-making process does not result in discrimination.

Identify specific regulatory bodies and guidelines in Italy.

The DPA has issued guidance on the use of AI in several fields, such as data protection when AI is used in healthcare services, facial recognition for law enforcement purposes, tax risks related to combating tax evasion, the reform of Electronic Health Records, and the establishment of the Health Data Ecosystem. The DPA has also carried out control activities on topics such as deep fakes and smart assistants.

The Italian government released the National AI Strategy for 2022-2024, which focuses on three main areas of action:

1. Strengthening Expertise and Attracting Talent: Developing an AI ecosystem by enhancing skills and drawing in talent.
2. Increasing Funding for Advanced AI Research: Boosting financial support for cutting-edge research in AI.
3. Encouraging AI Adoption and Application: Promoting the use of AI in public administration and various productive sectors.

Recent company scandals and regulatory news

1. ChatGPT's General Data Protection Regulation (GDPR) Violation Allegations by Italian DPA
 - The DPA has notified OpenAI that it is suspected of violating EU privacy laws following an investigation into its AI chatbot, ChatGPT. It is said that the developers have no legal basis to justify the storage and collection of users' personal data to train their algorithms. Misleading information given by the platform was also not being handled properly and could mislead children who are way more vulnerable to these inappropriate and harmful responses from ChatGPT. This has led to the AI chatbot being banned in Italy, the first Western country to do so. The ban lasted from the end of March 2023 until it was lifted around one month later when OpenAI implemented some changes to comply with data protection conditions. Changes include allowing users to opt out of having their conversations with the bot to be used to train the algorithms, age verification process to protect children under the age of 13, and increased transparency on how the website processes user data.

Expected Deliverables

-Deeply Analyse the 3 main consulting companies operating in Italy in this industry.

1. Xstream
 - Location: Milan, Italy
 - Specialisation: web development, AI and mobile app development
 - Sector: financial and business services

2. Frankhood

- Location: Bari, Italy
- Specialisation: web and custom software development, AI services
- Sector: advertising and marketing, financial services

-Evaluate their approaches to helping businesses comply with the AI Act.

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Week 3

Sam - Germany

Opportunities, challenges and potential strategies for ethical AI implementation in German industries

Opportunities

Germany has provided many opportunities that can be utilised within each industry such as training programs, consultancy companies and research initiatives to connect industry to the benefits provided by AI in an ethical manner. Even though Germany has made steps towards improving the amount of opportunities available, there is a lack of industry specific opportunities.

1. **Manufacturing:** Companies that are within the manufacturing industry can use the proposed AI labelling system when AI is used during the decision making process of a products life cycle. This labelling technique can help companies comply with German data protection laws and regulations as the consumer is made aware that AI was involved and statistics of the AI's different attributes are stated, hence the consumer can make a better informed decision regarding a manufactured product.
2. **Retail:** Educating the general populace about AI can reduce negative stigma surrounding retail advertisements, tools and interactions between AI and ordinary people. As retail works more directly to the general populace than manufacturing and pharmaceuticals, the negative stereotyping affects retail businesses more.

3. **Pharmaceuticals:** Germany has not made pharmaceuticals a priority when creating opportunities regarding ethical AI implementation. This is potentially caused by the fact that Germany has significantly more international businesses in the manufacturing and retail industries which have been given more attention. In the coming years Germany may invest in a program akin to Spain's approach to providing support to pharmaceuticals, the EU-funded project EXSCALATE4COV and implementing Hispabot-COVID19 which supports diagnostic and treatment of COVID-19 (Anon, n.d.)

Challenges

The main general challenges that industries face is the compliance with incomplete regulations and compliance costs. The complexity surrounding the regulations leads to legal insecurities and undermining smaller companies. However there are some industry specific challenges that are as follows

1. **Manufacturing:** As the manufacturing industry in Germany has reached international status such as Mercedes Benz, compliance with German regulations as well with international regulations would lead to inconsistencies, confusion and further compliance costs. This confusion stems from compliance with the EU AI act and GDPR between Germany and their extraterritorial provisions which can lead to unintentional violations and uncertainty regarding which regulations take priority. Also, if a manufacturing company is spread across the globe, the different regulations can lead to internal conflicts within the company for the best course of action which stints innovations and improvements.
2. **Retail:** The Federal Anti-Discrimination Commissioner and Federal Commissioner for Data Protection and Freedom of Information have expressed want for more strict and enforced regulations regarding their sectors respectively. This need for stricter guidelines, significantly blocks retail from utilising AI in advertisements and as a tool for consumers to use which can limit a businesses options, innovation and drive for market improvement.
3. **Pharmaceuticals:** This industry is hindered by the lack of concise verification and barriers to risk assessments as the AI within pharmaceuticals is relatively new and the risk is significant if an error occurs. The difficulty lies with confirming if AI can improve efficacy of drugs while ensuring that the AI is designing drugs that are desired due to incomplete standards and the already implemented pharmaceutical regulations.

Potential strategies

1. **Manufacturing:** Form teams for each country that the company is present, which are responsible for that section of a company to comply with their respective countries' AI implementation regulations. This then creates independent departments within the company that can act accordingly to comply with local laws/regulations regarding AI which all report to the head offices in Germany. However, in exceptional cases where the regulations of a country are extremely sparse or incomplete then that department/section should follow Germany's regulations
2. **Retail:** Focus on implementing AI with careful consideration of the commissioners' statements and actions which may affect how the AI is implemented. Even though, the commissioner's actions and steps taken to improve anti-discrimination and data security, retail businesses can take precautionary steps to reduce disruption from law change later. These precautions include but are not limited to: ensuring that advertisements are targeting people based on interests and recent searches, informing people on how their data is used, considering an opt out feature and using a number based system instead of personal data if people want more privacy when shopping.
3. **Pharmaceuticals:** As the concept of AI in the pharmaceutical industry is relatively recent, the main course of action for companies revolves around further investments, research and development. The regulations will fully affect this industry once a complete and functional AI system is implemented as the speculated risks and benefits that AI can bring to the industry are not fully known yet. Also, more opportunities may arise if an AI system is proven to increase efficacy, decrease toxicity, lower time consumption, etc.

Identify where AI can enhance quality and lower costs in each industry

Manufacturing

AI within manufacturing settings can lead to less wastage of materials, streamlined factory procedure and reduced costs within a company. These enhancements to the quality of life for manufacturers need to have human oversight with regulated data security while not replacing employees.

1. **Creating a factory floor plan:** Within a factory, moving unfinished products a far distance - from one end of the factory to the other - can slow production, increase profit loss and depending on the product can lead to unnecessary damage. AI can speed up the process to efficiently place each workstation and machine by considering the floor size, machine size and number of machines and compare these variables with a database of successful manufacturers' layouts with similar floor size, machine size and number of machines.
2. **Real time tolerance checking:** As the product moves through each stage of a manufacturing process quality inspectors sample a few products to be tested for tolerance and quality control. If a certain number of the sampled product is defective then a whole batch is either recycled, repaired or thrown away depending on the benefits provided by repairing and recycling. This method can lead to potential quality products

being wasted. AI can be utilised in two ways with a similar outcome of reducing wastes and costs, firstly AI systems can be implemented into factory machines to identify in real time if a product is within tolerances with no visible damage by training an AI system on positive images of the product. If the AI detects a faulty product, the machine and therefore production can be halted, then the quality inspectors can be alerted to assess the judgement of the AI as well as re-collaborate the machine to stop producing defects. Secondly, an AI can be used after a batch is deemed as rejected to identify potential quality products within the rejected batch to reduce waste.

3. **Diagnostics on factory machines:** If a machine breaks down during production, profits are lost for each time the machine is down for. AI can be installed into the machines to run real time diagnostics to ensure the 'health' of a machine is above a given amount and if the the 'health' of a machine falls below the determined value then maintenance can be notified to assess and fix the problems before they lead to a machine breaking down. The AI can assess and identify voltage values, shaking with the machine, waste material build up, etc to determine the overall 'health of the machine'
4. **Customer support service:** AI can be used to give a support service to customers by questioning the customer on a manufactured product. The AI can then give a solution based on the answers received which can potentially reduce the strain on support services by giving solutions to otherwise trivial and frequent issues. If the AI solution does not fix the issue, the customer can be transferred to a person to take over the problem solving.
5. **Inventory and orders:** When a manufacturer over produces a product, the excess has to be stored in warehouses or in the factory which are expensive to keep running if the demand of the product is significantly lower than supply. AI can step in by keeping track of customer orders with human oversight to ensure that a manufacturer is producing a product on an order by order which can theoretically eliminate the need for inventory space for products. The AI may be able to track material storage levels, track orders through the manufacturing process and ensure options are kept, if options are provided by the manufacturer to the customer. This approach leads to lower costs to store product and potentially reduce electrical/water costs if a machine is turned of when no orders are present
6. **Tracking a product for quality insurance:** Even Though systems are in place that complete this task, such as barcodes and infrared identification chips, AI systems may provide more accurate data in real time. The tracking process accounts for where the material was produced, which batch and on what day the product was produced, which production line, etc. The AI can provide more data if it works in tandem with the aforementioned AI systems such as the condition of the machine(s), dimensions and tolerancing and which order the product was for, at the time of manufacture. This allows the manufacturing company to easily identify which specific product was faulty if a recall is needed and ensures that the machine, material, people are up to standard to prevent further recalls.

These key areas within manufacturing have the potential to increase costs while decreasing quality due to inefficiencies and wastages. The AI systems discussed to enhance quality of a

product each have consideration to human oversight which complies to current regulations while ensuring job security as the AI systems are used as a tool rather than replacing employees. In addition, data security is in place in terms of AI as the information used about a person would already be provided when accepting a job at a company and the employee can be notified before implementing the AI. Or though, the short term costs of implementing these AI systems in manufacturing can be high, the profit gained through the efficiency improvements the AI provides, can decrease costs in the long term.

Retail

Retail industries fully utilise AI systems especially in advertisements, promotions and optimising supply chain management. However, the retail industry has the most regulated forms of AI systems compared to manufacturing and pharmaceuticals as the AI systems work so closely to the public and with their data and retail industry mostly brings in products from overseas, which makes retail (more specifically clothing retail) notorious for disobeying labour laws in other countries.

1. **Targeted advertisements and offers:** Based on recent searches and personal interests, retail companies can use AI to send targeted advertisements to keep the consumer interested in what the company is offering and in theory buy more product from the company which increases profits and market growth. The consumers could get personalised offers, that create a similar effect of enticing the customer to purchase more products. The obvious, ethical concerns relate to discrimination such as social status, sex and race to target products which can be avoided if the AI solely holds search history and interests data from the company's website and doesn't hold any personal data. Also, the company can include systems such as allowing customers to opt out in sending the data, enabling a pause and delete features to search history and opt in for personal data for regional advertisements.
2. **Consumer tools:** The retail industry has, in recent years, started to implement AI systems to aid consumers in buying products such as showing how clothes would look, how a piece of furniture would integrate into a living space or representing how paint would look on the consumers walls. The aim is to allow consumers to make better informed decisions before buying which can benefit the industry by increasing customer satisfaction as well as in theory gain more loyal customers of a company/brand. This enables the company to overtake competitors and increase revenue, if the AI system works without biased decision making such as editing sizes, colour quality, clothing scale to project a perfect product to the customer when in reality when the product arrives, it may not fit or look as good as the tool.
3. **Optimising delivery routes:** By predicting or analysing traffic, junction and weather datasets, AI systems can direct the delivery fleets to take the route with the lowest chance of traffic queues, shortest junction wait times and least chance of flooding, snow, ice, etc. This optimization can increase customer satisfaction, decrease delivery costs and deliver more products in the same time as deliveries would be quicker, use less fuel/electricity and gain more profit.

4. **Tracking a product for labour laws:** To ensure fair labour laws and increase customer satisfaction as well as loyalty, retail companies can use AI to track essential information that relate to labour laws. These data points could include but are not limited to: Time spent making the product, where the product was made, how much the worker was paid for this product and how many people are working at the factory at any given time. This information could improve legal security for the company which decreases legal costs as well as assuring consumers that the product they are buying is sourced from fair labour.
5. **Inventory and orders:** In retail, having a product that's not selling as much as other products lying around in warehouses, especially in large quantities can be expensive to store and decrease profits as more profitable products are in lower supply. AI can assess the product inventory to make decisions with human oversight on either giving the product away, reducing prices, huge deals, etc, to move a product and gain profits. Also, AI can track orders through their position in delivery which drives customer satisfaction as the customer can see the order in real time.
6. **Basic customer service:** AI can answer frequent and otherwise trivial questions about sold products which can reduce customer service costs. The AI would give an answer/solution based on the questions that a customer would give, if the answer or solution does not prove effective than the customer can be directed to a human customer support worker, This allows the customer to check or question features with a lower wait time than regular customer support

Pharmaceutical

AI can provide a couple of main benefits to the pharmaceutical industry however these enhancements are more theoretical as a fully functional AI system is being developed and tested. Therefore, these benefits are predicted, assuming an AI system is capable and fully functional.

1. **Decrease research & development time and costs:** The research and development costs and lengthy process is the largest barrier to entry for this industry, therefore a reduction in costs, regardless of magnitude can have huge impacts. AI can aid in research by scanning databases quicker and more effectively than a human counterpart, and can form complete molecules from previous research with desired results. These features can allow research and development teams to fast track specific drugs which can shave years off the development and testing procedure. Also in theory, the reliability of the AI drug discovery systems should lead to less failed drugs which can significantly reduce costs and increase profits.
2. **Targeted volunteers to increase probability to pass clinical trials:** Due to the aforementioned theoretical reliability of the AI system, the volunteers that apply for testing can be targeted for specific drugs to ensure that the drug is effective for different

kinds of people such as ethnicity, sex, pre existing conditions with predictions on the results based on previous tests. However, this may have a particular grey area within ethics of AI implementation as the AI may inherit biased decisions based on the historical datasets being racially biased or contain sexism for clinical trials as well as issues with data security as the personal data is very sensitive. This can be prevented by meticulous analysis and documentation of the dataset used to train the AI and allowing volunteers to opt in for their data to be used as well as an opt out feature or their data is erased after a determined amount of years.

3. **Increase efficacy while decreasing toxicity:** As the theoretical AI system can form specific compounds with engineered qualities, this should decrease the toxicity, side effects and increase effectiveness of the drug that is being designed. Therefore, risks to life will decrease and clinical trials should have more success than failure when testing AI curated drugs. The costs associated with failing clinical trials after years of designing and testing can prevent further attempts at ground breaking discoveries in pharmaceutical industries and the requirements to pass clinical trials may become weaker due to desperation especially in diseases that affect a huge population with lethal outcomes such as cancer, HIV and heart diseases.
4. **Identify key data points in emerging diseases:** As seen with the recent pandemic of COVID-19, attempts are being made to have systems in place that quickly identify key data points and quickly distribute vaccines and drugs that can suppress the spread and mortality rate of emerging diseases. AI can be implemented to speed up processes due to faster comparisons between existing disease databases and the new disease. Also, AI may be able to predict when a pandemic is emerging by analysing reports on obscure symptoms and reactions while predicts or identifying trends within this data

Even though these benefits can save the pharmaceutical industry a vast amount of money, the developers behind creating the AI system must remain vigilant as this industry will have the biggest threat from regulations and the EU AI act as the risks involved are higher than other industries. However, AI systems used as a research aid have proved to be very useful so there is potential to overcome the barriers while conforming to the multitude of regulations. As a baseline, the AI system must contain human oversight at every step to reduce biased decision making and ensure compliance with data security..

Chian (Cheryl) - Netherlands

Analyse AI implementation in an ethical way in manufacturing, retail, and pharmaceutical industries

The ethical use of AI in the Netherlands manufacturing, retail, and pharmaceutical industries is examined, and the results show a complex interplay of opportunities, difficulties, and solutions that might direct ethical behaviour in these areas:

1. Opportunities

- **Manufacturing:** AI can optimise resource allocation and greatly increase manufacturing efficiency while maintaining ethical labour standards. By enabling prompt repairs that minimise workplace disturbances and guarantee a safer working environment, predictive maintenance solutions, for example, significantly lower the physical dangers to human workers. (*Pit, R., 2023*)(*Viswa, C.A. et al., 2024*)
- **Retail:** The retail industry benefits from hyper-personalised marketing and sales thanks to artificial intelligence's capacity to analyse large volumes of consumer data. This may result in customised marketing plans that successfully cater to each person's tastes, raising conversion rates and fostering a sense of brand loyalty. AI-driven analytics may also optimise stock placements and levels to increase sales and decrease overstocking, improving sustainability and profitability. (*Pymnts, 2023*)
- **Pharmaceutical:** By optimising the medication discovery and development process, artificial intelligence (AI) dramatically decreases the time and expense that pharmaceutical companies must spend bringing new drugs to market. Researchers can find potential candidates for additional testing considerably more quickly because to AI models' ability to simulate and predict the interactions between various chemicals. AI can also help design more targeted and therefore more likely to successful clinical studies, increasing the effectiveness of research efforts. (*Viswa, C.A. et al., 2024*)

2. Challenges

- **Manufacturing:** Important technological and safety issues arise when integrating AI with outdated manufacturing infrastructure. Sufficient implementation and continuous supervision are necessary to guarantee that AI systems improve operations instead of interfering. AI poses a threat to employment stability by automating functions that were previously completed by humans, hence workforce transfer and upskilling plans are required. (*Viswa, C.A. et al., 2024*)
- **Retail:** The use of customer data is the primary ethical issue facing the retail industry. Retailers must negotiate complicated data protection laws to prevent betrayals of customer confidence since personalisation and privacy must coexist in a delicate balance. Furthermore, if AI is not adequately managed, algorithms may reinforce pre existing biases in data sets, producing biased results. (*Pymnts, 2023*)
- **Pharmaceutical:** The ethical and precise application of AI is crucial in the pharmaceutical industry. Serious health concerns might result from AI prediction

errors, thus rigorous validation and monitoring are crucial. Ensuring that breakthroughs reach all parts of the population raises ethical concerns about the equal distribution of AI-driven advancements. (Hasan, H.E. et al., 2024)

3. Potential strategies

- **Manufacturing:** Businesses should think about forming cross-functional teams to supervise AI implementations, comprising specialists from both IT and traditional manufacturing, in order to overcome integration difficulties. This can guarantee that AI solutions are in line with current procedures and advance operational objectives. Automated employment difficulties can be partially mitigated by promoting an AI-literate workforce through education and training. (*Bias-free futures: Strategies for ethical AI implementation*)
- **Retail:** To earn customers' trust, retailers should put in place strong data governance structures that not only meet but significantly exceed regulatory requirements. This could involve providing opt-in consent for data gathering and transparent policies for the use of data. Potential ethical concerns can be resolved by utilising AI technologies that are intended to remove prejudice, such as those that anonymize data or audit algorithms for fairness. (*Pymnts, 2023*)
- **Pharmaceutical:** It is essential to work with regulatory agencies to provide precise criteria and recommendations for AI in medication development. Before implementing new AI technologies widely, this may entail pilot programmes with regulatory bodies to test them in real-world settings. You may also make sure that AI technologies are developed and deployed in a way that prioritises patient welfare and ethical issues by collaborating with ethicists and patient advocacy groups. (*Viswa, C.A. et al., 2024*)

With a focus on the significance of careful planning and strict control to optimise benefits while limiting hazards, these in-depth insights offer a road map for utilising AI technologies ethically across a range of industries.

The areas where AI can enhance living standards in each industry

In my extended research, which focuses on the Netherlands, I investigate how artificial intelligence (AI) is transforming four important industries to raise living standards: manufacturing, retail, pharmaceuticals, and fashion. Finding areas where artificial intelligence (AI) may improve productivity, cut expenses, improve product quality, and increase customer pleasure is the aim:

1. Manufacturing

- **Predictive Maintenance:** AI maintains production efficiency and lowers operating costs by predicting equipment failure before it happens and minimising downtime and maintenance expenditures. (*Taking AI to the next level in manufacturing, 2024*)
- **Advanced Quality Control:** AI systems analyse items more accurately than humans can by using machine learning for quality assurance. This lowers waste

and rejects while simultaneously guaranteeing exceptional quality. (*The dawn of ai in manufacturing: Understanding its wide reaching impact on industry, 2024*)

- **Supply Chain and Logistics Optimization:** Artificial Intelligence enhances the supply chain through demand forecasting, inventory control, and logistics planning, guaranteeing timely material availability and effective product delivery. (*6 ways to unleash the power of Ai In Manufacturing*)
- **Energy Management:** AI assists manufacturing facilities in lowering their energy expenses and carbon impact by tracking and managing energy use in real time, therefore fostering sustainability. (*6 ways to unleash the power of Ai In Manufacturing*)

2. Retail

- **Personalization Engines:** With the use of artificial intelligence (AI), marketing campaigns can be tailored, items can be recommended, and client engagement and satisfaction may be greatly increased. (*Beitinger, G., 2024*)
- **Inventory Management:** AI improves supply chain efficiency and minimises overstocks and stockouts by using predictive analytics to improve inventory accuracy. This reduces operating expenses. (*Beitinger, G., 2024*)
- **Virtual Assistants and Chatbots:** The customer experience is improved overall by AI-powered solutions that offer 24/7 customer care, efficiently managing questions and providing assistance to clients. (*Ai in manufacturing - improve the efficiency of your business, 2024*)
- **Checkout and Payment Automation:** AI technologies speed up and simplify the checkout process, cutting down on wait times and raising consumer satisfaction. (*Ai in manufacturing - improve the efficiency of your business, 2024*)

3. Pharmaceutical

- **Drug Discovery:** The identification and screening of possible new medications is accelerated by AI. The process of finding potential candidates for additional testing can be expedited considerably by using generative AI models, which can anticipate the structure and function of chemical molecules. (*Viswa, C.A. et al., 2024*)
- **Clinical Trials:** Through appropriate subject selection, study variable control, and more effective data processing, artificial intelligence (AI) optimises clinical trial designs. This improves study outcome precision while cutting down on the time and expense of drug development. (*Brazil, R., 2024*)
- **Personalised Medicine:** By evaluating patient data and forecasting unique reactions to different therapies, artificial intelligence (AI) aids in the advancement of personalised medicine. This method increases overall treatment efficacy while also customising medical care to each patient's needs. (*Viswa, C.A. et al., 2024*)
- **Operational Efficiency:** Researchers can now concentrate on more difficult issues by using AI tools to automate repetitive processes like data entry and analysis in the pharmaceutical business. This lowers the possibility of human error in addition to cutting operational expenses. (*Han, Y. and Tao, J., 2024*)

4. Fashion

- **Optimised Dyeing Processes:** AI improves dyeing procedures, which lowers water use and pollutants. AI lessens waste and its negative effects on the environment by precisely estimating the quantity of chemicals and dye that will be required. (Hudd, A., 2022)
- **Material Efficiency:** By increasing the accuracy of fabric cutting procedures, artificial intelligence (AI) lowers waste and maximises material consumption. When resources are used efficiently, less fabric needs to be produced, which reduces pollution and water use. (Milton, L., 2024)
- **3D Design and Virtual Sampling:** AI-driven virtual prototyping and 3D modelling eliminate the need for real samples, saving resources and reducing wastage of materials that would otherwise be employed in the production process. (Milton, L., 2024)

This thorough analysis shows that AI not only encourages innovation in a variety of fields but also significantly boosts productivity, quality, cost effectiveness, and consumer satisfaction. AI technology adoption in the Netherlands is anticipated to advance sustainability and living standards in these vital areas as they develop.

MAYBE HERE WITH AI, FASHION INDUSTRY CAN SPEND LESS WATER AND POLUTE LESS?

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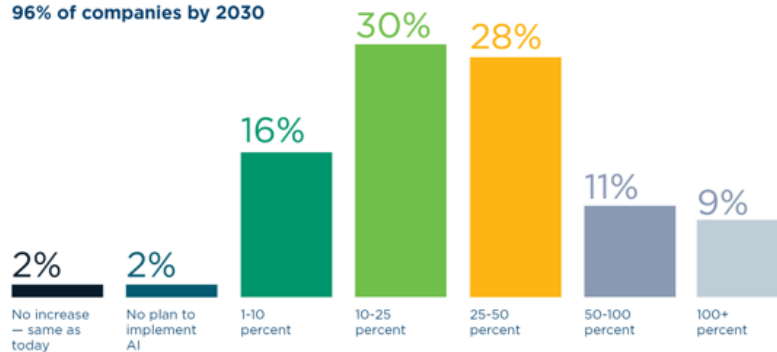
Nuoyi (Sandy) - France

Manufacturing Industry

Production could benefit from the precision of AI. With its ability to analyze vast amounts of data, AI might offer unparalleled insights into consumer demand, helping brands to align their production with actual needs rather than speculative trends. This alignment could drastically reduce overproduction and waste, marking a significant step towards sustainability.

Artificial intelligence is rapidly becoming a force in the manufacturing industry, permeating various processes like semiconductors, software applications, and robotics. With its data processing and decision-making capabilities, AI drives better outcomes and predictive maintenance.

Levels of manufacturing AI investment predicted to rise in 96% of companies by 2030



- **Opportunities**

1. **Operational Efficiency:** AI can optimize production processes, reduce downtime through predictive maintenance, and enhance supply chain management. This can lead to significant cost savings and increased productivity
2. **Customization:** AI enables mass customization, allowing manufacturers to produce customized products efficiently, which can meet specific customer demands

- **Challenges**

1. **Integration with Existing Systems:** Legacy systems in manufacturing may not be easily compatible with new AI technologies, posing integration challenges
2. **Data Privacy and Security:** Protecting sensitive manufacturing data from cyber threats is crucial, and AI systems must comply with GDPR and other regulations
3. **Skills Gap:** There is a shortage of skilled AI professionals who understand both AI technology and the manufacturing processes

- **Potential Strategies**

1. **Collaborate with AI Vendors:** Partnering with specialized AI vendors can provide the expertise and technology needed for successful implementation. Vendors can offer customized solutions that integrate seamlessly with existing systems

Retail Industry

- **Fashion Industry**

- Through the lens of AI, we could reimagine the entire lifecycle of fashion products, from design to production, to consumer engagement, making each step more sustainable and efficient.
- Design processes could be transformed by AI, enabling designers to leverage predictive analytics and machine learning to not only predict trends but also to create more with less. These technologies have the potential to allow for the optimization of patterns to reduce fabric waste and encourage the use of eco-friendly materials, all while speeding up the design process.
- CETIA, a company in the southwest France. Uses artificial intelligence to scan garments, identify hard elements like zippers and buttons, and use a laser to cut them out. It also has machines that can sort clothes by colour and composition at a rate of one per second. Its AI-laser machine can do this at a much faster rate that is rapidly evolving as it perfects the technology. For now, barely one percent of textiles in Europe are turned back into new clothes. That is because clothes are usually a complex mix of materials that must be separated carefully to keep the fibers in good condition if there is any hope of respinning them into new garments.

- **Opportunities**

1. **Personalized Customer Experience:** AI can analyze customer data to provide personalized recommendations, improving customer satisfaction and loyalty
2. **Fraud Detection:** AI can enhance security by detecting fraudulent transactions in real-time, protecting both retailers and customers

- **Challenges**

1. **Consumer Trust:** Building and maintaining consumer trust in AI-driven recommendations and data usage
2. **Technological Investment:** High initial investment costs in AI technologies and infrastructure can be a barrier for smaller retailers

- **Potential Strategies**

1. **Ethical Data Practices:** Implement transparent data management policies that respect customer privacy and comply with regulations

- **Case Study**

- **Les Mousquetaires' DIY chains(flagship home improvement brands)**
- **Opportunities:** Enhance the retail experience by pAInt, a virtual shopping assistant tool designed to guide customers through each stage of their home

improvement projects. This has infused with gen AI so that act as a shopping advisor, providing recommendations based on what the customer cares more about in the moment and also helping them search in a more conversational and natural way.

- **Challenges:** Ensure AI is used responsibly, trained on their patented data, with safeguards in place to limit its responses to home improvement projects only. It was crucial that mitigated against any potential brand damage or privacy issues; Ensure that pAInt was fully integrated with their e-commerce systems
- **Potential Strategies:** Creating and extensively testing, a GDPR-compliant end-to-end experience, so that pAInt would only discuss customers' painting and home improvement needs.

Pharmaceutical Industry

The benefits of AI in shaping clinical research and trials have given rise to many new AI-driven biotech startups. According to a recent report, the number of AI companies involved in drug discovery and development increased from 62 in 2011 to 400 in 2022. This AI-driven transformation is catching the attention of big pharmaceutical companies like Sanofi.

- **Opportunities**

1. **Drug Discovery and Development:** AI can accelerate the drug discovery process by analyzing biological data to identify potential drug candidates
2. **Clinical Trials:** AI can optimize clinical trial processes by identifying suitable candidates and predicting outcomes, reducing trial times and costs

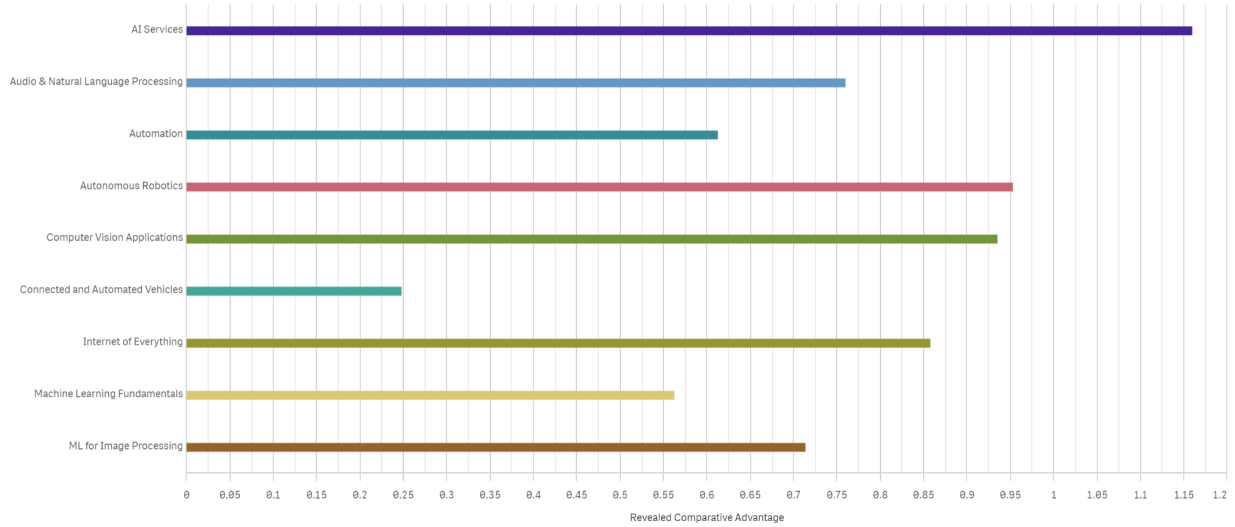
- **Challenges**

1. **Data Integrity:** Maintaining the integrity and security of sensitive patient and research data
2. **Ethical Concerns:** Addressing ethical concerns around AI in medicine, such as biases in AI algorithms and decision-making processes

- **Potential Strategies**

1. **Collaborative Research:** Partner with research institutions and other pharmaceutical companies to share knowledge and resources
2. **Regulatory Alignment:** Work closely with regulatory bodies to ensure AI systems meet all legal and ethical requirements

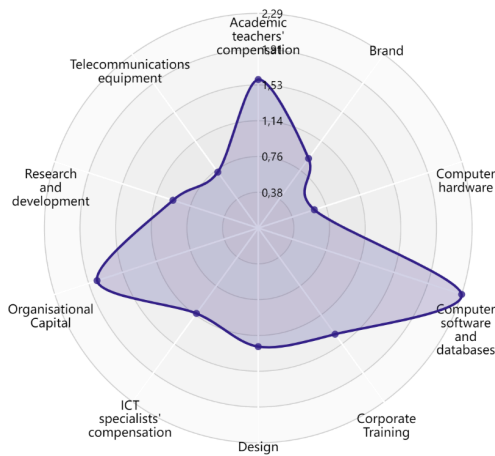
Revealed Comparative Advantage by Thematic Area



Key areas in each industry (manufacturing, retail, pharmaceutical) where AI can enhance efficiency, reduce costs, improve product quality, or drive customer satisfaction

AI investments by type per capita in France vs. EU28 average 2018

● France



Source: JRC based on EUROSTAT, Spintan and Intan-Invest data. * UK information and AI investment data displayed are from before Brexit

Based on the provided radar chart showing AI investments by type per capita in France versus the EU28 average.

Manufacturing:

Research and development
Organizational capital
ICT specialists' compensation

Retail:

Computer software and databases

Corporate training
Telecommunications equipment
Design

Pharmaceutical:

Corporate training
Organizational capital

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Mary - Spain

Opportunities, Challenges, and potential strategies for AI implementation in an ethical way
& Key areas where AI can enhance efficiency, reduce costs, improve product quality, or drive customer satisfaction

Manufacturing

- Challenges: Majority of small and medium-sized enterprises (SMEs) are not knowledgeable of the AI implementation or digitalisation, and especially manufacturing SMEs face a big challenge in AI implementation because they are required to make fundamental changes to their internal resources, processes, and capabilities and high cost is associated in a resource-intensive setting, which requires IT expertise and skilled labor resources and they have struggled to understand the impact of the AI implementation on their businesses (Einav Peretz-Andersson et al., 2024).
- AI can not only enhance SMEs' productivity and performance but also give SMEs flexibility and ability in addressing problems in businesses including dealing with the consequences of extreme events such as the COVID-19 pandemic (Einav Peretz-Andersson et al., 2024).
- Machine-wise implementation is cheaper compared to full production-wise implementation. SMEs can utilize IoT (Internet of Things) and AI for predictive analytics to enhance efficient decision-making processes.
- Manufacturing companies can benefit from Oracle's \$1 billion investment in cloud computing in Spain over the next 10 years (Babu, 2024). Effective implementation of cloud computing or digital transformation can enhance the efficiency, scalability, and cost-effectiveness of the manufacturing processes.

Retail

- Retail companies can also benefit from the investment in cloud computing by Oracle (Babu, 2024). Cloud computing can significantly make managing a massive volume of inventories and transactions more efficient and can help reduce costs and errors.
 - There is a lack of investment in AI implementation by retail companies even though AI could deliver a 59% boost to profitability across the Retail industry by 2035 (Springham, 2023). **WHY?**
 - Zara, an fast-paced global fashion retailer based in Spain, has integrated AI to enhance efficiency, responsiveness, and customer engagement. Their use of AI is not only in consumer behavior analytics and market trend analytics but also in supply chain and inventory management systems using technologies such as RFID tagging, real-time optimization of inventory levels and logistics, and machine learning. Other retailers can also utilize AI in those areas where their competitors are yet to keep up (Zaytsev, 2023)
- *SUSTAINABILITY (pollution etc.) issues can be addressed by AI? (do more research)

Pharmaceutical

- In response to the pandemic, healthcare industry in Spain has implemented AI technologies to support the diagnosis and treatment of the covid19, including development of Hispabot-COVID19, a chatbot specifically designed for the pandemic. In regards to pharmaceutical companies, Spain participated in the EU-funded project EXSCALATE4COV, leveraging Europe's most advanced computing resources to advance intelligent in-silico drug design, enhancing the precision and reliability of Computer-Aided Drug Design (Anon, n.d.). The AI implementation in drug designing would be a significant part of the pharmaceutical companies, however, the companies should also ensure the reliability and accuracy of interpretation of the AI generated results.

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Luanne - Italy

Retail

Sensei:

Sensei is a startup pioneering autonomous supermarket technology through the application of AI. In Verona, Italy, Sensei has partnered with DAO cooperative to launch the country's first autonomous supermarket, named 'Tuday Prendi & Vai.' This store allows customers to enter without barriers, pick up products, and leave without visiting a checkout counter. AI technologies such as computer vision and sensors track items taken from shelves, creating a virtual shopping cart for each customer. Customers can exit by tapping a card or showing a QR code linked to their payment method, all while being assisted by a team present in the store. These initiatives aim to revolutionise retail by integrating smart and seamless shopping experiences into traditional brick-and-mortar settings. It allows customers to shop without barriers, enhancing convenience and efficiency.

Il Gigante:

Il Gigante, part of Gruppo Selex, is leveraging AI through the HI! (Hyperlocal Intelligence) platform developed by ShopFully to enhance the readership and effectiveness of its flyers. Using AI, HI! analyses each Il Gigante store's catchment area and integrates loyalty card data to measure the impact of paper and digital flyers on driving foot traffic. It then optimises the distribution strategy by determining the ideal mix of paper and digital flyers tailored to maximise reach in specific geographic areas. ShopFully's platform also digitises Il Gigante's flyers, distributing them across various digital channels in a personalised and geolocalized manner, enhancing promotional campaign performance. This initiative not only boosts flyer readership but also improves operational efficiency, evidenced by a significant reduction in CO2 emissions from flyer distribution. The partnership spans 58 Il Gigante stores across Lombardy, Piedmont, and Emilia-Romagna, underscoring AI's role in transforming traditional retail marketing strategies to achieve sustainable and effective customer engagement.

Prada:

Prada has launched a new social media campaign using AI to reimagine five of its popular

fragrance bottles. They used an AI Image Generator tool to create fresh interpretations of their scents like Prada Paradoxe and L'Homme. The campaign explores visual perception and photographic illusion, showcasing AI-generated images alongside its original creations. This initiative marks Prada's innovative push in blending technology with creativity, highlighting both the AI's capabilities and its occasional errors as part of the campaign's narrative.

Christiano Agostini, Prada's head of technology, has spoken about the Italian fashion house's preparation for the future. Prada's adoption of AI presents significant opportunities across several key areas. Firstly, AI allows for enhanced customer experiences by personalising interactions based on individual preferences, thereby creating more engaging shopping experiences both online and in-store. Secondly, AI enhances operational efficiency through streamlined inventory management and seamless payment processes, optimising costs and improving customer convenience. Thirdly, AI-driven analytics enable Prada to refine product development and quality by analysing customer feedback and market trends, ensuring offerings align closely with consumer expectations. However, challenges such as navigating privacy concerns and ensuring algorithmic fairness must be addressed to maintain customer trust and compliance with regulations. Prada's strategic approach includes iterative implementation of AI technologies, starting with small-scale pilots to refine effectiveness, while emphasising ethical AI practices to ensure transparency and mitigate biases. By leveraging AI for strategic decision-making, such as market trend analysis and personalised marketing, Prada aims to remain agile in responding to the market dynamics and enhancing the overall customer satisfaction.

A good read from Luca Borreani highlights the impact of AI on the Italian e-commerce market.

Opportunities:

1. **Enhanced Customer Experience:** AI can personalise customer interactions through tailored product recommendations and personalised marketing campaigns based on individual preferences and behaviours. This personalization enhances customer satisfaction and loyalty.
2. **Operational Efficiency:** AI-driven predictive analytics can optimise inventory management by forecasting demand and adjusting stock levels accordingly. This reduces costs associated with overstocking and stockouts, while ensuring products are available when needed.
3. **Product Quality Improvement:** AI-powered data analytics can analyse customer feedback and market trends to refine product designs and enhance quality. This ensures that products better meet customer expectations and preferences.
4. **Cost Reduction:** Automation of repetitive tasks through AI can reduce operational costs, such as customer service inquiries handled by AI-powered chatbots, leading to increased efficiency and cost savings.

Challenges:

1. Privacy Concerns: Collecting and using customer data to personalise experiences raises privacy concerns. Retailers must implement robust data protection measures and obtain customer consent for data usage to maintain trust and comply with regulations.
2. Algorithm Bias: AI algorithms can inadvertently perpetuate biases present in training data, leading to unfair treatment of certain customer groups. Ensuring algorithms are trained on diverse and representative data sets and regularly audited can mitigate bias.
3. Ethical Use of AI: Transparency in AI decision-making processes is crucial. Retailers should disclose when AI systems are used, how data is collected and used, and provide clear opt-out mechanisms to empower consumers and build trust.

Potential Strategies:

1. Ethical AI Design: Develop and deploy AI systems with built-in ethical considerations, such as fairness, transparency, and accountability. Conduct regular audits and assessments to identify and mitigate biases in AI algorithms.
2. Customer Education: Educate customers about how AI enhances their shopping experience while respecting their privacy rights. Provide clear information on data usage and personalised recommendations to build trust and confidence.
3. Regulatory Compliance: Stay informed and compliant with evolving data protection and AI regulations. Proactively engage with regulatory bodies and industry standards to ensure responsible AI deployment.
4. Continuous Improvement: Continuously monitor AI performance and customer feedback to refine algorithms and improve the accuracy of personalised recommendations. This iterative approach ensures AI systems evolve to better serve customer needs over time.

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Anaqin - Sweden

Strategies For Implementing AI in Ethical Way in Manufacturing, Retail and Pharmaceutical Industries:

According to my previous week's research, the main problems that Sweden was facing in complying with the AI act and proceeding with AI developments were: Resource Limitation, Lack of Technical Expertise, Access to Ethical Data, and Understanding Regulations. So in this week's research I will seek strategies to mitigate these problems as a whole/broadly as well as the specifics for each industry.

Strategy for Resource Limitation:

Start-up companies who wish to work with AI or learn how to use AI solutions are eligible to sign up for the AI Sweden startup program (1). This program supports startups by offering training, testing environments and the opportunity to engage in goal-driven projects. AI Sweden offers a lot of technical knowledge and experience opportunities through their connections with over 100 partners. Of which include the major players identified in week 1 (2): Google, IBM, Intel, Microsoft, and Amazon.

Furthermore, as of July 12th 2024, deep tech companies can apply for Vinnova's (Swedish Agency for Innovation Systems) "Acceleration of Deep Tech Companies 2024" funding program, closing on 22 August 2024 (3). This program looks for companies that base their business on innovative development, which can include AI innovations, and application of latest advances in research and advanced technologies. This funding program can alleviate the financial resource limitations of companies as they are eligible to apply for SEK 700,000 - 1,000,000 (Conversions as of 12th July 2024: USD 66,410 - 94,870) per stage of projects with a maximum of SEK 4,000,000 (USD 380,000) to be granted over 3 years. Although the program application and active times are limited, there are many different funding programs offered by Vinnova as well as upcoming funding programs which can be applied for in future times (4).

Strategy for Lack of Technical Expertise:

As general information, it is found that 81% of IT professionals think that they can use AI, however only 12% actually have the skills to do so (5). There is a large disparity in the percentage of people who have the knowledge required to implement AI and the number of professionals in the IT field. This could be because of the advancements of AI through the recent years which differ from the AI taught to IT professionals beforehand. According to Reuters, there is an estimated hiring gap approaching 50% for all AI position needs. This is solid evidence for the need for further education within the AI and Machine Learning space.

For Sweden, there are a few ways that this issue can be addressed. Since the technologies involved with AI and ML are very recent, it is found that recent graduates from STEM fields often

have more up-to-date theoretical understanding of AI concepts and tools as compared to longtime workers (5). However, it is also reported that they lack the practical experience and industry hands-on required to be effective. It is also stated that longtime workers have a deeper understanding of the challenges within their domains which is also very important in applying AI solutions effectively.

This tells us that a possible solution is to employ recent graduates from the stem field and have them coordinate development with longtime workers. This provides the new expertise of recent graduates as well as the industry experience of long time workers to provide for the best in both fields of technical expertise.

Access to Ethical Data:

AI Sweden has made an initiative to provide easy access to training data for businesses interested in using AI technology (7). They have done this through the publication of datasets which they have deemed to comply with all applicable regulations. These datasets may have terms or conditions involved which are required to be followed. Example licences include:

- Attribution (CC BY): allows others to use the work, even for commercial purposes, as long as credit is given to the original creator.
- Attribution-NonCommercial (CC BY-NC): allows others to use the work as long as it is not for commercial purposes, and credit is given to the original creator.

Some of the datasets provided by AI Sweden (7) include:

- **Zenseact Edge AnnotationZ Dataset** (8): It contains real-world traffic scenarios from highways, country roads, and urban areas in and around Warsaw and Poland recorded in a 3 week time span. It complies to GDPR by anonymizing faces and licence plates through the use of Deep Natural Anonymization.
- **Adipocyte Cell Imaging Dataset** (9): It contains 300 pictures of stem-cell-derived human adipocyte cell cultures using both brightfield and fluorescence imaging.

Understanding Regulations:

When it comes to understanding the regulations set, businesses which have already sought the documentational content can seek further assistance from legal experts. AI Sweden has provided information on who to contact for legal assistance (10). As of July 12th 2024, they currently suggest contacting Ebba Josefson Lindqvist, as the International Relations Manager, and Tilde Skanvik, as the legal counsel/ compliance officer.

Key Areas in each industry where AI can enhance efficiency, reduce costs, improve product quality or drive Customer Satisfaction:

1. Manufacturing:

- a. **Supply Chain and Logistics:** As discussed in week 1 retail industry, AI has already been deployed for the purpose of optimising the routes taken by logistics in order to optimise time taken between transportation of goods/materials.
- b. **Energy Optimisations:** AI technologies can be used to optimise power usage through real time tracking and analysis of current energy usage.

2. Retail:

- a. **Personalisation:** AI can be used to personalise the kind of products recommended to unique customers through the analysis of previous purchasing/browsing habits. This can provide a unique experience for each user, potentially increasing the revenue from each customer.
- b. **Chatbots:** The use of generative AI as chatbot can help businesses in minimising the costs associated with customer service as training individuals for customer services are no longer required.
- c. **Inventory Management:** AI can be used to extensively analyse market trends and predict future demand for products, allowing for accurate and excellent management of inventory.

3. Pharmaceuticals:

- a. **Clinical Diagnosis:** AI can be used to analyse scans from patients to determine the probability of having a disease.

4. Fashion:

- a. **Clothing Simulation:** AI image generation can be used to generate realistic physics for how clothing would drape over certain body types to give customers a better idea on how certain garments may look on their body type.
- b. **Waste Reduction:** AI solutions can be implemented to find areas in production where there may be a particularly high amount of waste and suggest countermeasures for such high waste.

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Week 4

Sam - Germany

Actionable recommendations for ethical AI implementation

1. **Implementing concise and direct regulations for companies to follow:** Germany has stated that they want to be the central AI hub in Europe, to achieve this status they need to be the first country in Europe to successfully implement effective AI ethical regulations/standards. These regulations would need to cover every conceivable usage of AI and effect associated with AI, Germany would need to enforce the regulations to encourage business to comply and they would need to provide legal security, in the event of violations. Even though, this task is daunting and tedious, a suitable approach would be to incorporate a controllable baseline for each type of AI system - High risk, low risk and general purpose AI - as a governmental tool in which companies can use which can be monitored by the German Ethics Council and the German Data Ethics commission to ensure compliance.
2. **Rewards for exceeding compliance:** A kin to the International Organisation of Standardisation, the German Ethics Council could conduct audits for companies to firstly check compliance to regulations and secondly to judge whether a company has gone beyond the regulations to ensure ethical practices. This can be rewarded by a honourable status that the company can show to consumers to gain a good reputation, this reward may spark friendly competition between companies in the same industry which can encourage innovations to further ensure ethical practices and encourage compliance.
3. **Continue to fund educational programs:** If these programs are allowed to continue to raise awareness of AI and ethics surrounding them, an ever growing populace will emerge with the skills required to work with AI. This approach, if continued will reduce stigma related to AI which allows for easier integration of Ethical AI within companies that understand how to comply with regulations.
4. **Make more industry specific opportunities:** Compile a series of workshops, websites and fund industry specific consultancies related to ethical AI implementation. As of current, the absence of particular and concise information regarding different industries has led to confusion among businesses which leads to limited developments with AI in these specific industries. Having these opportunities in place can encourage companies to benefit from AI while having legal certainty while complying to the regulations and standards set.

Mary - Spain

Actionable recommendations for ethical AI implementation

1. **Invest in Education and Training:** Offer programs and training to help individuals and businesses stay compliant with the continuously evolving AI regulations. Additionally, educate businesses, especially SMEs, about the benefits of implementing AI technologies, such as cloud computing, while ensuring compliance with the laws.

2. **Provide Incentives to Businesses:** Although Spain does not yet have country-specific AI laws, it can offer extra incentives to encourage businesses to follow its guidelines and implement AI technologies for efficiency.
3. **Implement a Safety Rating System for Businesses:** To ensure the safe use of AI by businesses, Spain can introduce a safety rating system. This system would inform consumers and the general public about the safety level and measures taken by businesses. It would also encourage businesses to enhance the safety and transparency of their AI implementations.
4. **Require Accredited AI Specialists in Businesses:** Establish a rule requiring businesses to employ AI specialists who have the necessary knowledge and accreditation for implementing AI and ensuring legal compliance. These specialists can also be responsible for educating employees and executives on AI-related matters.

Chian (Cheryl) - Netherlands

Actionable recommendations and potential strategies for ethical AI implementation

1. **Establish Clear Ethical Guidelines:** Clearly define the norms and appropriate methods for AI development and application in your extensive ethical guidelines. These rules should ensure that AI systems function openly and equitably by taking into account both regional and global cultural norms.
2. **Implement Rigorous Oversight Mechanisms:** Establish supervision procedures to keep an eye on AI systems at all times. This entails setting up impartial review panels and regulatory agencies whose job it is to constantly assess AI applications to make sure they adhere to legal and ethical requirements.
3. **Promote Transparency:** Companies should be urged to publicly record and share their AI processes and data usage guidelines. Giving clear explanations of the data that AI systems utilise, how they make judgements, and the safeguards in place for that data are all part of this.
4. **Enhance Data Privacy Protections:** Boost data security protocols by securing user data using sophisticated cryptography methods and anonymization procedures. Make that all AI systems abide by applicable privacy rules, such as the General Data Protection Regulation (GDPR).
5. **Foster an Inclusive AI Ecosystem:** Create AI systems that are impartial and inclusive. To avoid biases that could result in unjust treatment or discrimination, AI is trained using a variety of data sets that fairly represent all facets of society.
6. **Educate and Train Stakeholders:** To increase awareness of the ethical implications of AI, developers, users, and policymakers should participate in continuing education and training programmes. The possible effects of AI on society and the significance of ethical issues in AI development should be the main topics of discussion here.
7. **Encourage Public-Private Partnerships:** Encourage cooperation to exchange resources and expertise between public and private sectors, academic institutions, and civil society organisations. These collaborations may spur the creation of moral AI solutions that advance society at large.

8. **Establish AI Ethics as a Core Business Strategy:** Motivate businesses to consider AI ethics as an integral part of their business strategy, rather than merely a legal obligation. Customers' and partners' trust in the brand can be increased using this strategy.
9. **Support Innovation While Ensuring Accountability:** Make sure that technology doesn't progress faster than our capacity to govern it responsibly in order to strike a balance between innovation in AI and responsibility. As part of this, procedures for accountability and reparation should be put in place in the event that AI systems malfunction or behave unethically.
10. **Regularly Update Policies and Practices:** Because artificial intelligence is a fast developing field, laws governing its usage also need to change. Guidelines and rules should be updated on a regular basis to ensure they are still applicable and useful in handling emerging ethical issues. and responsibility in situations where AI systems damage people or behave against the moral standards that they were designed to uphold.

The Netherlands can establish itself as a pioneer in ethical AI by putting these tactics into practice. This will allow the country to promote technology that complies with legal requirements and societal norms, all the while encouraging innovation and industry growth.

Nuoyi (Sandy) - France

According to CNIL's AI Action Plan:

1. **Understanding AI System:** Investigating AI system's workings and impacts, focusing on fairness(implement measures to prevent bias and ensure equitable AI decision), transparency and data protection, like document data sources, decision-making processes and algorithms.
2. **Guiding Privacy-Friendly AI Development:** Support GDPR-compliant AI development with guidelines for data sharing and reuse.

Mohammad (Anaqin) - Sweden

Actionable recommendations for ethical AI implementation:

1. **Understanding the Value of AI:** Swedish businesses who wish to understand the value of AI or educate their employees of the latter can take a free course offered by AI sweden which aims to teach some of the fundamentals and important aspects of AI to beginners. (1)
2. **Understanding the Ethical and Legal Implications of AI deployment:** Understanding the regulations involved with AI begins with reading about them. Information can be found regarding the EU AI act can be found online (2). If local Swedish businesses wish to seek further clarifications about local laws and EU laws, they can look to contact further legal advice from AI Sweden's legal experts (3). Online tools like the EU Ai act Compliance Checker might also be useful before contacting legal experts (5).

3. **Creation/Usage of Ethical AI Training Datasets:** Companies who wish to create/use their own dataset have to abide by the privacy and ethical laws surrounding training data. Businesses can verify their compliance through engagement with the Swedish Authority for Privacy Protection and the Swedish AI commission. This will ensure that all the training data used is ethical and does not violate the privacy of public individuals. Furthermore, smaller businesses who do not have the resources to create their own training data can seek the datasets available at AI Sweden (4).
 4. **Promote Partnership between Private, Public and Educational Institutions:** The benefit of this is the resources that partnerships can share. If more companies have more access to education and resources which are required to implement AI, there will be a greater understanding of AI itself as well as the ethical requirements of AI. This will promote a better broader understanding of AI for all partners within the industry.
 5. **Regularly Assess Ethical Performance and Provide Support based on Merit:** Creating a metric for ethical performance can allow the Swedish government or local businesses to assess their compliance to regulations as well as how well they are complying relative to other businesses. This can help in keeping a stricter regulation as it encourages companies not to slack in terms of ethics. Additionally, Providing support based on ethical merit will encourage businesses to stay ethical.
 6. **Staying Aware of AI developments:** There are many cases in other industries where developments in technologies breed further regulations for the said technology. It is likely that it is no different for AI. Keeping that in mind, There is a high likelihood that further developments in AI will lead to more regulations on AI which are required to be followed. Keeping up to date with the developments will help ensure that businesses are always ready to adjust with sudden changes to ethical policies.
1. <https://www.ai.se/en/adoption/courses-and-competence-building/get-started-ai-online-course>
 2. <https://www.europarl.europa.eu/topics/en/article/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence>
 3. <https://www.ai.se/en/ecosystem/networks/legal-expert-group>
 4. <https://www.ai.se/en/labs/data-factory/datasets>
 5. <https://artificialintelligenceact.eu/assessment/eu-ai-act-compliance-checker/>

Luanne - Italy

Actionable recommendations and potential strategies for ethical AI implementation

1. **Create an independent AI Ethics board:** Establishing an independent AI Ethics Board is crucial for ensuring that ethical considerations are central to AI development and deployment. This board should be composed of a diverse group of experts from various fields, including technology, law, ethics, and social sciences. The board should include

technologists who understand the technical intricacies of AI, legal experts familiar with data protection and privacy laws, ethicists who can offer insights into moral considerations, and social scientists who can evaluate the societal impact of AI systems. The board's primary functions will include providing guidance on ethical AI practices, overseeing AI projects to ensure compliance with ethical standards, and addressing emerging ethical issues as technology evolves. They should also engage in public consultations to gather diverse perspectives and ensure that ethical guidelines reflect societal values. The board should operate independently from governmental and corporate influences to maintain objectivity. Regular reports and recommendations should be published to ensure transparency and accountability.

2. **Formulate comprehensive ethical guidelines:** Developing comprehensive guidelines for ethical AI is essential to ensure that AI systems are designed, developed, and deployed responsibly. Guidelines should mandate that AI systems are transparent in their operations. This includes clear documentation on how algorithms make decisions, accessible explanations for end-users, and open reporting of any biases or limitations. Transparency fosters trust and enables users to understand and challenge AI-driven decisions. Clear lines of accountability should be established, specifying who is responsible for the ethical aspects of AI systems at different stages. This includes developers, companies, and regulators. Procedures for addressing and rectifying ethical breaches should be well-defined. Guidelines should emphasise the importance of fairness in AI algorithms. This involves regular auditing to detect and mitigate biases, ensuring equitable outcomes for all users, and considering the impact of AI systems on marginalised or vulnerable groups. Stringent privacy standards should be included, requiring that AI systems adhere to data protection regulations such as GDPR. This includes ensuring secure data handling, obtaining informed consent for data usage, and providing users with control over their personal information.
3. **Include AI Ethics in educational programs:** Integrating AI ethics and compliance into educational curricula is crucial for preparing future professionals to address ethical challenges effectively. Educational institutions should incorporate AI ethics as a core component of computer science and engineering programs. This should cover the ethical implications of AI technologies, regulatory requirements, and case studies of ethical dilemmas in AI. Hands-on training should be provided through simulations, workshops, and real-world projects that emphasise ethical decision-making and compliance. This practical experience will help students apply theoretical knowledge to actual scenarios.
4. **Ongoing professional development:** Continuous learning is necessary to keep pace with evolving ethical guidelines and regulatory changes. Organisations and professional bodies should offer specialised training programs focused on the latest developments in AI ethics, legal requirements, and best practices. These programs can include certifications, workshops, and conferences. Create platforms for knowledge sharing and discussion among AI practitioners, researchers, and policymakers. This could involve

regular seminars, webinars, and publications that highlight emerging trends and case studies in AI ethics.

5. **Encourage collaboration:** Collaboration between government, industry, and academia is essential for developing and implementing effective ethical AI solutions. Establish joint initiatives and partnerships to tackle common ethical challenges. These collaborations can lead to shared research, collective problem-solving, and the development of standardised practices and guidelines. Leverage public-private partnerships to drive innovation while ensuring that ethical considerations are addressed. Governments and private entities can work together on projects that push the boundaries of AI technology while adhering to ethical standards.
6. **Facilitate innovation through regulatory sandboxes:** Regulatory sandboxes allow for controlled experimentation with AI technologies, providing a safe environment to test and refine ethical frameworks. Develop regulatory sandboxes that allow AI systems to be tested under real-world conditions while ensuring ethical oversight. These sandboxes should be designed to balance innovation with risk management, providing a framework for experimentation while safeguarding public interests. Use the insights gained from sandbox experiments to refine ethical guidelines and compliance measures. Regular evaluations should be conducted to assess the effectiveness of these measures and make necessary adjustments based on real-world feedback.
7. **Conduct regular AI audits:** Regular audits of AI systems are essential for ensuring compliance with ethical guidelines and regulatory requirements. Develop a robust framework for auditing AI systems that includes evaluating transparency, fairness, accountability, and privacy. Audits should be conducted by independent bodies to ensure impartiality. Audit findings should be reported publicly to ensure transparency. Establish procedures for addressing and remediating any identified issues, including updating ethical guidelines and improving system design.
8. **Create metrics for ethical performance:** Develop metrics to assess the ethical performance of AI systems and guide decision-making. Define specific metrics related to fairness, transparency, accountability, and privacy. These metrics should be used to evaluate AI systems throughout their lifecycle, from development to deployment. Use the metrics to inform decision-making processes, ensuring that AI systems meet ethical standards and comply with regulatory requirements. Regularly review and update these metrics to reflect evolving ethical considerations and technological advancements.
9. **Other obligations and recommendations for Ethical AI implementation:** To foster trust in AI systems, it is essential that they are designed with transparency and adherence to core values, ensuring that effective measures are taken to minimise negative impacts. Safety must be a priority at all levels, encompassing data protection, system integrity, and the prevention of adverse consequences. Human oversight is vital to ensure moral and legal accountability, defining clear levels of autonomy and responsibility. Effective AI

governance should address scalability issues, ensuring that social benefits outweigh risks, while incorporating validation and monitoring procedures to protect rights and uphold societal values.