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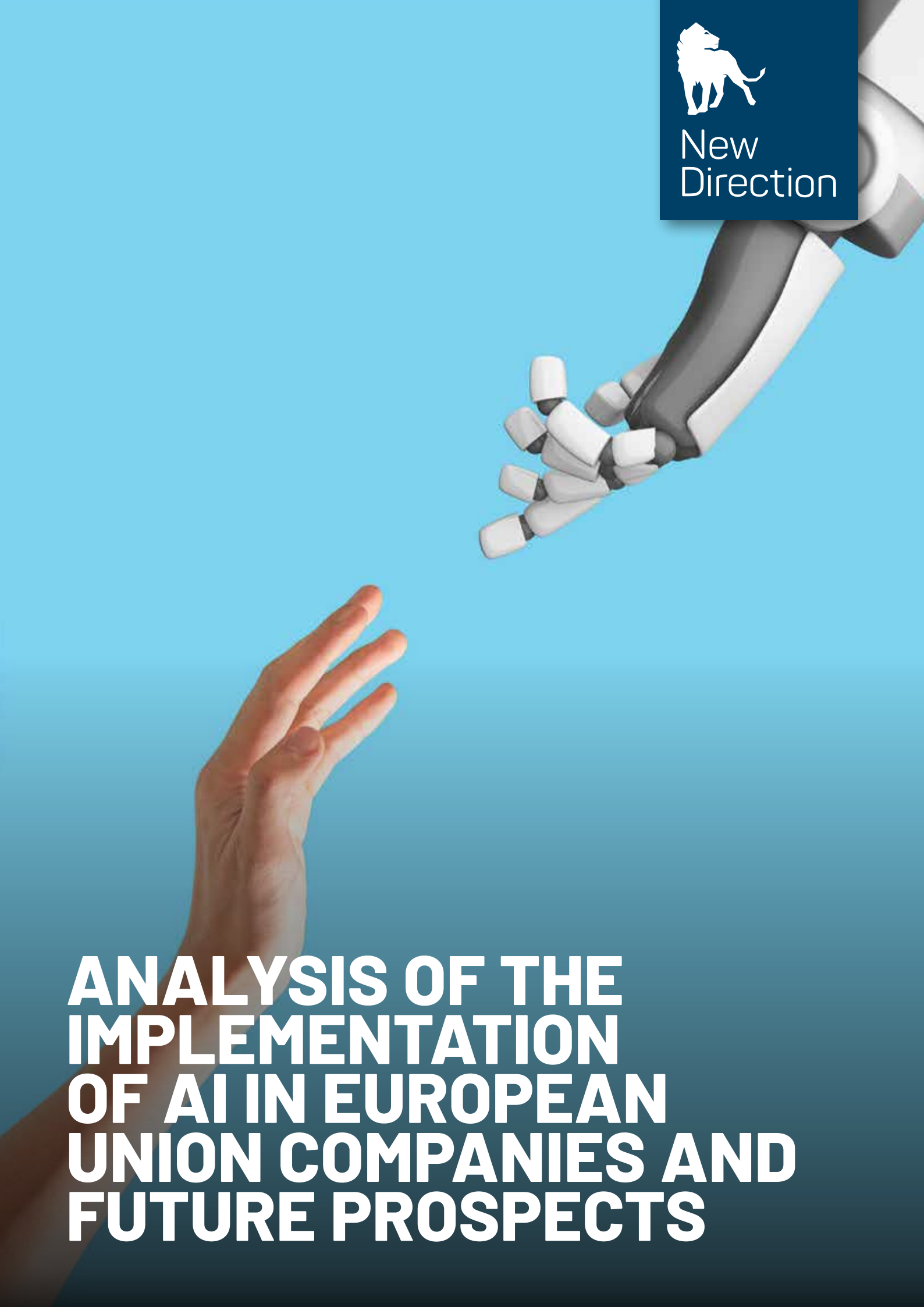

ANALYSIS OF THE IMPLEMENTATION OF AI IN EUROPEAN UNION COMPANIES AND FUTURE PROSPECTS

New Direction

Founded by Margaret Thatcher in 2009 as the intellectual hub of European Conservativism, New Direction has established academic networks across Europe and research partnerships throughout the world.

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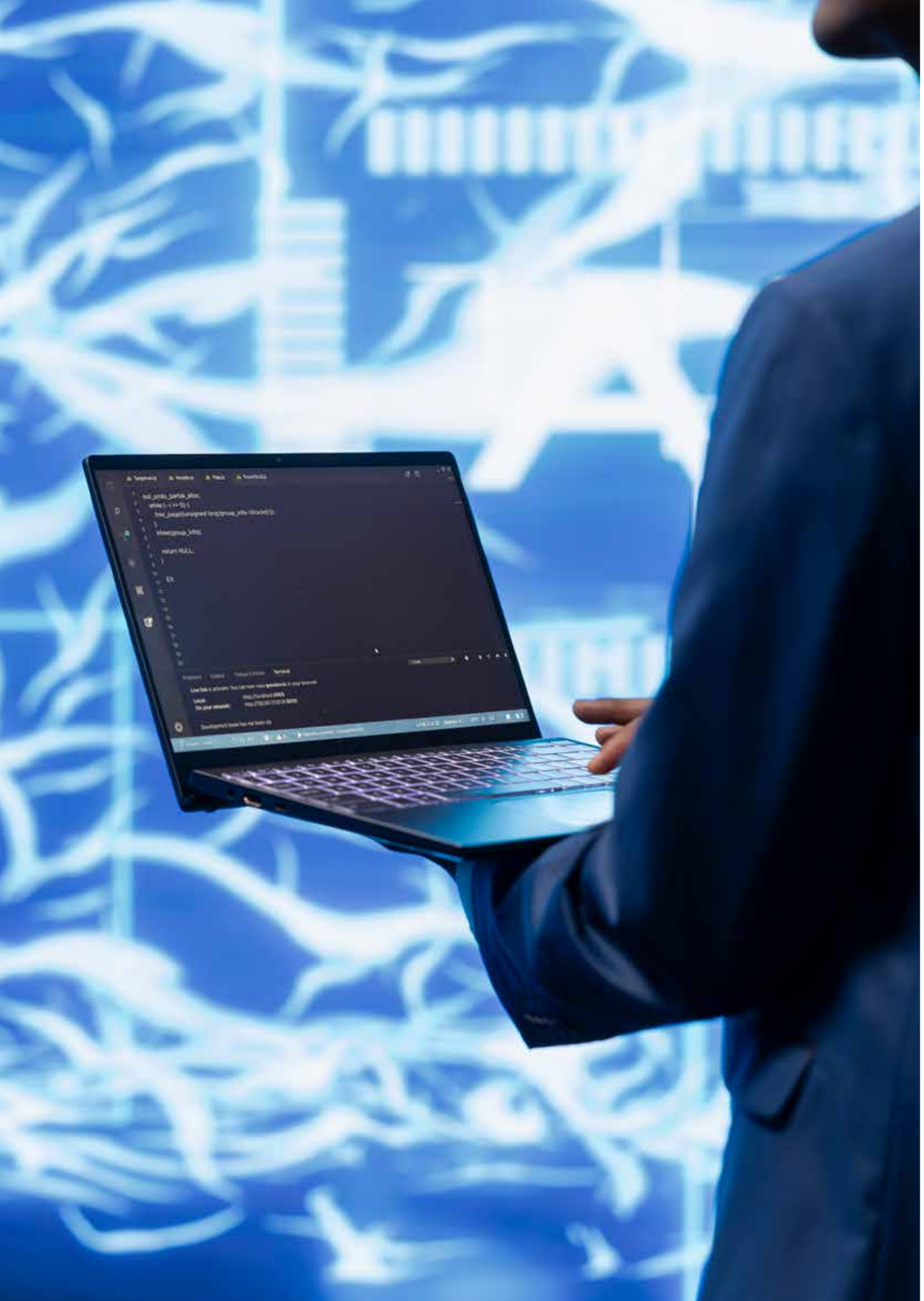


1

INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN THE EUROPEAN BUSINESS CONTEXT

Although there is no internationally established definition of artificial intelligence (AI), the Commission refers to artificial intelligence (AI) as a set of systems that manifest intelligent behaviour, as they are able to analyse their environment and take action - with a certain degree of autonomy - in order to achieve specific objectives.

The term AI encompasses a number of evolving technologies that develop synergies with other emerging trends (e.g. in robotics, big data, cloud computing, high-performance computing, photonics and neuroscience). A breakthrough was achieved with the development of machine learning algorithms capable not only of learning from large volumes of data using specialised processors, but also of improving their accuracy over time.

In any case, artificial intelligence (AI) is not new in the business environment, although there has been a qualitative and quantitative change in the use of this technology in recent years.

According to Eurostats' article "Use of artificial intelligence in enterprises", that give us new numbers on how EU businesses use artificial intelligence (AI) technology, artificial intelligence is growing fast and can have many good effects, like making transportation safer and cleaner, improving manufacturing efficiency, making energy more affordable and sustainable, and helping us make better decisions. AI effects are shown when machines use different technologies like reading text, seeing images, understanding speech, creating language, learning or understanding complex patterns. These tools can collect and analyse data to help make predictions, suggestions, or decisions that can help reach specific goals.

AI systems can be software like computer programs. computer programs that can see images, help you online, understand what you say, or recognise faces can be found in apps, websites, or built into things like phones and computers. Robots that work on their own, vehicles that drive themselves, and flying drones.

Businesses using AI technologies

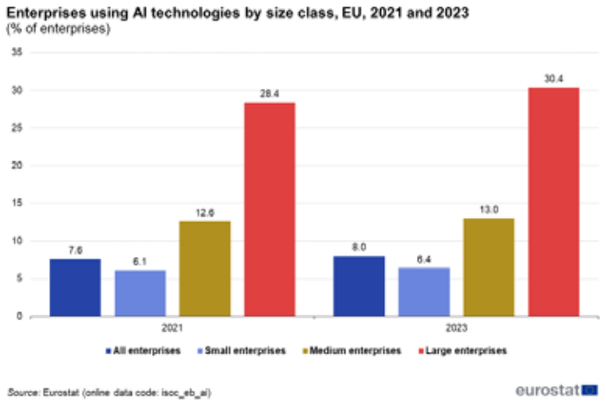
In 2023, 8 out of every 100 businesses in the EU with 10 or more employees and self-employed people used some form of AI technology.

- Technology that analyzes written language.
- Technologies that turn spoken words into text that computers can understand (speech recognition)
- Technologies that create written or spoken language (natural language generation)
- Technology that can recognise objects or people in pictures (image recognition, image processing).
- teaching computers to learn from data) is becoming increasingly popular in various industries such as healthcare, finance, and marketing.Using advanced technology (deep learning) to analyse data
- Technology that helps with tasks like decision-making and automating work processes, such as AI software or robots.
- Technologies that allow machines to move on their own by seeing and making decisions based on what's around them.

In 2022, AI technology usage went up by 0.4% from the previous year according to Figure 1. In Figure 1, it's clear that big companies are using AI more than smaller ones.In 2023, a small number of small businesses, a bit more medium businesses, and a lot of large businesses used AI. One reason for this difference could be how hard it is to put AI technology in a big company and how costs change as the company gets bigger. Larger businesses can make more money or save more money with AI because of their size. Big companies might find it easier to invest in AI.

Figure 1

Businesses using AI technologies based on company size, EU, 2021 and 2023. Percentage of businesses.



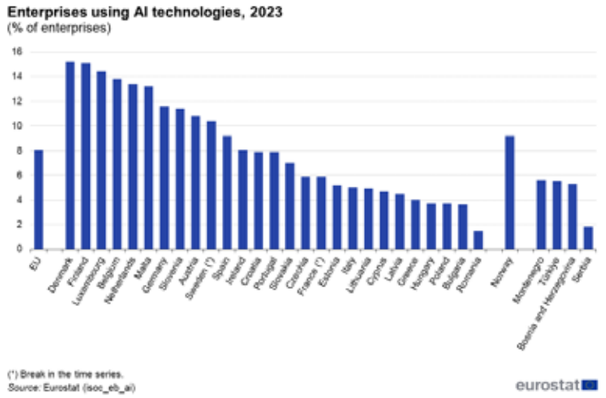
Source: European Union statistics agency (Eurostat)

When looking at businesses that use AI technology in European Union countries, we can see that the percentage of businesses using AI ranged from 1.5 % to 15.2 %.In Denmark, 15.2% of people had the highest share, followed by Finland at 15.1% and Luxembourg at 14.4%.On the other hand, Romania had the lowest share at 1.5%, followed by Bulgaria at 3.6%, and both Poland and Hungary at 3.7%.

Next chart will show which countries in the EU, as well as Norway and some candidate countries, are using AI technologies in 2023. The chart displays this information using vertical bars.

Figure 2

Companies using AI technologies by country in 2023 . Percentage of businesses.

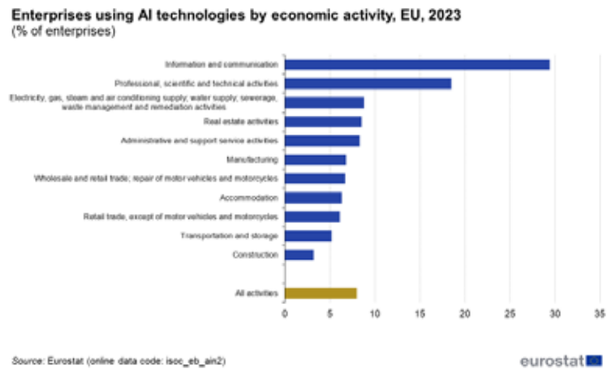


Source: Eurostat (isoc_eb_ai) - Information comes from Eurostat.

In certain jobs, AI is used much more than in others, as seen in Figure 3.This suggests that AI is better suited for some tasks.In 2023, the industries that used AI the most were information and communication (29.4%) and professional, scientific, and technical services (18.5%).In every other type of business, less than 10% of companies are using AI.The costs varied from 8.8% for utilities like electricity and water, to 3.2% for construction.

Figure 3

Enterprises using AI technologies by economic activity. Percentage of businesses.



Source: Eurostat (isoc_eb_ain2). Rewritten: Data from Eurostat (isoc_eb_ain2).

Types of artificial intelligence technologies employed

EU businesses used various kinds of AI technologies. In Figure 4, there wasn't one main AI technology. AI tools that help with tasks or making decisions were used more frequently. Automated software that uses artificial intelligence to do tasks usually done by people. In 2023, only 3 out of every 100 businesses used AI technologies. AI programs that can understand and analyze written words. Text mining was used by 2.9% of businesses. teaching computers to learn from data) can help computers do many things without being explicitly programmed - e.g.facial recognition, spam filtering, product recommendations. Between 2.1% and 2.6% of companies used technologies like deep learning, speech recognition, image recognition, image processing, and natural language generation for data analysis and communication. Machines can move by themselves using technology that helps them see and decide on their own. Less than 1% of companies (specifically 0.9%) were using self-driving vehicles.

While not all businesses use the same AI technology, Figure 4 shows that larger companies tend to use it more often. AI technologies that help with decision-making or automate tasks were used the most, at 16.4%.Next was machine learning for analyzing data, used by 14.6%.7% of AI technologies that allow machines to move on their own based on what they see around them are not used very often. In 2023, the graph shows the different types of AI technology used by businesses in the EU. The bars on the chart represent the size of the businesses using the different AI technologies.

Figure 4

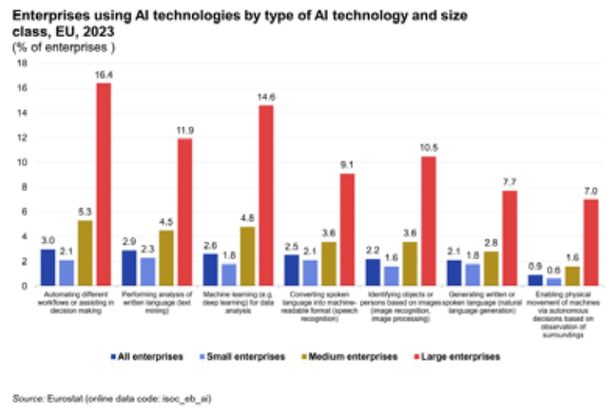


Figure 4 shows which kinds of AI technologies companies are using based on their size in the EU in 2023. Percentage of businesses. Eurostat has data on artificial intelligence in Europe.

If we focus more in this topic, Table 1 shows the different AI technologies used in various economic activities. In the information and communication industry, most companies use AI technology for data analysis and text mining. Machine

learning is the most popular AI technology used for data analysis, with 16.2% of companies using it, followed by text mining at 14.2%.In jobs like consulting, research, and technology services, speech recognition was used a little more than other AI tools (7.2%).Text mining and AI tools that automate tasks or help with decisions were used slightly less, at 6.9%.In other activities, only a small percentage of companies use certain AI technologies, from less than 1% to 3.9%.

Table 1

Enterprises using AI technologies by type of AI technology and economic activity, EU, 2023
(% of enterprises)

	Use of AI technologies						
	Automating different workflows or assisting in decision making	Performing analysis of written language (text mining)	Machine learning (e.g. deep learning) for data analysis	Converting spoken language into machine-readable format (speech recognition)	Identifying objects or persons based on images (image recognition, image processing)	Generating written or spoken language (natural language generation)	Enabling physical movement of machines via autonomous decisions based on observation of surroundings
All activities	3.0	2.9	2.8	2.5	2.2	2.1	0.9
Manufacturing	2.9	1.8	1.7	1.4	2.2	1.2	1.5
Electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities	3.9	2.5	3.4	2.1	2.2	1.8	1.0
Construction	0.8	1.0	0.4	1.4	0.8	0.6	0.3
Wholesale and retail trade; repair of motor vehicles and motorcycles	2.0	2.2	1.8	1.9	1.5	1.8	0.7
Retail trade, except of motor vehicles and motorcycles	2.3	1.7	1.7	1.8	1.4	1.7	0.5
Transportation and storage	1.8	1.7	1.3	1.6	1.4	1.3	0.6
Accommodation	2.0	2.0	1.2	2.0	1.6	1.8	0.8
Information and communication	12.2	14.2	10.2	10.6	9.0	11.1	2.9
Real estate activities	2.7	3.2	1.7	2.9	1.8	1.7	0.6
Professional, scientific and technical activities	6.9	6.9	6.8	7.2	4.2	4.5	1.3
Administrative and support service activities	2.5	3.8	2.3	2.8	1.8	2.5	0.7

Source: Eurostat (online data code: isoc_eb_ain2)

eurostat

Table 1 shows which kinds of AI technologies companies are using based on their activity in the EU in 2023. Percentage of businesses. Eurostat has data on artificial intelligence in Europe.

Why do European businesses use AI software or systems?

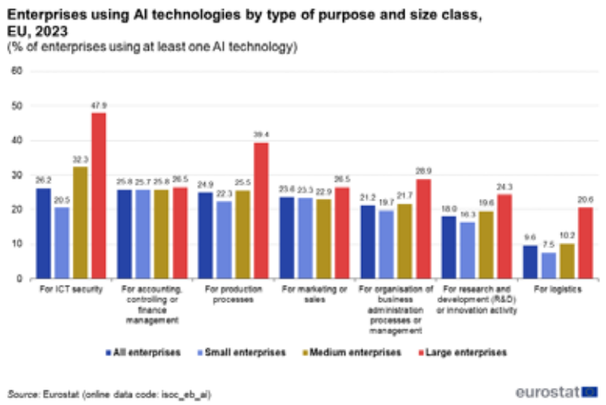
European businesses are using artificial intelligence software and systems for various tasks. In 2023, around 26.2% of businesses that used AI technology used it for ICT security purposes. Using machine learning can help detect and avoid cyber-attacks. It is also effective in tasks related to accounting, controlling, and finance management, with a success rate of 25.8%. Of all the companies using AI, only 9.6% used AI software or systems for logistics the least.

Businesses also use AI software and systems for different reasons depending on how big they are. Large companies are more likely to use AI technology for ICT security, production processes, and logistics compared to small companies. For example, almost half of big businesses use AI for ICT security, while only a fifth of small businesses do. The difference in usage between the two types of enterprises is also significant for production processes and logistics. This shows that large companies are more advanced in adopting AI technology in various areas of their operations.

In 2023, a bar chart in the EU will display how different types of businesses use AI technologies. The chart will show the size of each business using various AI purposes

Figure 5

Percentage of businesses using at least one AI technology. Percentage of enterprise.



Source: Information from Eurostat (isoc_eb_ai)

As can be seen in table 2, Companies in different industries use AI for specific tasks relevant to their field. In manufacturing, AI is mostly used for production processes, while in the energy, water supply, and communication sectors, it is mainly used for security purposes.AI was primarily used for research and development, as well as for innovation in the information and communication sector. Businesses mostly used AI technology for marketing and sales in the accommodation industry (51.4%) and retail trade industry (41.8%).

Table 2

Companies in the EU using AI for different purposes and industries in 2023. Percentage of businesses using at least one AI technology.

Enterprises using AI technologies by type of purpose and economic activity, EU, 2023
(% of enterprises using at least one AI technology)

	Purpose of use						
	For ICT security	For accounting, controlling or finance management	For production processes	For marketing or sales	For organisation of business administration processes or management	For research and development (R&D) or innovation activity	For logistics
All activities	26.2	25.8	24.9	22.6	21.2	18.9	9.6
Manufacturing	27.5	20.7	36.2	14.3	16.2	14.6	14.2
Electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities	37.6	20.8	26.5	21.8	21.2	15.0	9.6
Construction	21.5	32.1	12.1	9.8	20.7	10.3	5.0
Wholesale and retail trade; repair of motor vehicles and motorcycles	26.3	25.9	18.0	35.4	19.3	10.8	14.2
Retail trade, except of motor vehicles and motorcycles	21.9	25.2	17.1	41.8	14.2	7.9	17.7
Transportation and storage	28.8	25.2	19.4	14.1	24.4	8.8	27.3
Accommodation	16.3	24.2	18.2	51.4	22.0	9.1	4.5
Information and communication	31.6	21.8	29.7	31.1	29.3	41.3	8.0
Real estate activities	24.3	24.8	11.7	20.9	16.3		
Professional, scientific and technical activities	21.4	33.0	24.4	15.7	22.8	18.2	3.5
Administrative and support service activities	28.6	23.4	20.6	26.7	24.3	13.3	6.0

Source: Eurostat (online data code: isoc_eb_ain2)

eurostat

Source: Data provided by Eurostat (isoc_eb_ain2)

The information contained in the reference article comes from a study conducted in 2023 about how businesses use technology and online shopping. The National Statistical Authorities conducted surveys in the early months of the year to gather statistics. In 2023, a survey was conducted on 150,400 out of 1.47 million businesses in the EU. Out of 1.47 million businesses, around 83% were small, 14% were medium, and 3% were large companies. Businesses are classified based on their size into small (10-49 employees), medium (50-249 employees), and large (250+ employees).

The information in this article might be different from the data in the database because updates were made after the data was taken for the article. The database arranges data by the year of the survey. An enterprise is the unit we look at when we collect statistical data, as stated in Regulation (EC) No 696/1993 passed on 15th March 1993.The survey included businesses with 10 employees or more and people who work for themselves. Economic activities are grouped into categories called NACE Revision 2. These categories include things like manufacturing, construction, retail, transportation, accommodations, and more. Each category represents a different type of business or industry.

These figures show that AI is becoming an increasingly important tool for improving efficiency and productivity in European companies. It is interesting to note that the main objectives of the companies studied when using AI were to improve quality and innovation. These companies recognise that AI can add value to their products and services, thus boosting their competitiveness in the global market.

However, a large share of European companies stated that they do not have access to AI products, services or platforms specifically designed to meet their economic or technical needs and capabilities. This lack of access to customised AI solutions may be limiting companies' potential in terms of competing in an increasingly digitised business environment. To increase competitiveness, experts in the field agree that it is important for companies to have staff trained in the use of predictive analytics. These professionals can identify patterns and trends in business data, enabling companies to make more informed decisions.

In addition, it is crucial that companies have access to AI products and services that are compatible with their economic and technical capabilities. This includes customised or low-operational-cost solutions that are tailored to the specific needs of each company. However, it is not enough for businesses to have access to AI technology. It is also essential that the socio-economic framework in which they operate facilitates cooperation and balanced relationships across the AI ecosystem. This means establishing clear regulations that promote transparency, ethics and accountability in the use of AI.

It is also essential to foster collaboration between businesses, government actors and researchers, creating an environment conducive to innovation and the development of AI solutions. In summary, the adoption of AI in the European business environment is on the rise, and this trend is expected to continue in the future. However, current challenges and constraints need to be addressed, such as the lack of access to customised AI solutions and the development of a favourable socio-economic and legal framework. If the right measures are taken, AI has the potential to boost the competitiveness of European businesses, improving quality, innovation and efficiency in their operations.

2

CURRENT STATUS OF AI IMPLEMENTATION IN EU COMPANIES COMPARED TO OTHER INTERNATIONAL BLOCS

The global AI market is expected to grow by 15.8% per year over the period 2024-2030, reaching USD 739 billion (EUR 680 billion) by 20302. The adoption of AI technologies by businesses and the public sector can lead to productivity gains across the value chain (from research to commercialisation) in various economic sectors in the EU, and could help solve societal challenges. Given that AI is a cutting-edge technology , efficient investment in this area is likely to be key in determining the pace of economic growth in the coming years. Several countries around the world have set themselves the strategic goal of becoming leaders in AI development and deployment.

In light of the European Court of Auditors' recent Special Report 08/2024, "EU Ambition for Artificial Intelligence: Stronger governance and more and better targeted investment are key for the future", it has been found that two thirds (67%) of companies in the EU-28 have already adopted at least one form of artificial intelligence (AI). However, despite this adoption, the degree of implementation of this technology remains relatively low compared to other enabling technologies, representing, on average, only around 5% of these companies' sales.

However, forecasts indicate that this number will grow significantly in the coming years. In fact, it is estimated that approximately 20% of companies expect AI to account for more than 10% of their sales. This increase in AI adoption brings with it several competitive advantages for companies that employ it. First, companies that use AI tend to have a much larger average size, giving them access to resources and opportunities that are not available to smaller companies. In addition, these firms tend to hold a larger number of patents and trademarks, indicating that they are more likely to be innovative compared to firms that do not use AI.

Despite all the data analysed showing significant progress in the European artificial intelligence landscape, the Special Report 08/2024, "EU Ambition for Artificial Intelligence: Stronger governance and more and better targeted investment are critical for the future" has also revealed that the EU is lagging behind Asia and the US in the race for AI leadership. However, it also highlights that there is a unique opportunity for the EU to become a full leader in this field, followed by the rest in what some have called the third industrial revolution. It has been noted that 75% of EU startups have been acquired by US companies, which is evidence of the importance that these foreign companies attach to European technology and talent.

At the same time, the EU accounts for approximately 24% of the potential demand for AI technologies, suggesting that there is a significant domestic market for this technology within the region. These circumstances pose a challenge for AI developers and entrepreneurs in the EU. In the short term, many may hesitate to enter universities or create startups in this field, as competition in large-scale AI services is intense and dominated by established companies. However, by establishing a similar landscape in the EU, this will open up opportunities in both the public and private sector for new ideas and innovation in the field of AI.

This not only represents a monetary inflow for the region, but is also a measure to ensure the integrity of a technological structure in which there is no exclusive dependence on training and solutions from external sources. In conclusion, the adoption of AI in EU-28 companies has shown progress, but there is still room for improvement. It is expected that in the coming years, this technology will have a greater impact on companies' sales.

The EU has the opportunity to become a leader in the field of AI, although it faces challenges in terms of competition and dependence on foreign companies. However, by establishing a similar landscape in the region, new opportunities can be generated and the integrity of an innovative and sustainable technological structure in the EU can be ensured.

2.1. Trends and key figures

The following is a breakdown of the results obtained in these reports comparing the status of artificial intelligence between 2016 and 2023. By 2023 in particular, 38% of EU companies had implemented artificial intelligence technologies in their business activities. This represents a significant increase compared to previous years and demonstrates the growing interest and adoption of these disruptive technologies in business.

Within this group of companies that had implemented AI technologies, 60% were in the manufacturing sector. Specifically, these companies were mainly involved in the production of pharmaceuticals, electronics and machinery. This indicates that companies involved in the manufacturing of physical goods were the first to recognise the potential of artificial intelligence to optimise their production processes and improve the efficiency of their operations. However, service companies, and more specifically the ICT (information and communication technologies) sector, showed a lower implementation rate of AI technologies, reaching only 9%. This may be partly justified by the fact that, although the ICT sector devotes 23% of total investment to innovation, it tends to place greater emphasis on other areas of technological development, such as software development, telecommunications or cybersecurity.

Despite this data, it is encouraging to note that 28% of EU companies plan to implement AI technologies in the near future. This indicates that interest and understanding of the potential benefits of artificial intelligence is growing across the continent. Moreover, 31% of these companies have already made the decision to adopt these technologies, demonstrating greater determination and a stronger understanding of how artificial intelligence can boost their growth and competitiveness. The reasons for implementing AI technologies are diverse and vary by company size and business sector. For example, 51% of companies indicated that their main goal in implementing artificial intelligence was to improve the efficiency of their operations. This suggests that task automation and process optimisation are key considerations for companies when adopting these technologies.

In addition, more than 40% of companies said that the main reason for implementing AI technologies was to be able to better personalise their products and services to meet the unique needs of each customer. This shows how artificial intelligence can help companies differentiate themselves and deliver more personalised experiences to their customers, which in turn can increase customer satisfaction and brand loyalty.

Other important reasons for implementing AI technologies include the ability to analyse data in real time, cited by 32% of companies surveyed. This highlights the value of artificial intelligence in analysing large volumes of data and generating real-time information that can help companies make more informed and strategic decisions. In addition, many companies cited reduced human resource costs as a key benefit of implementing AI technologies. By automating routine and repetitive tasks, companies can free up time and human resources to carry out higher-value activities and gain a competitive advantage.

Finally, companies also highlighted the ability to optimise their marketing and sales activity as an important reason for adopting AI technologies. Artificial intelligence can help companies better understand their customers, identify behavioural patterns and preferences, and adapt their marketing and sales strategies accordingly, which can lead to greater results and better customer experiences. In summary, the implementation of artificial intelligence technologies is on the rise in the EU, and is expected to continue to grow in the future. As more companies recognise the benefits and potential of AI, they are taking steps to adopt these technologies and leverage their ability to improve efficiency, personalise products and services, analyse data in real time, reduce human resource costs and optimise sales and marketing activity. This trend towards the adoption of AI technologies suggests a significant change in the way businesses operate and compete in today's marketplace.

2.2. Impact of AI in different industrial sectors

As we can see in detail, the percentage of significant impact of artificial intelligence in various industrial sectors in the selected countries far exceeds the global average.

A striking example of this is the impact in the United States, where it reaches 44% in the retail sector. It is important to note that this impact is not only limited to efficiency, but also affects the growth rate of these industries. This implies that the degree of competition increases considerably due to the adoption of artificial intelligence, making these sectors more attractive for investment by companies. It is clear then that new investment opportunities arise in other sectors as a result of this trend.

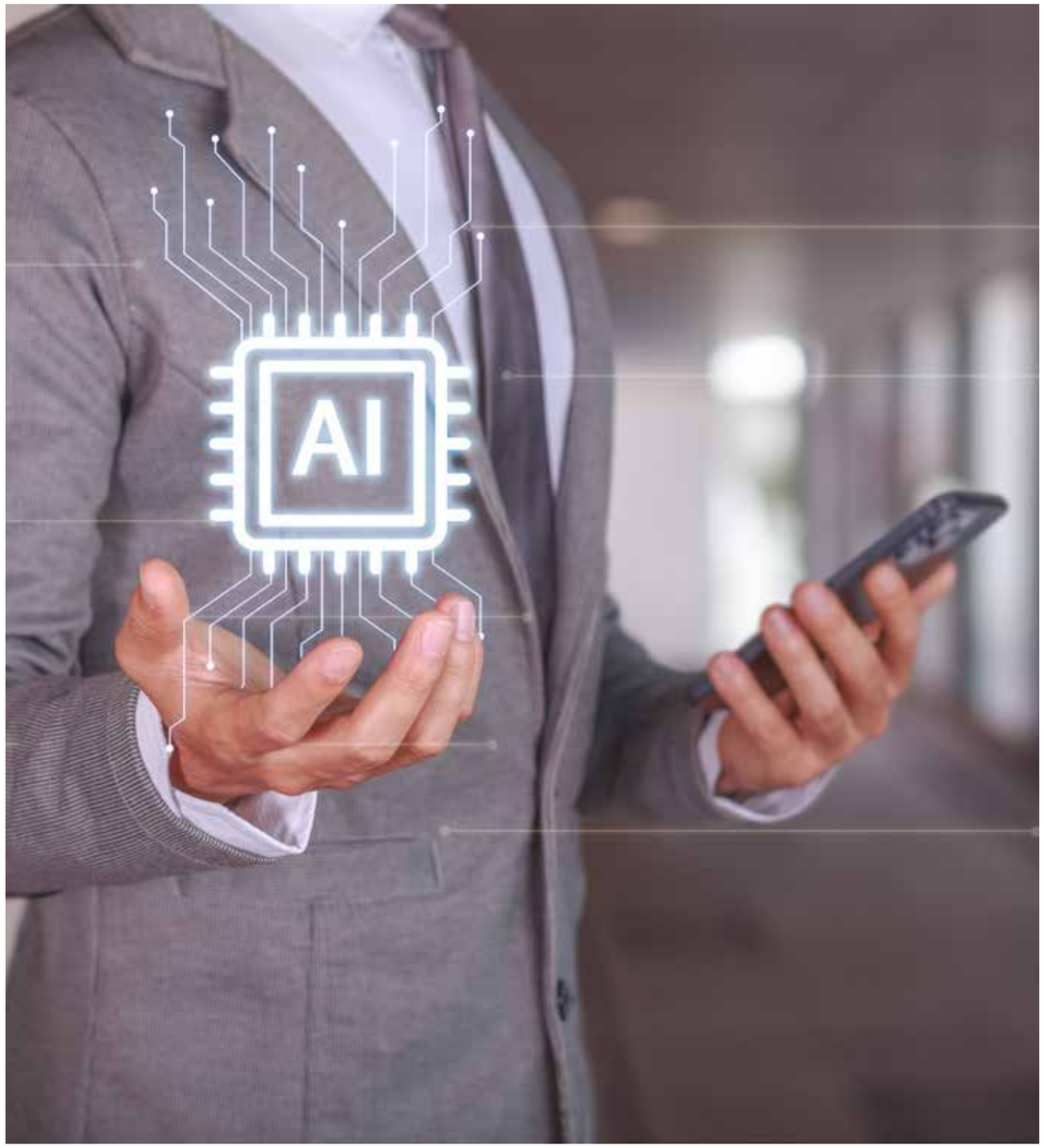
However, it is important to mention that not all sectors have benefited equally from the adoption of artificial intelligence. For example, the durable goods industry, such as consumer goods, is experiencing less impact compared to the rest of the industries. The study found that the functional areas that will be most affected by this technological revolution are supply chain and operations, marketing, and product and service research

and development. It is important to note that in these departments, the changes brought about by artificial intelligence are more likely to be reflected in improved efficiency rather than increased revenue.

As mentioned above, the areas where these changes are most noticeable are the production of goods and services, advertising and personalisation for the customer. Finally, it is important to note that all research and development departments have implemented artificial intelligence in collaboration with the marketing department.

At a general level, this technological advance not only affects marketing and research and development, but also affects how information is shared with the rest of a company's departments. In addition, it examines how knowledge is extracted and shared with other companies in the same sector, as well as with the technology and the functioning of the final product that incorporates artificial intelligence.

It is crucial to bear in mind that most of the positive effects and strategic recommendations will only be effective if a cultural change is achieved within the company.



3

FACTORS INFLUENCING THE ADOPTION OF ARTIFICIAL INTELLIGENCE IN EUROPEAN COMPANIES

In addition to taking into account the legal framework and the culture of innovation adoption, it is possible to identify a number of factors that are closely related both to the companies themselves and to information and communication technologies, which have a significant impact on the adoption of artificial intelligence and robotics in the business environment. Among the most innovative sectors in terms of artificial intelligence are the automotive and manufacturing sectors.

Artificial intelligence systems and applications are based on technologies that are constantly changing, and are designed to adapt to dynamic and varied environments. Furthermore, it is worth mentioning that one of the biggest challenges faced by data science departments is the selection and configuration of the various technical tools available, as well as the constant mismatch between scientific-technological advances and their respective literature, compared to concrete implementations where pioneering developments themselves often sacrifice quality and innovation for the sake of competitiveness. On the other hand, as far as knowledge export is concerned, it is the medium-sized companies that show the highest percentages in both fields, clearly outperforming large companies by 14 and 18 points. The benefits of artificial intelligence are largely known, but its potential for companies in all sectors is even greater than has been realised so far.

3.1. Regulations and legal frameworks

While EU legislation is very important and has a significant impact on various aspects of society, the size of the market in which companies operate can be just as crucial, if not more so. In this paper we are addressing an issue that has taken several years of work by regulators who understand that they cannot stand still in the face of the constant technological advances that characterise our times. As each company will seek its place in the market, it is essential that regulators balance social, economic and environmental interests. To achieve this, they have a number of tools at their disposal. For example, they can set appropriate policies by implementing funding programmes, promote and facilitate the diffusion and adoption of enabling technologies, encourage the creation and implementation of pilot projects, and foster participation in relevant networks and fora. In addition, appropriate technology watch is of paramount importance. Within the framework of the European Infrastructure Network, different platforms have emerged that play a key role in embedding big data and artificial intelligence in research management, as well as in regulatory and decision-making processes. These platforms are indispensable for achieving sustainable and rigorous management in all areas.

For some time now, work has been underway to create a solid regulatory framework to enable the development and effective implementation of artificial intelligence. In this regard, the decision has been taken to adopt an ethical approach to clearly differentiate itself from other open positions and the lack of limits found in other international actors. There is a great deal of ambiguity around this issue and so far no specific guidance or position has been established on data policy, which is of vital importance for the development and evolution of artificial intelligence.

The regulatory framework to be transposed to all member states has been established in the commonly called AI Law (Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations).

The Artificial Intelligence Act, or AI Act, also known as Regulation (EU) 2024/1689, marks a turning point in the European Union's approach to artificial intelligence. The aim of this landmark law is to ensure that artificial intelligence technologies are developed and used in a way that promotes innovation and protects individual rights, while preserving fundamental European values. At its core, the AI Act aims to balance the incredible potential of AI with the need to manage its risks and create a framework in which AI can truly benefit people.

The law uses a tiered approach to risk, classifying AI systems according to their impact. Some systems are considered unacceptable and will be blocked immediately. This includes AI applications that manipulate behaviour or perpetuate discriminatory social cues through subtle means. High-risk AI systems, which play a significant role in areas such as healthcare,

law enforcement, and education, are subject to strict regulations. This includes requirements for strict risk management, transparency, and ongoing monitoring to ensure safety and compliance. Currently, low-risk systems, such as chatbots or emotional intelligence tools, must meet strict standards, but low-risk systems are governed by existing regulations.

One of the characteristics of AI law is its focus on transparency and accountability. Users interacting with AI systems must understand that they are interacting with AI. For high-risk applications, developers should maintain detailed documentation to facilitate traceability and ensure availability. Decision-making is also important, especially in situations where AI systems affect people's rights and well-being.

Knowing the nature of technology in the world, the scope of AI legislation goes beyond the borders of the EU. All AI systems that affect people in the EU must comply, even if they are from outside the EU. This comprehensive approach will not only strengthen the EU's position on ethical AI, but also set the benchmark for AI governance.

The law also takes into account the challenges faced by small and medium-sized enterprises (SMEs) and start-ups. Legal sandboxes allow these companies to test and improve their AI systems in a controlled environment and in accordance with legal guidelines. Compliance requirements ease the burden on small organisations and encourage innovation without compromising ethical standards.

The European Artificial Intelligence Board (EAIB), which works with national authorities to ensure uniform regulation across all member states. The EAIB provides guidance, oversight and monitoring of the implementation of the legislation. Non-compliance can result in significant penalties, particularly for violations involving high-risk systems or prohibited activities.

Ethics and values are at the heart of AI law. Human rights, privacy and non-discrimination, as well as the protection of environmental and social well-being. The law promotes the introduction of common governance practices and promotes AI literacy so that people can interact with AI systems with confidence. By promoting inclusion and diversity, the AI Act aims to eliminate bias and ensure equitable outcomes.

The law allows for certain situations. AI systems designed solely for military use are available, reflecting their unique context. However, dual-use systems must comply with regulations when applied in a public setting. Research and development activities are exempt from market supply or solicitation without appropriate oversight. Finally, the AI Law demonstrates the EU's commitment to creating a future where AI enhances human potential without compromising its fundamental values. By establishing clear rules that protect rights, promote understanding and foster innovation, this law sets a new standard for ethical AI. With this balanced and visionary approach, the EU is not only managing technological trends, but shaping the digital era for the better.

3.2. Investment and resource requirements

It is undeniable that large companies in the EU are not on a par with other countries in terms of investment in AI development, which has led to an unfavourable imbalance. Despite significant growth in investment in AI software, hardware development has not kept pace and has shown only minimal growth. It is clear that training is essential to achieve AI inclusion, and therefore the EU must prepare its citizens by expanding investment in relevant skills.

In this respect, spending on computer skills training in the EU is only a tiny percentage compared to other countries. On top of this, investment in specific skills falls short of what is needed.

In relation to training in digital and computer skills, investment in the European Union does not reach the percentage of investment made by other countries. As for training in virtual and augmented skills, the EU does not publish data on this, while several countries show significant investment in this area.

Finally, in terms of availability of digital platforms, while other countries have several platforms per 10,000 workers, the EU barely manages to have one platform. It is imperative that corresponding efforts are made to close this gap and foster the optimal development of AI in the EU.

3.3. Corporate culture and resistance to change

Entrepreneurs and managers of the future will need to be able to implement new technologies, in particular AI, to stay in the market and improve their competitive position.

A number of studies, analysed for this report, have explored the role of culture within organisations and its relationship to innovation. Although the number of studies on innovation and technology in the field of business management is very small and there is not a sufficiently complete work to explain in a solid way how an innovative business idea flows within an organisational culture until its implementation as a product or service in the market, in view of these weaknesses identified in the literature, this section attempts to highlight the role of culture in the development and implementation of technology in the field of business management.

Firstly, creating an environment of trust is an essential element in increasing employee engagement and, in some cases, increasing their contribution to innovation.

There are several key aspects that can characterise the culture of a business organisation related to the motivational factors and relationship dynamics that occur within the organisation itself:

- the existence of trust and cooperation between management and employees;
- the promotion of communication and conversations of all kinds;
- foster leaders with emotional intelligence and the ability to manage emotions and be assertive with their team;
- change and diversity management;
- motivation and continuous learning.

In this respect, it is essential to create an environment where employees feel safe and where there is a constant exchange of ideas and knowledge. Collaboration and trust between management and employees are key to fostering innovation within the organisation.

In addition, it is necessary to promote open and fluid communication, allowing all members of the company to engage in conversations of all kinds, from informal discussions to more formal debates.

The presence of leaders with emotional intelligence is also essential for the development of an innovative company culture. These leaders must be able to manage their own emotions and understand the emotions of others, which will allow them to be more assertive in their dealings with the team. They must also have the ability to handle change and diversity well, adapting to new situations and promoting acceptance of a variety of perspectives and approaches.

Finally, motivation and continuous learning are key to fostering innovation in a business organisation. Employees must be motivated to constantly look for new ways of doing things and to improve their skills and knowledge. This can be achieved through training and development programmes, as well as by creating an environment where curiosity is encouraged and learning is rewarded.

In short, organisational culture plays a crucial role in the development and implementation of technology in business management. To foster innovation, it is necessary to create an environment of trust, promote open and fluid communication , have leaders with emotional intelligence, manage change and diversity, and foster motivation and continuous learning. With these foundations, companies will be able to adapt and use new technologies effectively, ensuring their competitive position in the market.

4

BENEFITS AND CHALLENGES OF IMPLEMENTING AI IN ENTERPRISES

The last few years have seen a rapid growth and wide diffusion of AI-based applications and AI-related strategies.

This phenomenon has had a significant impact on various industries, as it is estimated that approximately 89.9% of companies with 250 employees or more have adopted some form of AI application. These applications range from production planning to demand forecasting and recommender systems.

Sectors leading the way in this adoption include transportation, manufacturing and information and communications. Despite the high percentage of companies that have adopted AI, there is still a major challenge in this field: access to know-how.

40.3% of companies consider that they lack access to AI expertise, either internally or through external consultants. This lack of expertise can limit the full exploitation of AI applications and hinder their implementation. This barrier needs to be overcome to ensure that all businesses have an equal opportunity to benefit from this technology.

At the regional level, it has been observed that there are significant variations in the level of AI adoption across Europe. However, European companies share a similarity in their approach to AI. Despite regional differences, all European companies recognise the potential benefits of AI and seek to make the most of them.

One of the main benefits that companies can gain by implementing AI in their business processes is the improved personalisation of the services offered. AI allows data to be collected and analysed more efficiently, giving companies a deeper understanding of their customers' needs and preferences. This allows them to offer products and services tailored to each customer more precisely. This personalisation capability can lead to higher levels of customer satisfaction and, ultimately, greater growth and profitability for businesses.

Despite the benefits, there are also challenges associated with AI implementation. These challenges are widely recognised in the industry literature and have been the subject of study and research by the academic community. However, there is still a significant gap between academic theory and practical application. Closing this gap is essential if the full potential of AI is to be realised and the challenges it poses are to be overcome.

As a result of a lack of clear information and limited understanding of the technical aspects of AI, many companies face uncertainty when considering the adoption of these technologies. There is a fear of not drawing clear conclusions or not fully understanding the impact AI may have on the tasks workers perform. This can lead to a lack of confidence in the implementation of AI and delay its adoption. In summary, the growth and diffusion of AI applications in recent years has been significant.

However, significant challenges remain, such as access to technical expertise and understanding the impacts of AI on business processes. Addressing these challenges and bridging the gap between theory and practice is critical to realising the full potential of AI. Only then will companies be able to fully benefit from the advantages that this technology can offer.

4.1. Competitive advantages and operational efficiency

The use of AI gives companies great competitive advantages, as well as efficiency in their internal processes. Thus, a significant percentage of companies that have incorporated AI point to profit leakage from the sub-sector, penetration of new markets and improvement of nearby products through artificial intelligence as a competitive advantage. In addition, a high percentage indicate that AI has enabled them to gain a foothold in their business strategy by offering new innovative products and services. On the other hand, several companies that have implemented AI have been able to refinance their cost structure in the short and long term. This has been possible thanks to the optimisation of production processes and the reduction of costs derived from the use of artificial intelligence in the company. These cost savings are estimated to have contributed to a decrease in business losses and enabled more efficient management of financial resources. On the management side, AI has led to a significant improvement in the visualisation and analysis of additional data. This has generated a feedback loop in business management, where the learning gained through AI is leveraged to further improve business performance. In addition, AI has brought considerable value to the business analysis process, facilitating strategic decision making and the identification of growth opportunities. The second aspect related to management is that AI has facilitated the establishment of a chain of mutual analysis between management and artificial intelligence. Both actors feed back and extract valuable information from each other, using this data as input to improve the effectiveness of their actions and decisions. This close collaboration between management and AI has boosted the competitiveness and cost efficiency of companies in the different sub-sectors analysed. In summary, the use of AI has provided significant competitive advantages and cost efficiencies for firms. The ability of artificial intelligence to improve internal processes, introduce new products and services, optimise cost structure and facilitate strategic decision-making has led to positive results in the business subsectors studied. Consequently, AI continues to be a key tool for boosting business growth and profitability in today's highly competitive environment.

4.2. Privacy and ethical risks

Despite the significant growth experienced by Artificial Intelligence (AI), already implemented and tested in several countries around the world, there are risks associated with its performance that require special attention.

In several EU countries, AI has proven to be highly effective, and even exceptional in some cases, in the field of medical diagnostics. However, it is important to note that these AIs operate in secrecy, thus safeguarding the integrity and confidentiality of diagnostic results.

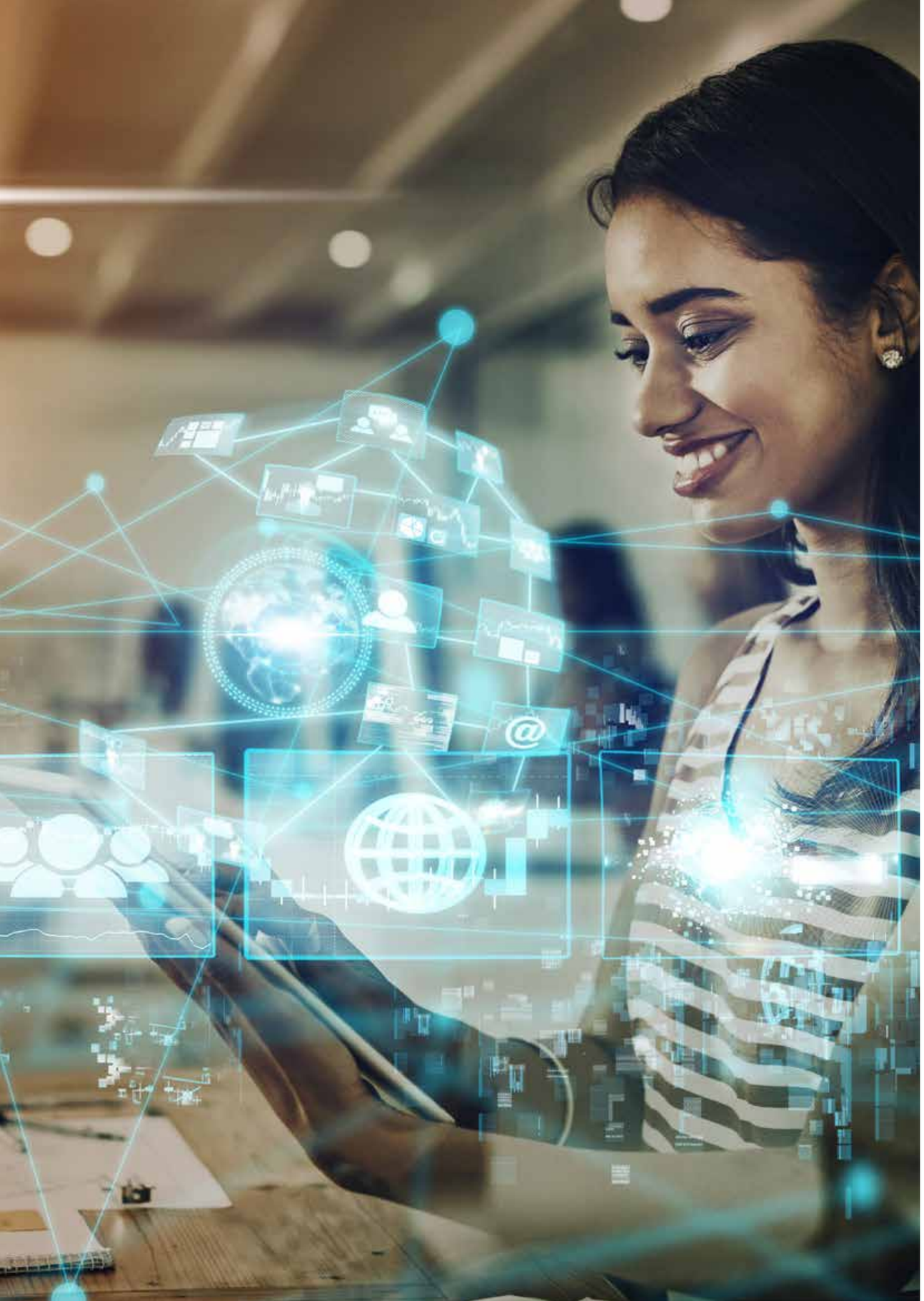
This category of AI is known as "Little AI", subtly referring to a trend within the industry that makes use of small algorithms and secret curves with the primary goal of maximising its economic benefit. It is imperative that the decisions made by these AIs are reasonable, fair and ethical, with the utility they offer in terms of medical diagnosis at their core. From this problem, a series of obstacles arise that undoubtedly justify their inclusion within the scope of ethical issues.

This proposed classification has been generated from multiple observations by groups of clinicians, researchers and AI experts. In many cases, it has been found that a given AI model does not provide a satisfactory explanation of its behaviour, and its usefulness is very limited or even non-existent . In other cases, however, high efficiency has been achieved by using a relatively simple but highly specialised AI model.

It is extremely difficult to justify from an ethical point of view the implementation of a tool that does not provide relevant knowledge or does not adequately adhere to any particular model. Therefore, it is clear that simply stating an argument based on facts alone is not sufficient to close an ethical debate when there is no unanimous consensus.

It is essential to promote transparency and accountability in the development and use of AI, as well as to establish regulations and oversight mechanisms to ensure its proper functioning and prevent potential abuses. Continuous research should be carried out to optimise algorithms and improve understanding of AIs, always seeking a balance between efficiency and ethics. Likewise, care must be taken to ensure that decisions made by these AIs are subject to review and supervision, thus avoiding any type of discrimination or injustice.

The inclusion of sound ethical principles in the implementation and operation of AI is essential to ensure its proper and beneficial deployment in the field of medicine. Multidisciplinary ethics committees should be established to participate in the monitoring and evaluation of AI systems, ensuring a variety of perspectives and considering the different impacts they may have on society. AI has enormous potential to revolutionise medical diagnosis, but it is imperative that it is used responsibly and ethically, always prioritising the well-being of patients and respecting their fundamental rights. Only through an inclusive and balanced approach will it be possible to maximise the potential of AI without compromising the values and ethical principles that govern our society.



5

APPLICATIONS OF ARTIFICIAL INTELLIGENCE TO IMPROVE PRODUCTIVITY IN COMPANIES, TAKING STARTUPS AS A REFERENCE.

5.1. Introduction to Artificial Intelligence in the context of startups

Startups, emerging companies, are considered key players in innovation and the entrepreneurial system, as well as spearheads in the technological development of a country and of the market in particular in which they are developing their adventure . Their exponential growth is synonymous with new opportunities, the contribution of talent to the labour market and development in the business world.

Currently, one of the differentiating factors for attracting investment in this type of company is the development of services and products working with artificial intelligence. Moreover, it is the activity that attracts the most investment, with this figure increasing considerably year by year. As a result, it is considered that its implementation in the business environment is one of the points of challenge and opportunity for the improvement of decision-making, facilitating the performance of tasks with a high degree of complexity, as it helps to identify patterns in unstructured data, for a better understanding of the production process and customers.

Artificial intelligence, also known as AI, is a field of study that seeks to develop computer systems capable of performing tasks that normally require the use of human intelligence. These systems can learn, reason and make decisions based on information received and accumulated experience. AI has advanced significantly in recent years, enabling the development of increasingly sophisticated technologies and applications.

In business, the implementation of artificial intelligence offers numerous advantages. For example, companies can use AI to analyse large amounts of data quickly and efficiently, allowing them to identify patterns and trends that would otherwise be difficult to detect. This can help companies improve their products and services, as well as make more informed and strategic decisions.

In addition, AI can also be used to automate tasks and processes, which can save companies time and resources. For example, chatbots, which are computer programmes capable of having conversations with humans, can be used to provide customer service quickly and efficiently. This not only improves the customer experience, but also frees employees from routine tasks, allowing them to concentrate on more important and value-added tasks.

However, the implementation of artificial intelligence also poses challenges. On the one hand, there is the technical challenge of developing systems and algorithms that are able to learn and adapt efficiently. On the other hand, there is also the ethical challenge of ensuring that AI is used responsibly and with respect for users' rights and privacy.

In summary, the implementation of artificial intelligence in the business environment presents numerous opportunities and challenges. Startups and emerging companies that succeed in harnessing the potential of AI can gain a significant competitive advantage, improving their ability to make informed decisions and deliver innovative products and services. However, it is important to address these challenges in a responsible and ethical manner, ensuring that AI is used for the benefit of society as a whole.

Lack of knowledge or fear on the part of startup managers to work with AI scares investors and project managers, so the generation of qualified employment is not efficiently exploitable. Can startups and their ideas be made more profitable and efficient when it comes to production? Nowadays, digitalisation and big data are present in startups, but is the market ready to work with new and advanced technology, AI being one of them, providing efficiency and knowledge-based decision making? The aim of this paper is to make an analysis of the different types of AI, neural networks and support vector machines, their applicability and their application in robots, mini robots or chatbots working within the company to become profitable and the key and critical decisions to be made.

5.2. Benefits of Artificial Intelligence for Startups

In the previous section, we delved into the substantial amount of data that we generate on a daily basis and discussed how its growth is expected to continue. This remarkable volume of data has the potential to serve as the catalyst for artificial intelligence, enabling it to process and analyse information in the most efficient and effective ways imaginable.

Moreover, AI can uncover new avenues for monetization, providing businesses with the means to thrive and flourish. Startups, in particular, can benefit greatly from implementing AI methods across various areas of their operations. For instance, the sales department could greatly benefit from predictive analytics algorithms that forecast sales for upcoming quarters or even subscription services. These machine learning algorithms would evaluate both constant factors and variables influenced by the current economic climate.

Additionally, AI tools have the capacity to revolutionize the marketing and advertising departments by saving valuable time and resources. Personalised recommendations and real-time ad retargeting, based on data gleaned from website interactions, are just two examples of the myriad of possibilities that this technology carries. With algorithm-powered automated management, brands can significantly enhance the performance of their advertising campaigns. Human resources and effective organisation are pivotal to the success of any company, and startups are certainly no exception.

In this context, AI presents a remarkable opportunity for teams within companies to work cohesively and with a clear set of objectives. Tasks related to data analysis and processing, which were previously conducted manually, can now be accomplished more efficiently and accurately through the integration of artificial intelligence. This paradigm shift enables decision-making processes to have markedly reduced margins of error. Consequently, companies can gain a competitive advantage by anticipating market trends, scaling their positions exponentially, and swiftly carving out a niche within their respective sectors.

A noteworthy example of this phenomenon can be witnessed in a popular public transportation app widely embraced by urban dwellers worldwide. This mobile application has introduced a demand-responsive transport service that adapts its routes based on individual user habits and preferences. Users can either request personalised routes or opt for routes proposed directly by the company. Through the seamless integration of AI, this app successfully amalgamates data-driven insights with user-centric offerings, ultimately enhancing the overall experience for its users.

5.2.1. Automation of repetitive tasks

We will see below how using artificial intelligence combined with task automation, combined with other techniques, will help to improve different aspects of day-to-day productivity in startups or any other type of company.

Automating procedures is one of the ways that entrepreneurs can save time and obtain greater productivity in the development of their start-up. Email templates, CRM and ERP are common examples of simple automation. But nowadays we have several tools for automating tasks and processes. These kinds of platforms include different blocks of actions, the combination of which allows you to build user-determined workflows.

It is worth noting that in this field there are a large number of development platforms specially designed to promote 'no-code', i.e. without the need for programming. Such automation software enables users to organise workflows to the level of complexity they need for the projects they are handling, saving time and resources, which is essential for companies that do not often have them.

5.2.2. Optimisation of internal processes

The best way for a company to make the most of the data-generating potential of the multiple platforms and applications it integrates is through the use of Business Intelligence technologies. Currently, there are several BI solutions available that allow the collection and consolidation of internal information to transform it into value-added knowledge.

There are a large number of platforms and applications on the market that offer numerous functionalities and services, such as e-commerce platforms, ERP, CRM, document management applications or specific solutions that allow the analysis of the behaviour and activity carried out on these tools.

At this point, if we are in a situation where we have a large amount of data and our company has integrated various technologies and platforms that handle this information, but we are not getting the maximum benefit from it and are not taking advantage of BI technologies, it would be interesting to consider the integration of an artificial intelligence and predictive analytics engine for discovery or learning actions through some internal processes. In this way, knowledge can be enhanced and decision-making can be improved.

Therefore, a possible solution to the problem of lack of knowledge about whether working methods are working correctly is the automation of data collection, consolidation and subsequent analysis, as well as the implementation of a predictive model. This automation would allow the company to process and interpret the data in real time, providing actions based on the data automatically. The only possible way to achieve this integration is through the implementation of artificial intelligence and predictive analytics engines, which can perform deep analysis and provide valuable information for decision making. With this technology, the company will be able to make the most of the data it generates and use it strategically to its advantage. This can ensure continued growth and success in an increasingly competitive market.

5.2.3. Improved decision making

In any organisation, decision-making is one of the most important aspects of day-to-day business, and it is undoubtedly the most relevant aspect when creating a startup. An entrepreneur without the ability to make quick and effective decisions cannot act as an entrepreneur. In this ever-changing world, having artificial intelligence to obtain more accurate and quicker conclusions, for example, through the analysis of data from various sources, is essential. Some solutions provided by artificial intelligence for decision making, which are proving to be very relevant for startups, are advanced analytics or virtual consulting for decision making.

Virtual assistants for decision-making should essentially be decision-making tools, similar to personal assistants, providing knowledge and understanding through their voice interface. Intelligent decision-making solutions are already dictating more accurate medical diagnoses than the world's best doctors and helping to prevent material losses in organisations. Startups whose business is to make decisions to invest large sums of money or save such sums could act as creators, rather than users, of virtual decision-making assistants. Through artificial intelligence, we could know in advance and with a high degree of certainty whether a new pricing policy would be effective before implementing it or not, and could act accordingly.

In addition, artificial intelligence could also be used to optimise decision-making processes in organisations. For example, machine learning algorithms could be used to analyse large amounts of data and generate accurate recommendations in real time. This would allow companies to reduce the time and effort spent on decision-making, as well as minimise the risk of making mistakes.

Another possible application of artificial intelligence in decision-making is predictive analytics. With the help of advanced algorithms and statistical models, future trends and potential outcomes could be predicted, allowing organisations to anticipate changes and make informed, strategic decisions. This would be particularly useful in sectors such as e-commerce, where purchasing trends change rapidly and quick and accurate decisions are essential.

In short, artificial intelligence offers organisations new opportunities to improve their decision-making. From virtual consulting to predictive analytics, these solutions can help startups make better decisions and stay competitive in an ever-changing business world. With the continued advancement of artificial intelligence, we are likely to see even more improvements in decision-making in the future.

5.2.4. Personalisation of the customer experience

Another application of artificial intelligence in startups is to personalise the customer experience. Startups usually offer products and services that are new and innovative, so the customer has no previous references to evaluate them. In many cases, they do not have a great deal of information about them, which means that the success rate drops considerably. One solution is to use algorithms to adapt and personalise the service offered according to the customer's characteristics, behaviour and preferences.

One company is pioneering the use of AI to personalise customer experiences. For a company that markets health and wellness products, this startup has developed self-analysis devices, such as a watch, that monitor the user's vital signs. The results obtained are then cross-referenced with other databases, allowing the application of AI to identify patterns of user behaviour and offer personalised suggestions to improve their health. Through this added value of security, we can speak of an application that combines big data analysis with AI algorithms.

Another application of AI in the startup space is an eCommerce solution that recommends products to users based on their browsing behaviour, and reduces costs through automatic catalogue curation and personalisation time management. In addition, it provides eCommerce teams with the necessary real-time data to make informed decisions, improves the overall view of the business through reporting and analysis of personaliser performance and profitability, and increases knowledge of its users by establishing a complete history of user behaviour.

These startup AI use cases are revolutionising the way companies interact with their customers, providing them with an unprecedented level of personalisation. Artificial intelligence plays a key role in this process, as it can analyse large amounts of data and find patterns or preferences specific to each customer. This allows companies to offer more precise recommendations tailored to the individual needs of each person.

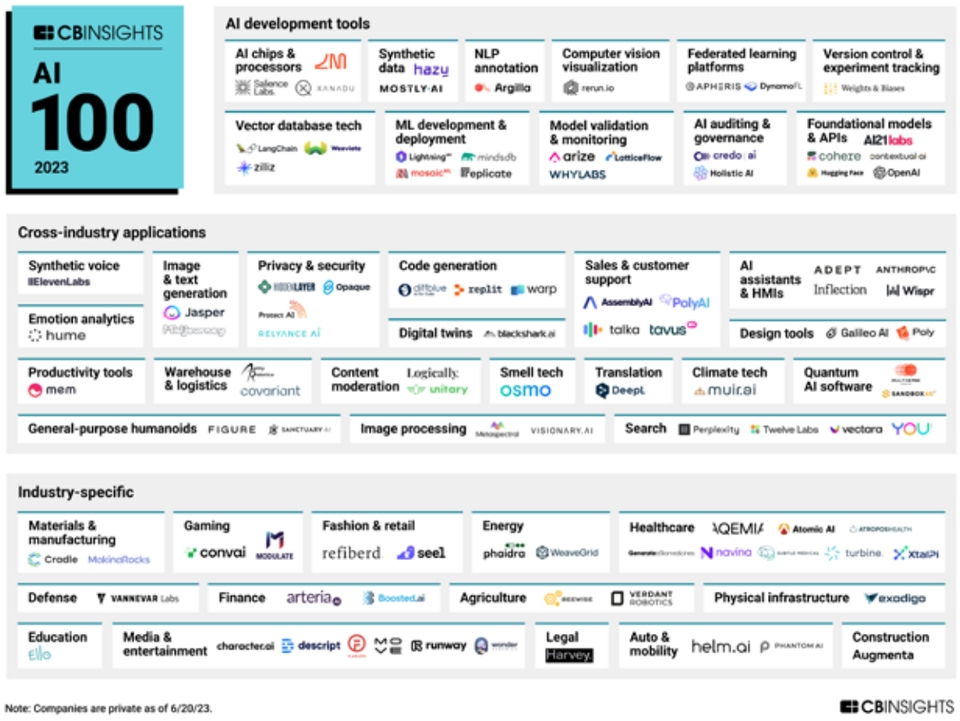
In addition, artificial intelligence also helps to improve the efficiency and profitability of companies. By analysing users' browsing behaviour, startups can quickly identify which products are most relevant for each customer, allowing them to optimise their catalogue and reduce unnecessary costs. Furthermore, by providing real-time data on the performance and profitability of personalisation strategies, businesses can make informed decisions and adjust their approach to maximise results.

In short, artificial intelligence is transforming the way startups personalise the customer experience. From

self-analysing devices that monitor users' health to product recommendations based on browsing behaviour, these companies are using advanced algorithms and data analytics to deliver an unprecedented level of personalisation. In doing so, they are redefining the relationship between businesses and their customers, and leading the way to a more personalised, customer-centric future.

5.3. Success stories of Startups that have implemented Artificial Intelligence

In this section, successful cases of various startups that have implemented artificial intelligence will be presented. These startups are Nestpick, Atrophs Health, Lingo Journal, Deel. Each of these startups has brought innovation and disruption to their respective industries through the application of artificial intelligence. As you can see in next figure, there are a lot more success cases.



Let's dive deeper into Nestpick, an exceptional company that aims to revolutionize apartment hunting and accommodation search for individuals moving to a new city. With its powerful search engine, Nestpick is capable of presenting a wide range of apartments, rooms, and accommodations tailored to the preferences, interests, hobbies, age, and expectations of each user. By leveraging a sophisticated algorithm, Nestpick provides personalized options for users based on their unique profile. This algorithm, after collecting valuable information through a small questionnaire, identifies places that closely match the user's requirements.

Moving on to Browsing Technology, this startup has established itself as a leader in utilising expert algorithms to repurpose human knowledge. By integrating a series of interconnected algorithms developed by industry professionals, Browsing Technology effectively breaks down and analyzes knowledge from diverse sources. The software intelligently understands the essence of the information and applies it to address user queries. Furthermore, Browsing Technology's natural language processing project encompasses designing lexical and grammatical pipelines for multiple languages, extracting, classifying, categorizing, and summarizing textual information, as well as autonomously constructing knowledge bases from unstructured and processed data.

These are just two examples illustrating the remarkable success achieved by startups that have implemented artificial intelligence. As we explore further into their accomplishments and contributions, it becomes evident that the fusion of cutting-edge technologies with innovative ideas has led to transformative outcomes in various domains. Stay tuned to discover more inspiring case studies and witness the continued evolution of artificial intelligence in the startup landscape.

5.3.1. Examples of use in the health sector

Voice enables effective searches of unstructured data, which we would not normally be able to access through SQL. Examples: chatbots for patient care, prescription analytics using data science, blood pressure monitoring systems, eHealth analytics, sleep monitoring systems, adaptability to new events, telemedicine for patients with chronic diseases, conducting surveys using sentiment techniques.

Chronic diseases: these are diseases of long duration and slow progression. That is, they are slowly evolving and are caused by genetic, infectious and environmental factors. To improve the patient's quality of life, the following examples realise applications of the aforementioned artificial intelligence techniques:

- Adaptability to new events: allows the application to adapt to previously announced events. For example, pregnant women can add physical activity to the non-daily routine, when it is natural during the 9 months. This adaptability ensures that the app can adjust to different situations and user needs, resulting in a personalised and efficient experience.

- Telemedicine: provides remote medical services involving the patient and the health system. In the chronic area with programmed services, the user will be able to keep track at home, enter readings, interact by sending questions to the nurse or collecting actions recommended by the professional. Telemedicine has revolutionised the way patients receive medical care, allowing consultation and monitoring of chronic diseases from the comfort of the home.

In addition, artificial intelligence has become an essential tool in the medical field, as it can analyse large amounts of data and generate personalised recommendations for each patient. By analysing health data, artificial intelligence can identify patterns and trends that human doctors might miss, improving the diagnosis and treatment of chronic diseases.

A real-life example of the application of AI in a healthcare startup is Atropos Health. In this case, its models have been trained with millions of anonymised patient records. For example with data from the Mayo Clinic's open platform. With that training, the AI tool generates an automated report, called Prognostogram, which could be the answer to a medical consultation, as a decision aid. Although its interface is chat-like, it does not use generative AI as it is based only on scientific literature, while Atropos Health uses multimodal data.

In conclusion, voice and artificial intelligence have great potential in the field of healthcare, especially in the management of chronic diseases. These technologies enable more efficient, personalised and accessible care for patients, improving their quality of life and facilitating the work of medical professionals. With the continued advancement of technology, we can expect voice and artificial intelligence to play an even more important role in the future of healthcare.

5.3.2. Examples of use in the education sector

Nowadays, teachers have a considerably high volume of students, which implies a significant volume of assessments, projects, assignments and meetings to handle. However, thanks to the implementation of AI, it would be possible to classify these elements and establish appropriate rules to make a more efficient use of time when designing and correcting assessment activities for learning. It has been detected that stress levels in learners are high during the learning process.

In fact, between one-third and two-thirds of the students reported experiencing constantly, often or sometimes each of the five negative emotions that were investigated: anxiety, overwhelm, disorientation, lack of direction or frustration due to difficulty in understanding the material. These feelings occur on a daily basis or several times a week.

A real example of the benefits of AI is the startup Lingo Journal, which has more than 300 million active users across five continents. The journey of this platform, from downloading the app to studying a new language, always adjusts to the pace of the users. If a user passes a level, they will proceed to the next one and if they need more time to do so, the classifier will offer a greater or lesser amount of time to try again with the use of adverbs. This approach has maximised the benefits of the platform and explains the consistently high rate of active users. Another example is Deel.com which uses AI to speed up the creation of online courses on its LMS.

5.4. Artificial Intelligence tools and technologies for Startups

Other techniques that could be very useful for startups are AI applied to solve product or service recommendation problems.

If you add AI algorithms to deal with buyer-to-buyer variability, the solution becomes more general and broader, focusing on a long-term expectation that is not just limited to recommendation. Another way in which AI can be used in startups is through the development of intelligent applications that can be used both for website development and for any application that needs a backend where actions are generated through an algorithm that can be developed by the startup itself or by acquiring this knowledge from a third party expert who provides them with the algorithms in the form of APIs.

Depending on the complexity required, these applications could be developed using the known tools offered or more generic options such as resorting to platforms that offer pre-built services and whose users can interact with them. Among some of the various artificial intelligence tools and libraries that can be used, we highlight some of the most recognised and widely used. - The automatic learning engine developed by by Google Brain engineers is completely open source and is widely used for the development of neural networks.

It is also an open source library for Python based on Torch which has many similarities with the well-known language and is especially aimed at advanced programmers. Recently created, it was created mainly for the development of neural networks.

In addition to these aforementioned tools, there are other equally valuable and popular options in the field of artificial intelligence. These solutions allow startups to take full advantage of AI capabilities in various aspects of their business.

For example, AI can be applied in fraud detection, data analytics, natural language processing, image recognition and much more. In addition, startups can collaborate with AI experts to get customised advice and develop innovative solutions that fit their specific needs. With the rapid advancement of technology and the growing interest in artificial intelligence, startups have the opportunity to use these tools and techniques to gain competitive advantage and achieve sustained growth in the market.

It is essential for startups to keep up to date with the latest trends and research in the field of AI, as this will allow them to keep innovating and adapting to an ever-changing business environment. In short, startups can benefit greatly from artificial intelligence techniques and tools, both to improve the customer experience and to optimise their internal processes and gain valuable insights. By strategically adopting AI into their business model, startups can increase efficiency, reduce costs and generate higher revenues. Artificial intelligence not only offers innovative solutions, but also provides new opportunities for business growth and success.

5.4.1. Machine Learning

An innovative and promising technique in the field of machine learning is machine learning, which is based on the association and generalisation of phenomena from observed data. The main objective of this methodology is to develop software capable of making valuable deductions from the information provided. By combining fundamental concepts such as data processing and the inference process, together with specially designed algorithms , machine learning offers numerous advantages and opportunities.

It is now recognised that time is a limited resource and that acquiring knowledge in the traditional way can consume a large part of our lives. This is why machine learning has become increasingly relevant and useful. Thanks to technological advances in data collection, storage and utilisation, mastering this discipline has become essential for businesses. Through machine learning, organisations can address situations internally or based on the data collected. This enables informed decisions, such as pricing and production planning, as more knowledge and expertise is gained in the area.

Machine learning represents a breakthrough in the field of artificial intelligence and has the potential to revolutionise numerous industry sectors. With its applications in areas such as medicine, economics, logistics and security, this methodology is positioning itself as a powerful and versatile tool. As we continue to explore new ways to use and improve machine learning, it is safe to say that its relevance and value will only increase over time. There is no doubt that we are witnessing an exciting era full of opportunities in the field of machine learning.

5.4.2. Natural Language Processing (NLP)

Natural Language Processing is the discipline derived from Artificial Intelligence that aims to analyse and understand human language in textual form. Among other things, it is responsible for content recommendation, comment moderation, message classification, sentiment analysis, machine translation, etc. As with machine learning techniques, these systems are capable of improving their results as more interactions take place.

NLP-based services are well known in the market and may be the algorithms in charge of these tasks, some of the most widely used, such as libraries. Since we are working with NoSQL components, it is best to look for libraries that meet the following requirements: interface that allows queries with requests, large community and good documentation. A much more comprehensive online platform of AI-based services is distributed, including an analysis module that includes sentiment analysis and recognition of entities and grammatical phrases, which can be purchased on a per-unit basis for ‘credits’, although it offers a range of transactions instead of (important depending on the number of users who tend to use this service). To extract sentiment from a message, an installation is carried out and the necessary functions and objects are defined. With these tools and services, from comments, ratings and reviews that want to extract information about customer sentiment or compare with similar companies, the Data Science department can create a system where an end user is provided with a degree of confidence in their business (recommendation and warning, for example).

Natural Language Processing (NLP) is a fundamental discipline within Artificial Intelligence (AI) whose main objective is to analyse and understand human language in its written form. Thanks to advanced techniques and machine learning algorithms, NLP systems are able to perform a variety of tasks, such as recommending content, moderating comments, classifying messages, analysing sentiment or even performing automatic translations. These systems can improve their performance as they interact with more users and data.

NLP-based services are widely recognised in the market and there are numerous libraries and algorithms available. When working with NoSQL components, it is advisable to look for libraries that meet certain essential requirements, such as having an interface that allows queries and requests, having a large user community, and having complete and up-to-date documentation.

In addition, there are online platforms that provide AI-based services in a comprehensive manner. These platforms include a sentiment analysis module and recognition of entities and grammatical phrases. These services can be purchased for “credits” and offer a wide range of transactions, which is an important consideration depending on the number of users who wish to use this service.

In order to extract the sentiment of a message using NLP tools, it is necessary to set up a proper installation and define the necessary functions and objects. With these powerful tools and services, the Data Science department can create a system capable of extracting valuable information through comments, ratings and reviews, allowing for customer feedback and comparisons with other similar companies. This information can be used to provide end users with a degree of confidence in relation to a particular business, providing recommendations and warnings, for example.

5.4.3. Computer Vision

There is considerable potential in the market for machine vision. Over time, Machine Learning (ML) algorithms have been able to create highly valid predictive models based on images. The most widely used algorithms in this field today are mainly convolutional neural networks. Convolutional neural networks are a variant of neural networks that aim to learn spatial patterns from a two-dimensional matrix. Convolutional neural networks allow, by partitioning a weight set associated with the two-dimensional matrix of the original image into several convolutional sub-matrices, to learn patterns in each small fragment. This has led to significant advances in the field of computer vision.

In the field of information technology, we are also beginning to see applications of computer vision linked to virtual reality, which in the future may also have some application in photography, where applications are already being developed that follow the user’s gaze in real time, blocking out certain areas or other interests, thus improving empathy and freedom. These new applications offer a more immersive and personalised experience.

In addition, to describe the functionality of the libraries of applications that use computer vision in Python, we will use one known as OpenCV. OpenCV is an open source, cross-platform library mainly oriented towards optimising real-time applications with a large number of functions that allow for such speed and image-specific processing. OpenCV also offers high-level functions, such as algorithms for object tracking. Thanks to these functionalities, OpenCV has become a reference library in the development of computer vision applications.

OpenCV not only offers a wide range of image processing functions and capabilities, but also supports a variety of hardware devices. This means that programs using OpenCV can interact with a wide variety of devices, providing great flexibility and access to different platforms.

In conclusion, computer vision, supported by Machine Learning algorithms and libraries such as OpenCV, has enormous potential in the market. We are seeing significant advances in this field, and computer vision is being applied in a number of areas, such as virtual reality and photography. Over time, we are likely to see further development and use of this technology, allowing us to enjoy more immersive and personalised experiences in various application fields.

5.4.4. Robotics

In this section we will address the definition of robotics. In addition, we will focus on the applications that may be of most interest if you are looking to maximise productivity in a startup.

Definition of robotics

Robotics is a branch of technology, within the field of engineering sciences, which studies a series of disciplines that allow the design and construction of electromechanical systems and devices that in practice carry out the functions of a robot. The robot is synonymous with “artificial intelligence”, as this is its virtue. The term robotics is usually restricted to certain machines and consists of a series of elements that enable them to perform a certain function.

Robotics applications with productivity

The applications of robotics to improve productivity in the most relevant startups provide maximum efficiency and effectiveness in the production of products and services. Although in principle, the cost of investing in a robot machine is very high, if it is assessed in the long term, it is a technology that allows the cost to be amortised in a few months. In addition, they help to have machine-to-machine feeding, which could generate a faster and more efficient assembly line, adjusting production functions and action times.

Robotics, as mentioned above, would involve the automation of production processes, which is a significant improvement when setting up a company. By having robots in charge of specific tasks, the possibility of human error is reduced and performance is optimised. In addition, robots can work continuously without the need for breaks, which increases production capacity and overall efficiency.

Another advantage of robotics in startups is that it allows for efficient product customisation. Robots can adjust their movements and actions according to the specific needs of each customer, which speeds up the manufacturing process and enhances customer satisfaction. Robotics also makes it easier to implement continuous product improvements, as it is easier to update and modify robots than to make changes to manual methods or systems.

In the field of logistics, robotics also plays a key role for startups. Robots can handle the storage and transport of products in an automated way, streamlining processes and reducing delivery time . In addition, robots can be used in inventory management, optimising stock control and avoiding problems of lack or excess of products.

In short, robotics offers numerous advantages for maximising productivity in startups. From improving production efficiency and reducing long-term costs, to enabling product customisation and streamlining logistics processes, incorporating robots into a company's operations can make all the difference in a highly competitive market. As technology advances and artificial intelligence evolves, robotics will continue to transform the way business is done and offer new opportunities for growth and success.

5.5. Challenges and ethical considerations in the implementation of Artificial Intelligence in Startups.

These are small startups that are at an early stage of obtaining and analysing comprehensive data. However, it is possible for these startups to overcome this challenge, as there are several data marts, services and artificial intelligence applications that allow access to their machine learning resources controlled through APIs. These APIs offer specific tools for tasks such as multimedia content creation, text translation, image classification and price prediction, which are very useful for startups.

In addition, there are cases of small, specialised consulting companies that help startups integrate these technologies due to their in-depth knowledge of AI models and their end-use capabilities. These companies have a detailed understanding of the unseen capabilities of AI models, which is invaluable for startups in their integration process.

In addition to technology integration, startups also need to develop a legal and ethical framework for the use of AI applications. On the one hand, it is important that the technology works in a way that can demonstrate that its use incorporates ethical principles and social considerations. On the other hand, startups must commit to comply with and respect existing regulations at different legal levels. These challenges need to be considered and addressed in the company's AI governance framework.

To meet these challenges, artificial intelligence, especially machine learning, relies heavily on the quality of the data used to obtain and derive results. This aspect is crucial not only for CRMs, but also for any responsibility involving more or less personalised contact with third parties, both internally and externally to the organisational structure . Under normal circumstances, the organisation's Data Protection Officer should pay particular attention to ensuring that data quality does not represent additional risks in the processing carried out. In summary, startups need to address these challenges in a holistic manner to realise the full potential of artificial intelligence and ensure ethical and lawful use of AI applications in their daily operations.

5.5.1. Transparency and explainability

While the creation of business-tailored AI systems generally lacks as much secrecy as is common in traditional models, and most are modifiable by domain experts in a learning process, in general we can state the following. Three major properties are desirable in AI when applied to understanding or explaining. On the one hand, transparency, the fact that a human can access the information that the algorithm handles, especially if they are required by the legal or ethical regulations of the services or products that are intended to be implemented. Explainability, which informs us about the ability to see, hear, read, understand and possibly modify how an AI system has reached its conclusions. And finally, a desirable property, not much studied so far in AI, with an obvious name, but which we want to emphasise: understandability.

We have worked on transparency, especially in expert systems, presenting the results on demand in different representations, conveying to the user motives and rules used, as well as the range of reliability proposed by the expert. We have also worked on explainability, with the use of complete decision-making processes based on three models: seasonal, qualitative probabilistic and probabilistic, as well as the use of complementary information to clarify the assignment of variables. In addition, 60% of the people in charge of managing Big Data and Analytics do not have specific, relevant and advanced training.

5.5.2. Privacy and data protection

Another salesperson. In addition, providing security training both internally and to customer requirements. Indeed, one of the problems faced by any AI system is the limitation of access to data for knowledge extraction, more specifically machine learning. Supervised machine learning needs labelled samples for training and calibration; therefore, it is essential to ensure data privacy and security. Even for training one's own workers, data sets can be created that, if misused, can compromise the business. The use of multiple cloud providers with corresponding AI algorithms can have the advantage of offering a higher level of quality due to the increased data processing and analysis capabilities of an AI model. This, however, may make it more difficult to have full control over the data, making it more complicated to implement the measures detailed in these paragraphs and, therefore, significantly increasing the risk of certain privileged information being leaked to competitors or made available to unauthorised third parties. In addition, the diversity of providers implies different security and data management policies, which makes it even more difficult to ensure robust protection. On the other hand, the increased complexity of the AI infrastructure when using multiple vendors can also lead to increased vulnerability to potential security breaches. Therefore, a comprehensive and rigorous approach to ensuring confidentiality and control of data in the AI environment is essential. This minimises the risk of security breaches and adequately protects sensitive information. In summary, while the adoption of multiple cloud providers can improve the quality and performance of AI systems, it also introduces additional challenges in terms of security and data management. Finding a balance between optimising performance and protecting sensitive information is essential to ensure the success and integrity of the enterprise AI implementation.

5.5.3. Algorithmic Biases

One of the biggest challenges of this technological revolution is the use of algorithms that discover patterns or structures, capable of innovating or standing out from the rest, establishing trends in the increase of productivity and commercial traffic on the internet. This is the origin of what has come to be known in recent times as algorithmic bias. Although it may seem to be a peculiarity of an academic stream, empirical evidence shows how information algorithms produce discrimination. A clear example is found in a study in which male and female views were seen with the same probability in the case of placing photos in an advertising campaign, but the price offered to users for this product was disparate depending on the sex of the internet user, with the price for women decreasing by approximately 5-7%, a stereotype that was derived from the analysis of the tendency towards girls who accessed a link from a blog on specific cyber-topics. Apart from ethical doubts, the question that arises is whether it is possible to avoid or remedy these undesirable classifications. Bias, while unavoidable in any algorithmic human decision process, can be subrogated to another by either correcting the data by making corrective decisions, processing the decision differently or modifying the algorithm itself. From the first two options, it may be safe for both routes to transit efficiently, but imposing the algorithm as a stand-alone entity will be more cost-effective for the latter. However, this computational solution to the problem is not clear. The usual solutions, such as data correction or problem correction, while they might solve the problem, may not be cost-effective. If we employ algorithms to map inputs to an output and these variables have a linear basis for a classification system, it is a critical decision whether to correct for bias to obtain unbiased results or to continue using it.

In a world increasingly dominated by technology and artificial intelligence, there is a major challenge: the use of advanced algorithms capable of discovering patterns and structures, generating innovation and standing out from the crowd. These algorithms are key to driving productivity and commerce on the internet. However, in recent times, a worrying issue has emerged: algorithmic bias. Although it may sound like an academic concept, empirical evidence shows that information algorithms can lead to discrimination. One study revealed a clear example of this: in an advertising campaign, images of men and women were equally likely to be shown, but the price offered to users for a product varied according to the user's gender. Surprisingly, the price was lower for women, with a reduction of about 5-7%. This stereotype was derived from the analysis of the trend of women entering from a link on a specific blog.

Beyond the ethical issues that this example raises, the question arises as to whether it is possible to avoid or correct these undesirable rankings. Although bias is inevitable in any algorithmic decision-making process, there are alternatives that can replace or modify the algorithm to obtain fairer results. Two options are to correct the data through corrective decisions or to change the way the decision is processed. However, imposing a stand-alone algorithm may be the most cost-effective solution. Although this seems a promising solution, there is still uncertainty about how to tackle this computational problem effectively. The usual solutions, such as data correction or direct solution of the problem, could solve the bias, but may not be cost-effective. Moreover, if we use algorithms to map inputs to outputs and these variables have a linear basis for a ranking system, the critical question arises whether we should correct for bias to obtain unbiased results or continue to use it to our advantage.

5.6. Steps for the successful implementation of AI solutions in Startups

The implementation in the startups covered in this project consists of the following steps. Before starting the outline of the whole process of involvement, the role of the company or department manager, who is aware of the needs and capabilities of the organisation and the problems to be solved, stands out. Ultimately, they will be the ones to decide on the process to be followed, the level to be reached and the professionals to be involved. In addition, they will be the intermediate point between the technicians who carry out the development and the end users.

5.6.1. Setting concrete objectives

If, at the end of the process, difficulties are detected, it will be the person in charge who will solve them and remain attentive to the reactions of the users. In the same way, the project's interest in the development attempt is public and notorious, which is why he or she will manage the necessary resources. The aim is to achieve a final result that is optimised and adapted to the company.

5.6.2. Involving end-users

The success of the implementation of a technology will be determined by a number of factors, the most important of which is that the technology meets the expectations of the users, i.e. that it is accepted and used in the performance of the organisation's normal activities. In order to achieve this objective, it is necessary to convince users of the benefits of the technology and the possible advantages that it can represent for them at the individual and organisational level.

5.6.3. Defining clear objectives

Understanding what you want to achieve and setting clear goals remains the first step towards creating a technology strategy that drives growth. Working closely with users and teams and involving them in the design process can ensure both product success and buy-in over time, mitigating potential adoption risk. Business leaders should consider from a practical point of view that for small problems, artificial intelligence can generate a solution that is more costly than the problem itself; in these cases, big data analytics may be more appropriate. In contrast, having an artificial intelligence system that looks into high-value customer accounts and suspects fraudulent activity makes sense from a merit assessment perspective, given the potential risks of not acting. Establishing a baseline of dual system performance is related to clear target setting, as it allows firms to evaluate both standalone performance and user-based solutions over time. This practice could facilitate meaningful tuning, data influx or data training to improve system performance. On the other hand, baseline knowledge could preserve the investment of improving dual system performance, where deeper investment can be made. Identifying and driving critical capability could also be effective. As the intelligent system looks over the user's shoulder, including the procedure from the side, the system has the ability to make use of its own perception, understanding and action that can improve performance beyond human capabilities, while increasingly providing useful feedback to the user, as opposed to most interaction systems.

5.6.4. Collecting and preparing quality data

Data collection is a crucial process for smart decision making. The problem today is not access to data, but how to obtain and extrapolate relevant and quality information from a vast amount of information resources. After all, it is from the data collected that the information needed for decision making is extrapolated, even if the data itself does not provide anything without a structured and meaningful support extracted through extensive processing. Sources of information must be identified in the application environment in order to obtain the necessary data that can then be aggregated to analyse the information. However, the problem remains as to what data we need for efficient and effective analysis. There is no doubt that the success of a Big Data project is directly proportional to the quality of the data set used, hence the importance of data collection and refinement work. Establishing and implementing methods by which data can be captured, stored and categorised is vital to understanding the scope of our projects. Experts in the field believe that one way to better understand application data is to categorise it. To do this, we select a subset of specific characteristics that define a class and we categorise, detect trends and establish relationships between the data collected to increase the efficiency of our initiatives. This categorisation diagnoses how change occurs in the market at a particular point in the cycle. Two of the most commonly used classifications are geographical characteristics and behavioural characteristics, as the data collected is often unusable due to the presence of errors or inconsistencies.

5.6.5. Selecting the right technology

To achieve a successful digital transformation in software production, the right technology must be selected. The goal is to reduce time and costs. The right software is a prerequisite for reducing time, but it is not enough. We show how a good software development strategy aimed at accelerating development cycles is also necessary. For a successful development strategy, we focus on two axes: reducing the software time-to-market and not only building, but also evolving the development. Adequate software is a prerequisite for reducing time-to-market, but it is not enough. We will present a case in which, in a large software construction company, over a period of 2 years, the recommendations proposed here were implemented to improve: the software architecture oriented towards microservices; the API maturity model to favour standardisation and the release of shorter evolutionary cycles; the development process by increasing, completely eliminating the bureaucratic management of the backlog, orienting the flow towards obtaining candidate versions to be released at any time and segmenting the flow coverage into small packages: first the completely finished software and passing the integration tests with the process and, in parallel and successively, the deployment in load and, subsequently and evolutionarily, the coverage of the regression tests.

5.6.5. Train the team in AI skills

In relation to training in Artificial Intelligence, I support startups developing immersion programs in AI skills for their staff and that, in addition, AI training strategies take into account SMEs. The most advanced companies have already recognized that offering training to their employees is not only an ethical duty but also a conscious business decision that allows for the expansion of internal talent competencies and fuels the innovation process. They offer, especially: training courses on strategy, financing, practical solutions, and information and outreach services on the subject. Some initiatives aim to increase adoption by SMEs through an active policy and a demand-centered approach. This includes, for example, awareness-raising and promotional activities aimed at increasing awareness of AI, developing a comprehensive knowledge base, and a database of successful use cases. It is also planned to inform SMEs promptly about funding opportunities and access to the right moments. In general, the goal is to address the specific limitations of SMEs in deploying AI initiatives and in the adaptation and technological evolution of business models. Additionally, the expansion of AI training programs to accommodate the needs of SMEs is crucial in order to promote inclusive growth and ensure that these businesses can thrive in the digital era. With the right training and support, SMEs can harness the power of AI to drive innovation, improve productivity, and compete on a global scale. As AI continues to evolve and transform industries, it is essential that all businesses, regardless of size, have the opportunity to leverage its potential.

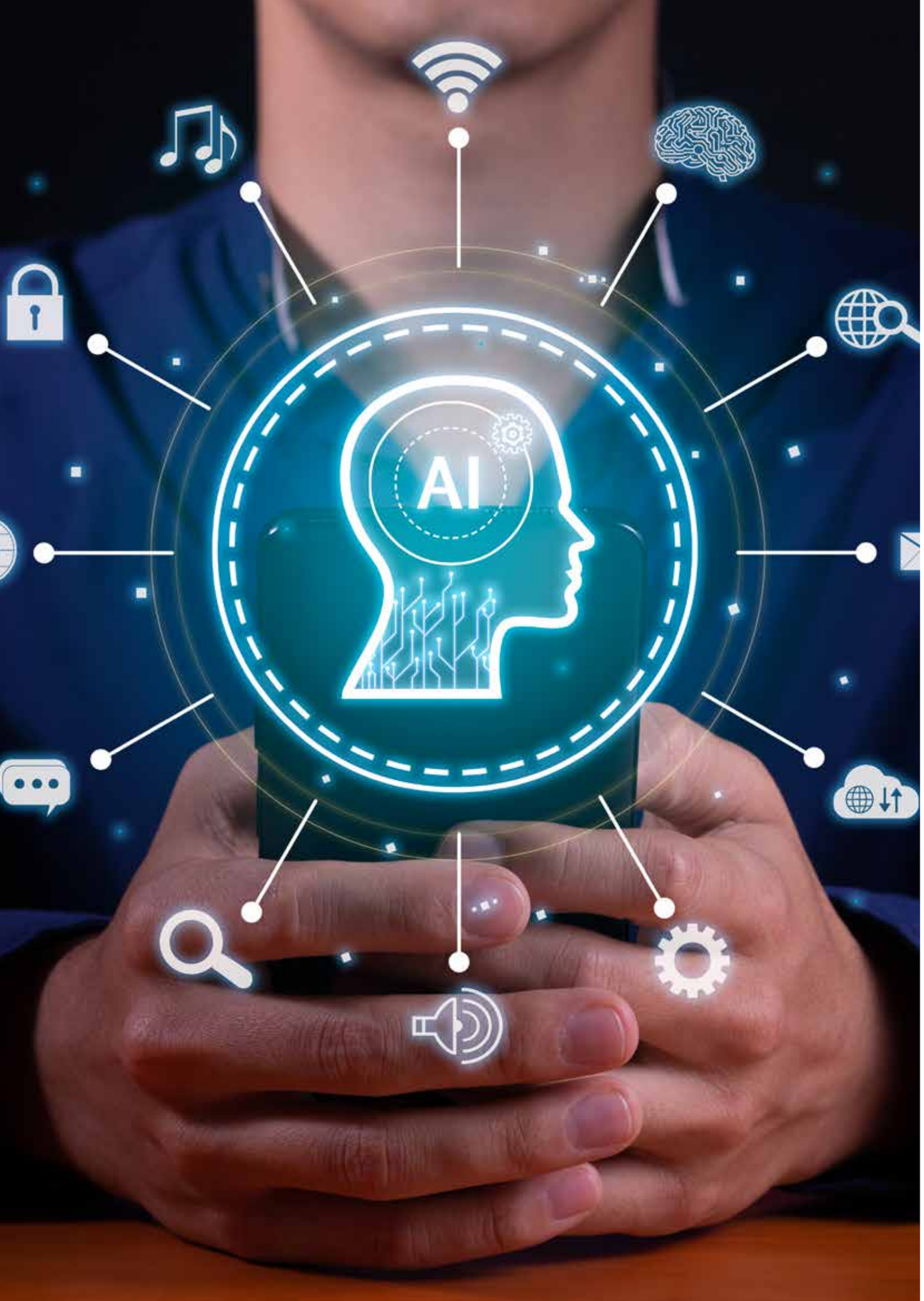
5.7. Conclusions and future perspectives on the use of Artificial Intelligence in Startups

Artificial intelligence (AI), along with new technologies, is set to significantly revolutionise business in the handling of large amounts of data, as well as automating numerous tasks that are performed manually. Startups are the perfect scenario for this change. Many startups could not afford to grow without AI because of the level of analytics required and the unfeasibility of performing these tasks manually. Not only that, but startups go through different stages of growth needs and formats, which is why it is necessary to differentiate between the different stages of growth and the different objectives for which startups are seeking funding. In addition, the acquisition of funding is one of the factors limiting the growth of companies and these tools have been shown to significantly improve in this area. But this is not the end of the story, as companies are increasingly aware of the financial needs they will require, and campaign optimisation needs to be done at a precise level of granularity.

Customer acquisition in a startup should be as smooth as possible and, according to the capabilities of each company, users can be segmented and unwanted situations can be detected. In conclusion, the main benefits that tools based on the use of artificial intelligence offer these companies are: optimisation of marketing strategies, improvement of the conversion funnel, indispensability in the analysis of metrics, help in customer segmentation and in targeting, and the possibility of customer scoring. Acting in real time, detecting undesirable situations such as fraud, and competitive advantage in customer acquisition.

Then, for startups, it is crucial, already in the campaign dilation phase, to manage in an automated and effective way the multiple activities they perform to engage and satisfy their customers/users. Artificial intelligence can improve the efficiency and effectiveness of these activities, enabling startups to achieve a higher level of successful growth and customer satisfaction. In addition, AI can also play a key role in personalising the customer experience, allowing companies to tailor their products and services to the individual needs of each user. This not only improves customer satisfaction, but also increases the chances of customer retention and loyalty.

In short, artificial intelligence and new technologies are changing the way startups operate and grow. These tools enable companies to handle large amounts of data, automate tasks and improve their analytical capabilities. The adoption of artificial intelligence is becoming increasingly essential for the success and growth of startups, as it provides them with competitive advantages, optimises their marketing strategies and improves the customer experience. With the right use of AI, startups can achieve unprecedented levels of efficiency and effectiveness, enabling them to stand out in the market and outperform the competition.



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FUTURE PROSPECTS FOR AI IN EU BUSINESS

The extensive development of AI will greatly facilitate the adoption of these systems in the near future, as current barriers are resolved, collaboration between the different actors involved is fostered, and the implementation of these systems becomes increasingly efficient and effective.

The development of AI in Europe is one of the top priorities for the European Union in the period 2024-2030. This interest is mainly focused on the highly positive effects that AI can have in terms of attracting investment, increasing competition and generating employment in the labour market. Several European countries are adopting measures and policies to foster research, development and innovation in the field of AI, including the implementation of tax incentives for R&D&I activities, the creation of pilots for the adoption of digital technologies in different sectors and the establishment of a European trustmark for AI-based products and services. The European Commission has published numerous reports and recommendations related to AI, including new public procurement rules that encourage governments to use IT services that integrate artificial intelligence.

This new directive is transforming the public procurement landscape in Europe, promoting the adoption of digital technologies by governments and fostering openness, transparency and efficiency in the procurement of goods and services. In addition, it proposes the design and creation of a "Digital Single Market" that promotes collaboration between sectors and governments in the procurement of e-Intelligence solutions.

All of this clearly shows the EU's commitment to leading the development and implementation of AI on the continent. In terms of emerging technological innovations, it is important to note that while numerous AI-related projects are being observed, in many cases their actual impact is not yet as significant as might be expected.

So far, AI implementation ecosystems have only been seen in specific fields such as medicine, Industry 4.0 and digital transformation, as well as in the use of robots in programmed tasks. However, what we do see among businesses and organisations in general is the increasing use of big data analytics.

Although a full manifestation of the possibilities offered by this mass data in terms of graphical representations and interpretation developed through AI has not yet been reached, it is evident that mass data analysis has already started to be implemented since the end of the last decade. This indicates that we are at a point of maturity or even decline of this tool, which further highlights the importance that AI can have in the development of various human activities.

In terms of possible evolution scenarios in different sectors, the healthcare sector is one of the areas with the greatest potential for the application of artificial intelligence. Over the next fifteen years, significant development of industry-driven medical applications is expected, such as advances in diagnostic imaging, personalised medicine, prescription support and reference systems to help improve clinical decisions. These advances could lead to significant cost reductions, which would have a positive impact on public healthcare systems.

In the field of education, artificial intelligence-based teaching and learning systems are in full development, although there are still few leading systems and their use remains controversial. Future developments are expected to include advances in clinical-educational diagnostic methods, the implementation of personal tutoring systems, and increased resistance to change towards more participatory approaches to teaching.

Regarding the impact of AI on the labour market, surveys of IT managers indicate that 91% expect job profiles to change due to the introduction of AI. Low-skilled jobs, especially those related to mechanical or manual tasks, are expected to be the first to disappear.

Over time, other jobs requiring manual skills will also be affected, replaced by new hires who will need to meet the necessary requirements to effectively manage and control AI. Despite the concern among managers, only 50% of companies are investing in training their employees to adapt to the current changes, indicating that there is still a long way to go in this revolution that is transforming and developing our societies as never seen before.

Finally, in terms of conclusions and recommendations for companies in the European Union, the use of artificial intelligence, robotics and additive manufacturing systems in European companies has been analysed. The results have shown that around 7% of EU companies have developed AI systems in the last year, with Spain being six percentage points below the average. Other countries such as Portugal, Greece and Slovenia exceed the EU average, with an average of 10.6%. In terms of the use of other advanced technologies, the results in Spain are below average.

This shows that both Spain and the European Union in general are not strongly promoting the implementation of AI in the business world. This trend looks set to continue in the coming years. On the other hand, a survey of business executives worldwide reveals that 59% plan to implement cognitive technologies, and in the case of Spanish companies, 67% intend to implement AI. This shows a greater lag in the EU compared to other regions. With this in mind, it is important to note the importance of European companies adopting technologies based on AI and preparing for the changes they bring. Greater investment in training employees and driving AI into the business fabric is needed to remain competitive in the global marketplace and to make the most of the opportunities that AI can offer.

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