

# Booklet

## An essay on life in the AI era

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### Abstract

HEDY - Life in the AI era is a 2-year Erasmus+ project started in November 2021. Its goal is to offer a comprehensive and shared view of how AI is affecting our lives and reshaping our socioeconomic, cultural, and human environments by promoting critical reflection, self-based learning and debate on these issues. The main target for this project is the higher education audience. Four specific objectives will be produced to reach this goal, the first of which is the Booklet, the subject of this paper. The Booklet is an essay defining the HEDY position on life in the AI era and the rationale for that position. In this paper, we describe and present the results of our two-fold approach to build our rationale about the challenges, opportunities and expected impact of AI on four areas: business, governance, skills & competencies, and people & lifestyle. This two-fold approach consists of collecting information from two sources: i) Literature survey, and ii) Interaction with people. Clearly, the first source consists of collecting the current state of knowledge about the impact of AI. The second source was a mixed approach consisting of both questionnaires and focus groups conducted in five different European countries with either experts or non-experts in AI. These two sources provide a unique contribution on AI panorama by combining state of the art research with first-hand opinions and debated questions, concerns, and ideas of interacting individuals.

### 1. Introduction (UPC)

The digital is invading our world, with technology being used in all dimensions of life, from education to work, health or governance. Knowledge and skills development is now a lifelong process, demanding growing digital literacy. While for some members of society, such as ‘digital natives’, using technology is natural, this is not necessarily the case for the non-native digital persons (the so-called digital immigrants). How do we ensure that every citizen develops the necessary skills to remain included in an increasingly digital society? And how to achieve fairness rather than amplifying inequalities? Assuming that Artificial Intelligence (AI) will transform the labour market, it is relevant to imagine the education system in a world where work is not a central factor in life or where jobs, as we know them, do not exist. What would be the role of education? How could we organise it? What would be its aims and what needs would it address? And nothing better than proposing the use of technologies to raise awareness of life in the digital age and to develop skills to enjoy the benefits but also face the challenges that this new age offers.

This is the leitmotif of HEDY – Life in the AI era [1], which is a 2-year Erasmus+ project started in November 2021. In its own title, it provides tribute to Hedy Lamarr<sup>1</sup>, an Austrian actress and inventor (1914-2000), co-creator of wireless communications technology, adopted to control torpedoes during World War II and currently still used in mobile networks, Bluetooth devices and Wi-Fi. HEDY project stands for being a free and accessible source of

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<sup>1</sup> [https://en.wikipedia.org/wiki/Hedy\\_Lamarr](https://en.wikipedia.org/wiki/Hedy_Lamarr)

information regarding the digital technologies of the 4th industrial revolution (Industry 4.0), namely AI, by enlightening its possible positive future applications, whilst clarifying the possible impacts. HEDY's goal is to offer a comprehensive and shared view of how AI is affecting our lives and reshaping our socioeconomic, cultural, and human environments by promoting critical reflection, self-based learning and debate on these issues. The main (but not exclusive) target group of this project is the higher education audience.

Four specific objectives will be produced to reach this goal:

- 1) A *Booklet* – an essay defining the HEDY position on life in the AI era and the rationale for that position;
- 2) A *Toolkit* – a collection of influential AI audio-visual related tools, including films and expert talks;
- 3) A *Massive Open Online Course* (MOOC) – a course to spread out the awareness of main developments in AI and promote extensive knowledge, critical reflection and debate on AI and its key impact on society;
- 4) A *Guideline* – a concise and easy-to-read documentation for the best use of the assets produced, creating a solid foundation for ensuring the usability of the HEDY results by a wider community of practice network.

In this document, we present the Booklet. It plans to be a contribution to the challenge launched by the European Commission to build a solid European approach to AI, based on the 2018 strategy (AI for Europe, COM/2018/237 final) and reinforced by the 2020 White Paper (On AI – A European approach to excellence and trust. COM/2020/65 final). It also contributes to the ethical framework of UNESCO [2] which provides in its resolution the basis to make AI systems work for the good of humanity, individuals, societies and the environment and ecosystems, and to prevent harm.

As stated above, its scope is to organise the AI features, identify challenges, opportunities, risks associated with certain uses, and expected impacts on four different ambits of our society:

- **Business** – with the increasingly vast amount of data available today and the constantly evolving preferences and complexity of customers, businesses can no longer rely on traditional business methods to drive growth. These radical changes have opened up a new realm of possibilities, with AI, to drive business growth through actionable insights generated from customer data. AI in business simply involves the use of intelligent computer software with human-like capabilities to boost revenue, improve customer experience, increase productivity and efficiency, and drive business growth and transformation.
- **Governance** – the word *governance* has become embedded in standard business vocabulary and it is something that includes all processes of governing. It is the way rules or actions are structured, maintained, and regulated – and often how accountability is assigned. AI governance should close the gap between them and make sure that boundaries within technology are set (i.e., they are ethical), so it does no harm and further aggravates inequalities incidentally while it operates.
- **Skills & competencies** – it is a virtual certainty that AI is beginning to replace increasing numbers of labourers: outsourcing of labour to machines will alter the skills and competencies which are valuable in a competitive labour market. In response to the inevitable changes in the workforce, education systems' priorities seem to need a shift to reflect the skills and competencies that will be valuable in an AI dominated era, to better develop students' abilities to creatively think, to emphasise the importance of lifelong learning and to encourage students to be curious and innovative.
- **People & lifestyle** – AI came to stay in our daily lives. From making our day-to-day lives easier with online search recommendations, voice assistants and facial recognition logins, to facilitating advances in healthcare, identifying pandemics, and helping alleviate starvation, AI is a truly transformative technology with far-reaching effects. Nevertheless, those effects are not always positive to humans: social manipulations, invasion of privacy and social grading, discrimination are few examples of dangerous use of AI.

Besides describing the current applications and expected impacts of AI, for each ambit, we also identify the 5/6 more concerning issues about AI. Nonetheless, we are not trying to provide general solutions of these concerns; on the contrary the idea is to offer an engaging way to stimulate reflection and debate on knowledge society topics, discuss the ethical effects of these emerging digital technologies and provide paradigmatic examples.

To reach this goal, we have adopted a two-fold approach to build our rationale. This two-fold approach consists of collecting information from two sources: i) Literature survey, and ii) Interaction with people. Clearly, the first source consists of collecting the current state of knowledge about the impact of AI. The second source was a mixed approach consisting of both questionnaires and focus groups conducted in five different European countries with either experts or non-experts in AI. These two sources provide a unique contribution on AI panorama by combining state of the art research with first-hand opinions and debated questions, concerns, and ideas of interacting individuals.

The rest of the paper is organised as follows. Section 2 describes the fourth industrial revolution, namely the digitization and automation of manufacturing by means of a fundamental shift in the way products are produced, and it is deeply tied to the large adoption of AI. Section 3 is dedicated to the definition of AI and the identification of the main challenges and opportunities in general terms. Section 4 overviews the current applications of AI while Section 5 presents the expected impacts of AI in the four ambits discussed above. In Section 6, we summarise our findings and highlight the key ideas that cut across the entire document. Section 7 concludes the paper.

## 2. The fourth industrial revolution (UPC, all)

It is instructive to remember that this is not the first time society has been disrupted by an industrial revolution, but the fourth. Before the 19th century, a large percentage of the workforce was concentrated in the agricultural sector and the use of mechanical machines was very limited. Throughout the last 2 centuries, humanity has experienced four industrial revolutions that radically changed our life and our society.

The First Industrial Revolution can be dated in the period between 1760 and 1840 in Europe and the United States. The use of steam and water power marked the move from hand production methods to machines. The first sector where this transition happened was in the textile industry followed by iron industry, agriculture, and mining. It also marked a societal repercussion: the growing of the middle class.

The Second Industrial Revolution is also referred to as the Technological Revolution. It spanned the years 1871 to 1914 and was triggered by the construction of vast railroad and telegraph networks and the large introduction of electricity. As factories became more electrified, they were able to construct the modern production line. It was a time of rapid economic expansion and increased productivity, but it was also a time of high unemployment as many manufacturing employees were replaced by machines.

The Third Industrial Revolution is the Digital Revolution and it occurred after the end of the Second World War, in the late 20th century. It consisted of the transition from mechanical and analogue to digital electronics, which began with the adoption and proliferation of digital computers and digital record-keeping. The mass production and widespread usage of integrated circuit (IC) chips, and related technologies, such as computers, microprocessors, digital cellular phones, and the Internet, are at the heart of this revolution that still continues to this day.

Finally, the Fourth Industrial Revolution, also known as Industry 4.0 was first introduced in 2011 by a team of German scientists in a high-tech project, which promotes the computerization of production [4]. The term was then popularised by Klaus Schwab in 2015. He is the World Economic Forum Founder where he is currently serving as executive chairman. Schwab asserts that the changes seen are more than just improvements to efficiency, but express a significant shift in industrial capitalism [3].

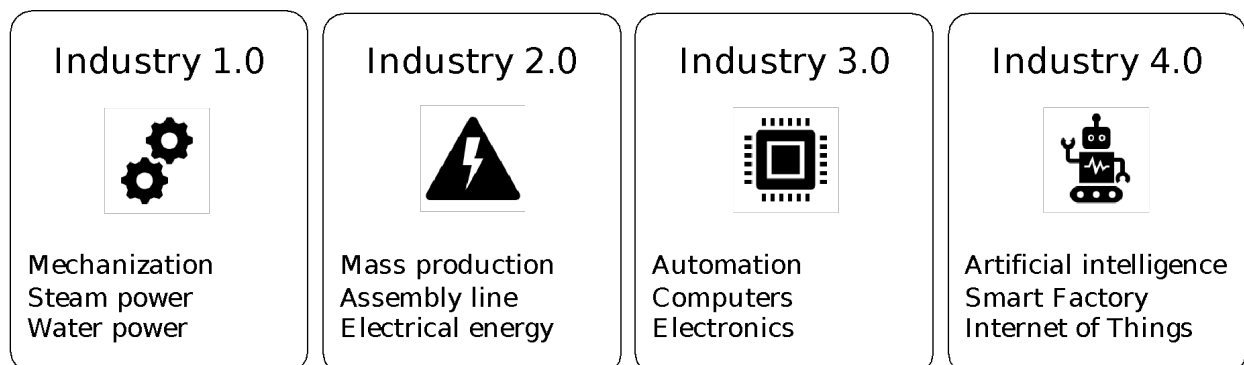


Figure 1. The four Industrial Revolutions

In essence, Industry 4.0 is the trend toward a union between physical assets and advanced digital technologies like Internet of Things (IoT), AI, robots, drones, autonomous vehicles, 3d printing, cloud computing and others, that are interconnected, having the possibility to communicate, analyse and act. Organisations adopting Industry 4.0 are more flexible, responsive and intelligent, therefore more prepared for data-driven decisions.

There are three reasons why today's revolutions are not just a continuation of the Digital Revolution, but rather the start of a new one: impact, speed, and scope. The present rate of breakthroughs is unprecedented in history. Emerging technological developments in disciplines including AI, IoT, autonomous cars, robots, quantum computing and networking, nanotechnology, etc. make Industry 4.0 progressing exponentially rather than linearly as in the preceding industrial revolutions. Furthermore, it is causing havoc in nearly every business in every country. And the breadth and complexity of these developments indicate a complete overhaul of production, management, and governance systems.

The Fourth Industrial Revolution, like the previous revolutions, has the potential to boost global income levels and enhance the quality of life for people all around the world. To date, those who can afford and access the digital world have benefited the most from it; technology has enabled new products and services that improve the efficiency and enjoyment of our daily lives. In the future, technological advancements will result in a supply-side miracle, with long-term benefits in efficiency and production. Transportation and communication costs will fall, logistics and global supply chains will become more efficient, and trade costs will decrease, opening up new markets and driving economic development.

Nonetheless, there are not only positive impacts. The current revolution has the potential to increase inequality, notably by disrupting employment. As automation replaces work across the economy, the net displacement of employees by machines may increase the gap between capital and work returns. It is clearly also possible that technological displacement of employees will result in a net increase in safe and satisfying occupations.

Besides the economy, inequality is the most significant societal worry related to Industry 4.0. The suppliers of intellectual and physical capital such as inventors, stockholders, and investors are the biggest benefactors of this revolution. This explains the growing wealth disparity between those who rely on capital and those who rely on work. One of the results of this situation is that the majority of people in high-income nations' earnings have remained stagnant, if not declining: there is significant demand at both the high and low ends of the employment market, but a hollowing out in the centre. This helps to explain why so many employees are disillusioned and concerned that their own and their children's actual salaries will remain stagnant. It also explains why the world's middle classes are becoming dissatisfied and unfairly treated. A winner-takes-all economy with restricted middle-class access is a prescription for democratic stagnation and dereliction.

The pervasiveness of digital technology and the dynamics of information sharing represented by social media may also foment discontent. In order to interact, study, and exchange knowledge, more than 30% of the world's population today uses social media platforms. These contacts, in an ideal world, would allow for cross-cultural understanding and integration. They may, however, foster and promote inaccurate expectations of what constitutes success for a person or a group, as well as provide platforms for the dissemination of extremist beliefs and ideologies.

In this context, AI is one of the key drivers of the fourth industrial revolution and is already all around us and affecting our life daily: from self-driving vehicles to virtual assistants, software that translates, invests, and suggests cultural preferences, to name only a few examples. The unprecedented computational and storage capacity, the access to massive quantities of data and the large adoption of AI in many different ambits are creating a symbiosis between digital and biological worlds that are changing the way we live and interact with the environment.

Referring again to the questions we raised in the introduction and in line with the potentials and risks mentioned above, in the following chapters we try to provide some more thoughts and arguments regarding AI and its impacts. Firstly, we present a survey of the challenges and opportunities of AI in a general context and then specialise them in four more target areas namely business, governance, education and lifestyle. Secondly, we report the results of the

focus groups we have conducted in five different countries with experts and non-experts in AI allowing us to get more direct reflections about the current and expected impacts of AI.

### 3. AI definition, challenges and opportunities (OÚ)

#### 3.1 Definition

It is difficult to clearly define AI due to the diversity of Artificial Intelligence (AI) problems, solutions, distinction of what AI contains and what not. The shortest and simplest definition is: „AI is not biological intelligence” [1]. AI is one of the most life changing scientific and technological developments of the century. There is no universally accepted definition of AI, it is an umbrella term. AI is a science and computational technology that is inspired by the way people use their nervous system (acquire, store, manipulate, transmit information, learn, reason) and bodies to learn, reason, and take actions.

Encyclopaedia Britannica defines AI [2] as „the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalise, or learn from past experience”. The Cambridge Academic Content Dictionary [3] compresses in a shorter version: „the use of computer programs that have some of the qualities of the human mind, such as the ability to understand language, recognize pictures, and learn from experience”.

AI, a term coined by John McCarthy in 1955, was defined [4] by him in 2007 as “the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable”.

After 1955, several definitions of AI emerged. In their popular book Russel and Norvig [5] developed a new taxonomy. They examined the definitions of AI according to two dimensions. On the one hand, they separate the human-focused conception of the empirical sciences from the rational-focused conception of mathematics and engineering. On the other hand, thought processes, inference, are separated from behaviour. Based on the combination of the two aspects, four groups can be formed.

#### Human approach

(1) **Systems that think like humans** (e.g., cognitive architectures and neural networks);

*Thinking Humanly*: there is no comprehensive theory of mind yet, but the ultimate goal is for the system to function in a manner similar to human thinking. The interdisciplinary field of cognitive science brings together computer models from AI and experimental techniques from psychology to construct precise and testable theories of the human mind. If the program’s input–output behaviour matches corresponding human behaviour, that is evidence that some of the program’s mechanisms could also be operating in humans.

(2) **Systems that act like humans** (e.g., pass the Turing)

*Acting Humanly*: Turing [6] proposed a test called "The Imitation Game": (Turing-test), which is an operational definition of intelligence. A computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses come from a person or from a computer. The computer would require to possess following capabilities:

- natural language processing to communicate successfully in a human language;
- knowledge representation to store what it knows or hears;
- automated reasoning to answer questions and to draw new conclusions;
- machine learning to adapt to new circumstances and to detect and extrapolate patterns
- computer vision and speech recognition to perceive the world;
- robotics to manipulate objects and move about.

#### Ideal approach

(3) **Systems that think rationally** (e.g., logic solvers, inference, and optimization);

*Thinking Rationally*: a system is rational if it does the „right thing”, given what it knows, based on an irrefutable reasoning process. The logistics tradition within artificial intelligence hopes to build on such programs to create intelligent systems.

- (4) **Systems that act rationally** (e.g., intelligent software agents and embodied robots that achieve goals via perception, planning, reasoning, learning, communicating, decision-making, and acting).

*Acting Rationally*: computer agents are expected to operate autonomously, perceive their environment, persist over a prolonged time period, adapt to change, and create and pursue goals. A rational agent is one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome. All the skills needed for the Turing Test also allow an agent to act rationally. Important fact: perfect rationality—always taking the exactly optimal action—is not feasible in complex environments, because the computing needs are too high. The history of AI is dominated by study and construction of the rational agent approach Russell and Norvig [5] define as the study of agents that receive precepts from the environment and perform actions.

The definition, given by Nilson [7], includes a broad interpretation of the concept of intelligence, not only humans, but animals and some machines are intelligent to variant degrees: „AI is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment.”

The definition of AI also differs in documents issued by international organisations.

- European Commission [8]: “AI is a collection of technologies that combine data, algorithms and computing power”.
- OECD [9]: „An AI system is a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments.” “AI systems are designed to operate with varying levels of autonomy.”
- UNESCO [10]: AI is an ensemble of advanced ICTs that enable “machines capable of imitating certain functionalities of human intelligence, including such features as perception, learning, reasoning, problem solving, language interaction, and even producing creative work”
- Council of Europe [11]: „Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions.”

In general terms, AI refers to a broad field of science encompassing not only computer science. If we construe AI as studying how information is acquired, processed, stored, used, etc. in intelligent animals and machines then it obviously overlaps with several older disciplines [12]:

- Philosophy
- Mathematics and statistics
- Economics
- Neuroscience
- Psychology
- Biology and medical science
- Linguistic
- Computer sciences
- Technical sciences
- Safety and security sciences

Nowadays AI is trained and focused to perform specific tasks (playing strategic games, language translation, self-driving vehicles, and image recognition, trip planning etc.). This development level of AI is called [13] Artificial

Narrow Intelligence (ANI) or Weak AI [14]. The next level is General AI (Artificial General Intelligence, or AGI) [13] or strong AI [14] refers to a future, theoretical form of AI system that exhibits apparently intelligent behaviour at least as advanced as a person across the full range of cognitive tasks. Artificial Super Intelligence (ASI) [13] — also known as superintelligence—would surpass the intelligence and ability of the human brain.

### 3.2 Brief history of AI

AI is a relatively new discipline (born in the middle of the 20th century). Turing, often called the “father of AI”, published in 1936 a mathematical description of what he named a „universal machine” [15] and he was the first to publish a method (Turing test) in “Computing Machinery and Intelligence” [6] to determine whether a machine thinks.

The initial flowering phase was replaced in the 1970s by the so-called AI winter when development slowed down. Forecasts proved to be excessive, the approaches used so far did not live up to expectations, and the capacity of the machines limited the possibilities. In the 1980s, expert systems brought a brief boom, but then came the second AI winter. The current wave of progress and enthusiasm for AI began around 2010 due to three factors:

- capabilities more powerful computers
- the availability of big data from sources including e-commerce, businesses, social media, science, and government
- improved machine learning approaches and algorithms.

The following table provides a concise overview of the historical evolution of AI without claiming to be exhaustive given the size of the topic [5][7][16][17][18][19].

Table 1. Brief history of AI.

Date	Name/ affiliation	Event
1936	Turing	published his paper "On Computable Numbers, with an Application to the Entscheidungsproblem".
1943	McCulloch and Walter Pitts	Artificial Neuron Model Logical Calculus of the ideas Immanent in Nervous Activity (neurons and synapses could be explained by logic and mathematics)
1945	Neumann	published "First Draft of a Report on the Edvac" -principles of operation of computers
1947	Wiener	published: Cybernetics: Or Control and Communication in the Animal and the Machine
1949	Neumann	EDVAC Electronic Discrete Variable Automatic Computer the first digital universal computer
1950	Turing	Turing published: "Computing Machinery and Intelligence" proposing the Turing-test
1950	Minsky and Edmonds	SNARC: first neural computer
1955	Bernstein	first chess program
1956	McCarthy	birth of AI in a summer conference at Dartmouth University and : the term 'artificial intelligence' was coined
1958	McCarthy	development of the computer language LISP (List Processing)

1959	Newell -Shaw– Simon	published the „Report on a general problem-solving program”– invention of a universal problem-solver machine
1958	Marvin Minsky and John McCarthy	founded the Artificial Intelligence Laboratory at Massachusetts Institute of Technology (MIT)
1962	Rosenblatt	Perceptron: the first neural network
1963	Slagle	SAINT program: first expert system solved calculus problems at the college freshman level
1965	Feigenbaum, and Buchanan	DENDRAL: first successful knowledge-based program for scientific reasoning
1966	Weizenbaum	ELIZA natural language processing computer program, interactively mimics a psychotherapist
1968	Quillian	published „Semantic network, introduced semantic networks as a method of modelling the structure and storage of human knowledge in the shape of a graph”
1969	Greenblatt, Eastlake III, Crocker	MacHack chess program played in human tournament conditions, granted a chess rating, and win against a person in tournament play
1966-72	Rosen, Nilson, Hart	Shaky: first general-purpose mobile robot able to make decisions about its own actions
1972	Stanford University	MYCIN: first medical expert system
1978	Simon	Nobel-prize in economics (bounded rationality theory)
1986	Thinking Machines Corporation	Connection Machine (supercomputer)
1995	Wallace	chatbot A.L.I.C.E (Artificial Linguistic Internet Computer Entity)
1997	IBM	Deep Blue a chess-playing computer win a chess game and match against a reigning world champion (Kasparov)
1999	Sony	AIBO (Artificial Intelligence RoBOt) robotic pet dog crafted to “learn” by interacting with its environment, owners, and other AIBOs
2011	IBM	Watson, a natural language question answering computer created by IBM, defeated two former Jeopardy! champions, Ken Jennings and Brad Rutter, in a televised game
2011	Apple	Siri: virtual assistant, uses a natural-language. It adapts to voice commands and projects an “individualised experience” per user
2013	Carnegie Mellon University	Never Ending Image Learner (NEIL), a semantic machine learning system that could compare and analyse image relationships
2014	Microsoft	Cortana: virtual assistant
2014	Amazon	Alexa: home assistant



2015	Elon Musk, Stephen Hawking, Steve Wozniak (and 3,000 others)	Signed an open letter banning the development and use of autonomous weapons (for purposes of war).
2016	Google Deep Mind	AlphaGo defeats world champion Lee Sedol in a logic called go in the game
2016	Hanson Robotics	Sophia: humanoid robot, the first robot citizen ability to see (image recognition), make facial expressions, and communicate through AI
2017	Google	Google Home: “personal assistant” smart speaker
2018	Google	Duplex: AI System for Accomplishing Real-World Tasks Over the Phone
2018	Google	Bert “bidirectional, unsupervised language representation that can be used on a variety of natural language tasks using transfer learning.”
2018	Samsung	Bixby: virtual assistant. functions include <i>Voice and Vision</i> ,

### 3.3 Applications of AI in different sectors

AI has already appeared in all areas of life and is spreading rapidly. Below are some examples of some of the uses of AI, without claiming to be exhaustive.

**Economy, finance:** AI based systems provide customer support, detect anomalies and credit card frauds by pattern recognition, enhance security across a number of business sectors, including retail and finance. Organisations rely on AI to trace those steps by analysing the behaviours of transactions. Ventures gives orders to data scientists to determine future patterns in the market, improve their stock trading performance [20].

**Agriculture:** Organisations are using automation and robotics to help farmers in farm management and free them up for other tasks. The AI systems promote finding more efficient ways to protect their crops from weeds, combat animal and plant diseases, monitor the movement, temperature and feed consumption of the animals. AI systems enable analysis of satellite images to coordinate production at regional and national level for example identify drought-prone areas [20].

**Health Care industry:** There are many examples of how AI in healthcare has helped patients, AI-based applications could improve health outcomes and quality of life for people all over the world. Personal or online consultations, personalised health guidance, virtual assistants reduce unnecessary hospital visits. The clinical decision support systems analyse conditions of a person with lab and other medical data to detect diseases and identify diagnoses. AI uses the combination of historical data and medical intelligence for the discovery of new drugs [21].

**Transportation:** A lot of advancement has been made in the autonomous vehicle segment (aviation in particular) [20] supported by AI: autonomous vehicles, unmanned drones. Today's cars now have AI-based driver-assist features such as self-parking and advanced cruise controls and natural language interfaces and virtual assistance technologies.

**Smart cities, buildings** [12][20]: The expected growth of urbanisation need to manage environmental, economic and social sustainability: A smart /digital/intelligent city is an umbrella term, uses breadth of digital technologies to improve operational efficiency, share information with the public, the best possible use of resources, provide a high quality of services and improve citizen welfare. For example: traffic management, waste management, safety service (monitoring areas of high crime, an early warning system for incidents).

**Education:** AI will fundamentally change education. Technology will revolutionise the way students learn and transform how teachers think about the educational practices [22]. Globally available virtual classrooms with real-time subtitles, tutoring via AI chatbots and software-driven tutors, personalised learning programs adapted to each

student's ability and goals, 24/7 access to learning from anywhere. AI communicates with students through a graphical or multimedia interface tailored to their needs and level of knowledge, and allows them to explore extended and virtual worlds. Time-management benefits for teachers, due to smart automation of tedious, time-consuming tasks, like record-keeping. Students with developmental/intellectual disabilities (ID/DD) accept robots equipped with social competencies [20].

**Robotics:** robots are often seen as both artificial intelligence because it is easier for the average user to imagine artificial intelligence in a mechatronic structure that also has a body, especially if it is body resembles a human/animal [20], for example social, therapeutic, educational robots. Machine-like robots are applied in industry and research, and other forms developed for military, medical use.

**Industry 4.0:** the fourth industrial revolution [23] “describes a new, emerging structure in which manufacturing and logistics systems in the form of Cyber-Physical Production Systems (CPPS) intensively use the globally available information and communications network for an extensively automated exchange of information and in which production and business processes are matched”. A part of this change is joining of AI technologies like smart/intelligent factories with intelligent data processing where product development, testing, manufacturing, purchasing, warehousing, transport, sales and all the related processes are based on AI. The next level [24] is Industry 5.0 “provides a vision of industry that aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society”. An important role in the creation of Industry 5.0 has been the need to place great emphasis on social and ethical risks in addressing new technical challenges. Three main components: people-centredness, resilience, sustainability. The human-centred approach essentially reflects the perception that technology is adapted to human needs, as opposed to the former, where human had to adapt to technology.

### 3.4 AI challenges and ethical implications

AI has fundamental societal and cultural implications. The new technology is bringing unprecedented challenges and as the AI systems spread in the world many ethical, moral and legal risks will also emerge.

- Trust deficit [25] People tend to fear what they don't understand, and most of them are unaware of the existence of AI in every life, like smart devices, banking, media.
- Lack of transparency: No transparency about the internal algorithms of AI products —making it difficult for customers to trust such products. AI based systems are kept secret to avoid security breaches and similar threats.
- Algorithm bias [25] and discrimination: When the organisations collect prejudiced data (based on race, religion, sexuality [26] etc.), the consequences will be unethical, unfair. The good or bad nature of an AI depends on the amount of data they are trained on.
- Discrimination: e.g., male dominance in AI workforce [27], female voice assistants and sex robots, deepfake pornography.
- Lack of qualified AI professionals [25] the growing demand for the new technology further enhances the demand for developers of AI tech.
- Investment [25]: The use of AI technology is quite expensive because it demands a huge amount of computing capacity and fast hardware and AI investors are sometimes sceptical about return on investment.
- Software malfunctions [28]: Automation makes it difficult to identify the cause of mistakes and malfunctions. In addition, due to the lack of ability of human beings to learn and understand how these tools work, they have little or no control over the system which is further complicated as automated systems become more prevalent and complex.
- Data security, privacy: data is generated from millions of users around the globe, there are chances this data can be used for bad purposes.
- Increasing inequality: AI gives developed countries a competitive edge that keeps developing countries even behind

- AI poses an ethical challenge to all of humanity that has led international organisations to take a stand to make AI people-centred, to develop their own policies. In 2019, the OECD [29] adopted recommendations on artificial intelligence and five principles [30] (G20 AI Principles) that focus on human rights and democratic values. AI must serve the future of humanity and the planet, maintain a fair and just society, be transparent, trustworthy, and hold AI developers, installers, operators, and individuals accountable for complying with the guidelines. Also in 2019, the General Conference of UNESCO [27] decided to create the first comprehensive global standard-setting instrument for the protection of fundamental human values and rights in the digital world.

All the Member states of the UN Educational, Scientific and Cultural Organisation (UNESCO) adopted in 2021 a historic agreement that defines the common values and principles needed to ensure the healthy development of AI, a global agreement on the Ethics of Artificial Intelligence [31]

The world's largest technical professional organisation for the advancement of technology (IEEE) has published [32] a comprehensive paper on the ethical use of Autonomous and intelligent technical systems (A/IS), which was developed by 700 of experts.

- **Human rights:** A/IS shall be created and operated to respect, promote and protect internationally recognized human rights.
- **Well-being:** A/IS creators shall adopt increased human well-being as a primary success criterion for development.
- **Data agency:** A/IS creators shall empower individuals with the ability to access and securely share their data, to maintain people's capacity to have control over their identity.
- **Effectiveness:** A/IS creators and operators shall provide evidence of the effectiveness and fitness for purpose of A/IS.
- **Transparency:** The basis of a particular A/IS decision should always be discoverable.
- **Accountability:** A/IS shall be created and operated to provide an unambiguous rationale for all decisions made.
- **Awareness of misuse:** A/IS creators shall guard against all potential misuses and risks of A/IS in operation.
- **Competence:** A/IS creators shall specify and operators shall adhere to the knowledge and skill required for safe and effective operation.

### 3.5 Steps towards the realisation of human-centred AI

AI will radically transform the world, we can already encounter such worrying phenomena, e.g. ethical concerns that may project a dystopian vision. Humanity is facing an existential challenge whose awareness and active struggle can bring about positive change, where cooperation between machines and people results in a utopian world. Tilesch and Hatamleh [33] are urging the development of a new paradigm in which humanity will define its vision, the institutional systems of AI. It is important to keep in mind that it does not serve the interests of a narrow stratum (the profit-oriented, amoral, manipulative use of AI) but places the public good above individual interests. Individual awareness of AI-related changes is considered necessary. This includes making digital citizenship an integral part of everyday life, encouraging social dialogue about AI. It is considered essential to maintain authentic and quality media and to restore social trust. Three steps [33] are identified for the future implementation of human-faced AI:

1. **Planning:** developing a globally accepted humanistic and actionable vision, harmonising divergent interests into a normative and regulatory framework (ethics, credibility, reliability). Regulation based on continuous feedback through impartial, fact-based supervisory institutions.
2. **Development, dissemination:** creation of institutions dealing with research and educational activities in order to solve systemic problems with a multidisciplinary approach, in the form of open research, in accordance with ethical standards. They ensure the global dissemination of AI knowledge through their educational activities.
3. **Transformation** of humanity's image of itself, the core of a new ideology is conscience and awareness.

We are currently in the planning stage. The OECD Recommendation [34] makes it clear that the role of artificial intelligence can be key to shaping the future positively, promoting people's welfare and subjective well-being, and contributing to economic development and the achievement of sustainable goals. All this is accompanied by profound social changes. Five principles have been laid down for the present and the near future can promote an AI-powered crisis management that is trustworthy and respects human-centred and democratic values:

- Inclusive growth, sustainable development and well-being: AI should help the population global prosper by promoting inclusive growth, sustainable development and prosperity.
- Human-centred values and fairness: AI systems must be designed to comply with legal requirements, human rights and democratic values. They should consider adequate safeguards (such as the possibility of human intervention) for a fair and just society.
- Transparency and explainability: AI systems need to be transparent, with information disclosed responsibly so that people can understand and challenge AI-based decisions.
- Robustness, security and safety: AI systems must operate in a robust, safe and secure manner throughout their lifetime, and potential hazards must be continuously assessed and managed.
- Accountability: Organisations or individuals developing, installing and operating AI systems must remain accountable for the proper operation of the systems, in accordance with the above guidelines.

The document also makes recommendations to governments:

- Investing in AI research and development: Promote public and private investment in R&D by encouraging innovation in reliable AI systems. AI systems must respect privacy and data protection and be free of inappropriate biases.
- Fostering a digital ecosystem for AI: In order to have a trustworthy AI, governments need to support digital technologies, infrastructures, mechanism of knowledge sharing about AI, i.e. the AI ecosystem.
- Shaping an enabling policy environment for AI: A regulatory environment needs to be created that paves the way for the deployment and operation of reliable AI systems.
- Building human capacity and preparing for labour market transformation: People need to be equipped with artificial intelligence skills and all support should be given to workers to ensure a fair transition.
- International co-operation for trustworthy AI: Cross-border and market-sector cooperation is needed to promote responsible care for reliable AI technologies by governments.

At present, the way is still open in any direction for an optimistic and pessimistic scenario.

## **4. Main applications of AI**

### **4.1 Business (ACEEU)**

By the 1970s, the finance community and business management information systems acknowledged the value of intelligent hardware and software, which significantly transformed many business operations (Lu, 2020). Various business sectors have been attempting to determine how different forms of AI can be implemented. For instance, computer-based systems, hybrid systems, and intelligent-agent systems have been equally implemented in management processes, planning, and strategy development (Kilinc & Unal, 2019). This technological advancement, ascribed to AI, has been revolutionising the living standards of the human, enhancing human-machine interactions, and above all, innovating and modifying the logic of business models. Business model innovation is a process of altering the core logic of a company's value creation in order to improve customer value and competitiveness. It may encompass changes in the elements of various business models, as well as changes in the interactions among elements or dynamic mechanisms (Lu, 2020).

Considered a key driver of future economic development and growth, AI has become a primary value proposition for an increasing number of new start-ups, particularly around Europe (Loureiro et al., 2021). AI is conquering every industry worldwide and motivating businesses to compete to become AI-focused entities. The competitive business

environment has been forcing corporate leaders, entrepreneurs, strategists, and investigators to employ AI to develop new strategies and generate new revenue streams (Eager et al., 2020). European Commission (2018) indicates that in 2017, 25% of large EU businesses and 10% of small and medium-sized enterprises utilised big data analytics. Only one out of every five small and medium-sized businesses was significantly digitised, and one-third of the workforce still lacks fundamental digital skills.

Meanwhile, the advantages of AI applications are widely acknowledged. According to the 2018 Digital Transformation Scoreboard, businesses in the commerce, agri-food and construction sectors that have implemented AI report excellent outcomes in developing products or services, attracting new customers and entering new markets. In the meantime, AI has revolutionised online shopping by anticipating shopping trends based on the products that customers buy and when they buy them. Most major e-commerce companies, such as Amazon, Alibaba, eBay, and others, have implemented AI to offer product recommendations that customers may be interested in, resulting in significant revenue growth (Soni et al., 2019). Other sectors dominantly utilising AI are as follows:

- **Marketing:** Marketing is one of the most advanced fields when it comes to AI. Discussions about AI in marketing include how AI methods can help forecast whether a new customer's future spending will reduce or grow after the initial purchase.
- **Management:** AI is widely used in Human Resources to improve decision making processes integrating technical, human, and organisational systems to achieve an enterprise's strategic success.
- **Production:** AI helps improve the quality of production systems and, as a result, the quality of products. AI also enables the creation of highly personalised goods.
- **Digital (Social) Media:** AI is a crucial component of the popular social media platforms that have become used primarily for business purposes. LinkedIn uses artificial intelligence to provide job suggestions, suggest new network opportunities and diverse content (Loureiro et al., 2021).

While there is a growing interest among businesses in investing in and incorporating AI into their operations, significant barriers exist at the organisational level that prevent businesses from achieving AI's full potential. These barriers have a direct impact on an organisation's capacity to gain access to and use enablers that allow AI. Some of the main barriers worldwide preventing AI applications are lack of clear AI strategy, cultural resistance, lack of talent needed for AI solutions, enterprise size, and budget constraints (Eager et al., 2020). Findings show that in Europe, a lack of government financing and venture capital are frequently reported as financial obstacles to AI development, particularly in SMEs and non-tech companies (Ghimire et al., 2020); thus governments have been working to determine and eliminate all the constraints that prevent companies from AI adoption. Yet, the development of AI technologies in Europe means reduced dependency on foreign technologies, which is vital for Europe's strategic autonomy. It also assists in the alignment of AI technologies with European values. Such insights into business technology adoption decisions are essential to guide legislation and guarantee that AI technologies benefit both employers and employees by making the technology trustworthy, simple to use, and useful in day-to-day work (Hoffmann & Nurski, 2021).

In a nutshell, AI technologies have started to be implemented all around the world and are expected to be integrated at the corporate level in order to realise macroeconomic benefits (Soni et al., 2018). A 2019 report revealed by Intellectual Property Organization on AI indicates that the number of research papers in the AI field has increased significantly since 2000, with notable growth in patent applications between 2013 and 2016. Until now, several European countries have been massively funding AI technologies and developing long-term plans to adopt AI applications to a larger extent. Germany, for instance, has recognized its backwardness in the field, thus is preparing to take significant action to become more attractive for German entrepreneurs and researchers who tend to leave the country for better opportunities in the field of AI. Moreover, Germany has spent 500 million euros on AI research over the last 30 years. Currently, the German Research Center for Artificial Intelligence (DFKI) is receiving 77 million euros for machine learning research (2017-2021) and 30 million euros for institutional support (2018 to 2022). AI has been and will continue to be financed — albeit on a much lower scale — through new technology initiatives.

## 4.2 Governance (UPC)

It is important to first clarify the term governance. Governance refers to all governmental procedures: the formation, maintenance, and regulation of rules or activities, as well as the assignment of accountability. It is usually a collective problem done by the government of a state, by a market, or by a network [1].

When we include AI in this term, we can find two different interpretations:

- The use of systems based on AI in the governance, meaning that the adoption of AI in service provision, policy-making, and enforcement in government practices and public-sector ecosystems [4].
- The governance of the AI, meaning the promotion of a proper institutional and legal framework for the development and use of AI [5].

Despite considering different topics, it is not possible to have a discussion about AI in governance without considering AI governance, because both function as communicating vessels. Thus, governance is understood here in reference to what is known as “AI governance”, an idea composed of a triad of topics related to: a) the infrastructure - obtaining, storing and processing the data; b) the application - the management of the data; c) the utilisation – the decision-making and evaluation processes based on the data.

Many other definitions can be found. For instance, AI governance is referred as “*a variety of tools, solutions, and levers that influence AI development and applications*” in [7], as “*the structure of rules, practices, and processes used to ensure that the organisation’s AI technology sustains and extends the organisation’s strategies and objectives*” in [8], as “*a set of processes, procedures, cultures and values designed to ensure the highest standards of behaviour*” in [9]. Probably, the most complete definition is available in [10] and it stands that “*AI governance is a system of rules, practices, processes, and technological tools that are employed to ensure an organisation’s use of AI technologies aligns with the organisation’s strategies, objectives, and values; fulfils legal requirements; and meets principles of ethical AI followed by the organisation*”. In a nutshell, AI governance should close the gap that exists between accountability and ethics in technological advancement [2].

As part of AI governance processes, capturing and managing metadata on AI models enables transparency into how AI systems are built and deployed, which is a critical prerequisite for most regulatory concerns. When properly implemented, AI governance empowers organisations with agility and complete trust. In fact, if an organisation deploys AI to automate some existing or new procedures, AI governance helps them to trust the AI outcomes at every step, producing trusted business outcomes and a rapid time-to-market product.

According to several studies, the Covid-19 epidemic has expedited the adoption of AI throughout all sectors of the economy. For instance, AI systems are increasingly being used by insurance companies [3] to process new and old datasets in order to underwrite risks and price insurance products, launch targeted marketing campaigns, or offer enhanced products and services to consumers via mobile phone apps or chat bots that are accessible 24 hours a day, 7 days a week from any location. The advantages of AI in terms of prediction accuracy, automation, new goods and services, and cost savings are significant. In healthcare, the worldwide rush of AI adoption allows hospitals to diagnose and cure patients more quickly.

Nonetheless, many academics believe that the way AI tools are produced has to change due to limitations in collaboration and inaccurate data assumptions, such as the unreasonable expectations that drive the usage of AI systems before they are ready. For example, inaction on AI prejudice has resulted in many injustices against entire groups of people, racial profiling, and other disturbing incidents.

Proactive governance and accountability measures are becoming more widely recognized as a differentiating feature for firms seeking to establish a reputation for trustworthiness. There are a number of worldwide frameworks on AI governance and ethics concepts.

The European Union issued the General Data Protection Regulation (GDPR) which includes a special set of rules that relate to a consumer's right to explanation when corporations employ algorithms to make automated choices.

Nonetheless, it also attracted some controversy as it does not afford a *right to explanation* of automated decision-making [12]. In this regard, the EU is likely to be the first to enact AI regulatory legislation<sup>2</sup>.

The Algorithmic Accountability Act<sup>3</sup> in the US requires major companies with access to large amounts of data to audit AI-powered systems for fairness, privacy, accuracy, and security risks.

A notable initiative is the Singapore AI Governance Framework. It is the first model developed in Asia and its strength is that it translates these principles into a practical, operational framework for immediate action, decreasing the entry barriers to AI adoption. This framework is based on two principles: i) AI solutions should be human-centric, and ii) decisions made or assisted by AI should be transparent, explainable and fair.

### 4.3 Skills & competencies (AidLearn)

Despite its youth, AI is impacting the job market. Firstly, due to automation some intermediate skill jobs are disappearing. Secondly, people are now more likely to use AI in their everyday lives including at their job as about 50% of organisations report using AI (Shiohira, 2021). Because of this, education and training institutions must adapt towards equipping learners with skills and competencies that are needed in this rapidly changing world.

This is particularly necessary as a way to combat people's distrust and fear over automation and digitalization replacing humans (CGC, 2019; 2020; 2021). Indeed, a majority of Europeans are in favour of governments limiting the implementation of automation and digitalization by workplaces as a way to protect jobs and keeping people employed (CGC, 2019; 2021). However, the changing nature of work and the implementation of new technologies is unavoidable and 37% of respondents of the Gartner 2019 CIO survey stated they already deployed AI and/or would do so in the near future to try to stay ahead of their competition or at the very least not get left behind (Howard & Rowsell-Jones, 2019). Additionally, whilst earlier reports on AI focused and implied people would be left behind and replaced by technology, which then reflects on people's misconceptions and fears regarding AI, newer reports have instead concentrated on how AI is actually creating jobs and/or allowing workers to have more fulfilling roles by being freed from doing menial and/or dangerous work (Burke et al., 2006; Harvey Nash/KPMG, 2019; Wilson & Daugherty, 2018). Additionally, AI can also be used to help increase the skills and competencies of workers (Paschen et al., 2019; Wilson & Daugherty, 2018). One need only look at the example of KONE which has installed IoT in their elevators and used AI to analyse the data, AI allows technicians to be informed about potential issues and do preventative maintenance (Paschen et al., 2019).

Indeed, here lies the big promise in AI: the creation of new jobs, freeing workers from menial tasks and increasing their competencies, while at the same time valorising those skills and competencies that are impossible to be replicated by robots. Per Frey (2019) "complex social interaction and creativity are the most difficult things to automate". Indeed, due to this fact, teachers are unlikely to be replaced by AI despite its increased implementation in education, partially due to the pandemic which made it of the utmost necessity (Pedro et al., 2019). Thus, one skill that has gained relevance in the age of AI has been critical thinking. In this age where fake news can be easily dispersed through social media, having critical thinking skills and validating one's sources are paramount. Critical thinking allows people not only to reach conclusions based on the currently available evidence, but also to have their beliefs challenged in regards to accuracy and relevance due to newer or different sources and change them accordingly (French & Poole, 2020). Other skills made more relevant by AI are social skills which, as aforementioned, are basically impossible to automate. Among these the skills that are more valuable are the ability to adapt to change, teamwork, good problem-solving, good communication, and helping customers in project managing and using IT (French & Poole, 2020).

It is noteworthy to underline that, in regards to skills and competencies, AI has not yet been integrated to such an extent that there would be a demand for it in non-technological areas (Anton et al., 2020). Shiohira (2021) however

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<sup>2</sup> <https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rules-artificial-intelligence>

<sup>3</sup> <https://www.congress.gov/bill/116th-congress/house-bill/2231>

emphasises that even non-professionals will need to be capable of implementing AI mechanisms in different working sectors. As an example, there already exist fields of applications in the area of human resources. As identified by Guenole et al. (2018), these can be during the process of recruitment as well as within the career development of employees. More precisely, during recruitment, AI can be used to identify and rank job candidates and their attributes based on advertised jobs and their respective requirements. Such selection tools are used for facilitating the choice of a candidate and are particularly interesting for employers with a large number of applicants. With the aid of the created list and rank, a final decision is made by a human. In regards to career development, AI technology is used for the mapping of employment patterns in order to improve the business' and worker's performances. This means for example the usage of AI to analyse which progression opportunities are most valuable to offer to an employee in order to promote a transition and progress in their career. Moreover, AI can be implemented in the shape of a chatbot offering coaching and counselling about the career. And finally, many companies (as much as educational institutions) already make use of learning management systems (which work with AI) to deliver and provide training throughout their organisation, enabling an assessment and scheduling of the contents adjusted to the learning individual.

As a final consideration of current changes caused by AI, one also must consider the new jobs created by it as there is a need for people to train AI (i.e., train the AI to do the intended work), explain outcomes to AI (i.e., explain how AI reached a certain conclusion to the layperson), and sustain responsible use of AI (i.e., ensure that AI systems are working properly, safely, and being used responsibly; Wilson & Daugherty, 2018). These new jobs create a need for new skills and education, thus some places like the ProgeTigerProgramme - which started in 2012 in Estonia - are starting to promote the implementation programming and robotics into the educational curricula for pre-school and primary students but also at the vocational level to prepare people for the job market of the future (Shiohira, 2021).

#### 4.4 People & lifestyle (BAEHF)

The areas of application of AI are very diverse (Stahl, 2021). In today's high-tech world, people are confronted with AI in one way or another (Bughin et al., 2017). Whether they have a deep understanding of the direct link to AI or not, a significant proportion of people already have access to such technologies, or at least handle digital information that accompanies, includes or applies to AI applications related to relevant databases (World Bank, 2016, Shraiberg et al. 2018). The fact that the majority of the population has an individual smartphone and/or computer can now be considered a prerequisite for the consumption of certain apps, software and more AI applications (Gadzama et. al., 2017; Kaka et. al., 2019). In their normal life, people and in particular consumers (ordinary people's lifestyle or professionals) can interact with the current main types of AI and AI applications, depending on their focus and application (APR, 2019):

- **AI crucial tasks.** AI is related to the predominance of intellectual analysis.
- **AI based on specific tools.** The difference between this direction and the above is that here AI is designed to be able to solve a larger class of problems.
- **AI according to the developed model of thinking.** AI is characterised according to the developed model of thinking.

Table 2 shows the three main groups of AI with their directions, characteristic of modern society and present in one way or another directly or indirectly in the lives of people and society.

Table 2. Main groups of AI, typical for the modern technological society (APR, 2019)

AI crucial tasks	AI based on specific tools	AI according to the developed model of thinking
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Machine translation	Artificial neural networks	Search in online space for solution(s)
Automatic forwarding and retrieval of information	Evolutionary calculation	Presentation of knowledge
Speech communication	Pattern recognition	Machine learning
Intelligence of games, proof of theorems and automation of research	Expert systems	
Computer vision	Heuristic programming	
Data mining	Multi-agent approach, etc.	
Writing lyrics and music, etc.		

Aimed at the daily activities of the majority of people, namely consumers (and partially also professional developers) using artificial intelligence is associated with certain priority applications of AI (APR, 2019). Some of the popular implementations of AI (popular in people & lifestyle) are related to activities such as:

- **Computer vision.** This technology processes visual information to extract useful knowledge. It includes many tasks (Sberbank, 2019): site discovery; tracking of objects; pattern recognition; segmentation; estimation of the depth of the distance.
- **Biometric identification.** It is widely used. Particularly popular application is related to activating access to a particular person's smartphone through biometric fingerprint (Kaděna and Ruiz, 2017). Biometric identification systems are many and are varied, such as: face recognition system, iris identification, analysis of the chemical composition of sweat, analysis of the chemical composition of body odour, analysis of microvibration of the fingers and micromovements of the hands, analysis of heart rate and heart size, fingerprints, voice biometrics, gait recognition, user action analysis - stride length, balance and speed, stylometry - keyboard handwriting - recognition of the author's individual handwriting when writing a smartphone or tablet, posture analysis, lip identification, palm vein pattern analysis, DNA test, auricle identification (TADVISER, 2019). Biometric identification systems consist of two parts:
  1. Hardware.
  2. Specialised security software.
- **Natural language processing, searching and extracting information from texts.** They are used to generate texts that are almost indistinguishable from human ones in style (Balov, 2019).
- **Voice recognition.** It is widely used in call centres. It is also used in education and in the process of learning foreign languages. There are three types of speech recognition errors that affect speech quality:
  1. Replacement - another word is recognized instead of one;
  2. Insert - there is an additional word as a result of the recognition;
  3. Delete - when the word has not been recognized at all.
- **Speech synthesis.** Includes the following options: Changing the style of speech, generating several voices from one model, generating previously unknown voices, transmitting the intonation by model, adapting to the speaker's voice and others.
- **Machine vision.** Machine vision is the application of computer vision in industry and manufacturing. They are used for counting objects on a conveyor belt, reading serial numbers or searching for surface defects. Machine vision technology helps equipment see the production process of something, analyse data and make an informed decision. Modern machines already recognize over 90% of objects, that is not only fix the presence, but also determine exactly what they see (Medusa, 2019). Such an example is IBM's PowerAI Vision (IBM, 2022).

- **Machine translation.** Depending on the language pair, the subject area and, in fact, how similar the data used to train machine translation models is, the quality of the results of the different systems can vary considerably. (CKNTI, 2019).
- **Generating text.** Allows the measure the quality of language models, for example, by the probability of guessing the next word from the previous context (Perplexity Per Word). For example, Google Brain allows many remote correlations to be effectively taken into account due to the original word position coding scheme using Fourier transform. This is the general seq2seq architecture used in machine translation (CKNTI, 2019).
- **Dialog systems (chatbots).** They are related to the interaction between man and vehicle (e.g., cars, buses, trucks, ships, etc.). By purpose, these systems are divided into three groups of chatbots: general purpose, targeted and those capable of dialogue. Modern intelligent dialogue systems are complex and differ according to their purpose, being divided into three groups: natural language comprehension module (NLU); dialog manager (DM); Natural Language Generating Module (NLG) (Milhorat, 2013). There are three indicators for determining the quality of chatbots:
  1. Consumer indicators. They include: total number of users, active users, included users and new users.
  2. Message indicators. They include: call start messages, bot messages, general messages, lost messages and new calls.
  3. Bot indicators. They include: retention level, target completion rate, goal / message completion time, number of failures, and customer satisfaction (CKNTI, 2019).
- **Tonality analysis.** Through this activity, users can determine the speaker's attitude or emotional reaction. They are divided into three types:
  1. Polarity of tonality. This is the main influencing factor.
  2. Custom models. Defines a specific language or jargon. Popular applications are IBM Watson, Meaning Cloud and Salesforce Einstein.
  3. Aspect assessment of the tonality. It is determined on the basis of the situation.

## 5. Expected impacts of AI

### 5.1 Business (ACEEU)

Many businesses, technology, and industry experts consider AI as a game-changing technology that will alter how we work, live, and communicate. For business and industry leaders, it will be necessary to comprehend and be convinced of the idea that proactive management of technology transitions is not only in the best interests of society as a whole but also in the more narrowly focused financial interests of businesses themselves.

The availability of funding and the amount of AI companies are good indicators of the feasibility of an AI ecosystem (Eager et al., 2020). The EU, China, and the United States have all placed a strategic emphasis on fostering the development of AI enterprises through a supportive legislative environment. The current EU start-up environment is broad and dynamic, however, only 10% of digital unicorns are located in Europe. Due to the lack of an adequate venture capital ecosystem, these companies are considered unable to attract significant investment. In this regard, Europe has raised its investment and the commitment to AI research to increase Europe's technological growth potential and catch up with the countries leading the AI race. According to the European Commission (2020), implementing an AI ecosystem can bring significant benefits of the technology to the EU and the economy in general. As for business development, innovative products and services can be boosted by AI in areas where Europe excels (machinery, cybersecurity, transportation, farming, the green and circular economy, healthcare, and high-value-added sectors such as fashion and tourism).

While this is the case, in the transformation process, organisations face major and particular obstacles and questions about the future of the business world (Kitsios & Kamariotou, 2021). The business world is rather sceptical about the

rapid pace of technological change and its impacts. Concerns about privacy, ethics, and trust are also present and are expected to rise in the near future. The most common cause of privacy issues is the exposure of personal information; thus, companies strive to set out particular objectives to gain trust. For instance, Google stated that it would not pursue the AI applications that have caused, or are expected to cause, widespread harm and will proceed only if the benefits outweigh the risks, and will include appropriate safety limits if there is a material danger of harm (Carter, 2018). Privacy and data protection is a major and frequently discussed ethical issue. Although privacy and data protection are not synonymous, for the purposes of AI ethics, informational privacy is the most important privacy concern, and data protection can be thought of as a means to protect informational privacy. AI based on machine learning generates several risks to data protection. On the one hand, it takes immense datasets for training, and access to those datasets can generate data security concerns. The fact that AI and its ability to recognize patterns may raise privacy risks, even when no direct access to personal data is allowed, is more noteworthy and more specific to AI. According to some studies, AI can detect sexual orientation from Facebook friendships, which is a good example. It is easy to understand how AI can be utilised to generate data that raises privacy concerns. AI also has the ability to re-identify anonymized personal data in ways that were not anticipated when machine learning's capabilities were discovered. While most nations have well-established data protection laws, AI has the potential to generate new data protection issues that are not addressed by legislation, raising additional ethical problems. AI could also use or generate sorts of personal data that are now neglected, such as emotional personal data, contributing to the problem (Stahl, 2021).

Relatively, some of the current ethical concerns include AI making choices in favour of AI systems, drastic job losses as well as the change in the workforce. Studies predict that AI may transform the concept of the workforce by extinguishing some jobs. The problem of trust is also considered from the perspective of both consumers and employees. Customers may prefer human interaction over AI, and building trust in AI technologies may take a while (Kılınç & Ünal, 2019).

Conversely, the majority of studies emphasise that when strategically implemented and developed, AI technologies are likely to bring various advantages and impact every business sector for good. Some of the impacts derived from the use of AI algorithms in business are:

- Increase in productivity and cost efficiency,
- Human error reduction,
- Faster business decisions,
- Customer satisfaction,
- Sales maximisation (Soni et al., 2018).

AI-enabled logistics management is expected to forecast product demand by analysing previous sales, geography, buying patterns, and other factors. Every year, retailers all across the world lose money owing to improper inventory planning. The inventory issues will be significantly eliminated through the newly created AI-powered warehouse drones. Besides, AI's integration into the workplace and daily life will have a substantial impact on digital literacy skills. By analysing speech and search trends and recommending online sources to improve understanding, AI will help more people expand their digital literacy skills (Herdiana, 2013). Research conducted by McKinsey (2019) on AI's potential impact on global economic activity underlines the highly potential development of as many new jobs as the number of ones that are being or will be replaced. It is estimated that there will be more available vacancies for engineers, software developers, and ICT professionals in Europe in the near future. According to the Deloitte Human Capital Trends (2018) report, newly created jobs will be more service-oriented, interpretive, and social, requiring creativity, empathy, communication, and complicated problem-solving skills. As for Accenture research, the AI-driven jobs that will be created are "trainers," explainers" and "sustainers." These new jobs will include training AI systems, guaranteeing that they continue to perform as designed and do not learn the "wrong" thing, and closing the gap between business and technology (Herdiana, 2013).

Finally, AI will be a market trend and a business opportunity during the next decade. It is predicted that it contributes \$ 15.7 trillion to global GDP and that this index will be 14 percent higher by 2030 attributable to AI. Analysts predict

a 6.6 trillion-dollar gain in production, with a 9.1 trillion dollar increase in consumption. If Europe develops and disseminates AI in accordance with its current assets and digital position in relation to the rest of the world, it may contribute €2.7 trillion, or 20%, to its combined economy output by 2030, resulting in 1.4 percent compound annual growth. This impact would be nearly double that of previous general-purpose technologies which developed countries have adopted in the past (Mckinsey, 2019).

## 5.2 Governance (UPC)

When managed AI is done correctly, it may provide significant benefits [13]:

- Utilise information collected across the AI lifecycle to get more visibility and automate documentation.
- Improve results and efficiency by using best practices discovered through metadata analysis.
- During the AI development and deployment lifecycle, establish and enforce uniform policies.
- Facilitate communication and cooperation between data scientists, AI engineers, developers, and other AI stakeholders.
- Create AI at scale with a single, all-encompassing view of all actions.

In this regard, IBM [6] provides a 6-step scale to indicate the degree of AI governance penetration and evaluate the risks:

- **Level 0 - No AI governance.** There are no established common policies for AI development or deployment and each AI development team utilises its own technologies. This method offers a lot of flexibility and is common among firms that are just getting started with AI. Since there is not a common framework, it is not possible to assess the risks of using these AI models into production, potentially posing major dangers to the company. Besides, scaling AI processes is tough for companies at this level.
- **Level 1 – Introduction of AI policies.** These policies are defined at a high level. Since their enforcement is not mandatory, individual AI systems are still compartmentalised with no consistency due to the lack of implementation of these standards. Therefore, there is a risk of misinterpretation and even subversion of the policies. Again, companies cannot see a lot of productivity gains with AI adoption.
- **Level 2 - Metrics to govern AI.** This level expands on level 1 by creating a common set of acceptable measurements as well as a model monitoring tool. This not only ensures that AI teams are on the same page, but it also allows metrics to be compared across development lifecycles. To track these metrics, a single monitoring framework is usually implemented, allowing everyone in the business to interpret them in the same way. This lowers the risk level and increases the openness of data needed to make policy decisions or troubleshoot dependability in the event of a problem. Companies at this level often have a central model validation team enforcing the enterprise's policies during the validation process, resulting in productivity benefits.
- **Level 3 - AI data repository.** This level uses the metadata from level 2 to guarantee that all assets created over the lifespan of a model are available in a repository. The company can now track the whole provenance of data, models, lifecycle metrics, code pipelines, and more with a single source. Companies at this level are able to clearly explain AI risks and have a holistic perspective of their AI strategy's success.
- **Level 4 - Automated data validation and monitoring.** This level automates the procedure so that data from the AI lifecycle may be captured automatically removing the stress of manually documenting actions, measurements, and judgments. This data also helps model validation teams to make judgments on AI models and to take use of AI-based proposals. It also eliminates any concerns of missing measurements, information, or data/model versions due to errors made along the way. As a result of their ability to reliably and swiftly deploy AI models into production, companies at this level start to witness an exponential rise in productivity.
- **Level 5 - Fully automated AI governance.** The automation from the previous stage is used to automatically enforce regulations on AI models at this level. This architecture now ensures that the

company's policies are consistently applied across the life cycles of all models. At this stage, an organisation's AI paperwork is automatically generated, with the appropriate amount of openness for regulators and, more crucially, consumers. This allows the team to focus on the most dangerous regions that require greater manual intervention. At this level, a company's AI strategy may be incredibly efficient while keeping confidence in its risk levels.

Nonetheless, to be effective and provide the correct trade-off between a company's strategies and objectives, legal requirements and ethics, many actors work on identifying the main principles. For instance, Harvard University [11] created a visualisation map of 32 sets of AI principles. KPMG [14] provides four guideposts to help organisations ensure the proper governance of algorithms. Google [5] highlights five specific areas where concrete, context-specific guidance from governments and civil society would help to advance the legal and ethical development of AI. There is global agreement on a fundamental set of five AI principles that are functionally algorithm-agnostic, technology-agnostic and sector-agnostic:

- Accountability
- Transparency
- Fairness
- Safety
- Human control

**Accountability** requires a clear identification of who holds responsibility for decisions and actions when designing, developing, operating, and/or deploying AI systems. It is not appropriate to delegate responsibility to a machine. Giving the responsibility to a machine is unnecessary (there will always be a natural person or corporation liable within existing laws and legal frameworks), immoral (responsibility is an intrinsically human property), impractical (it is impossible to hold machines accountable for violations of their obligations), and open to abuse (it would make it easier for bad actors to shield themselves). It must be people or organisations that are ultimately accountable for the acts of AI systems under their design or control, no matter how complex the AI system is. In this respect, governments are collaborating with other stakeholders to offer more clarity on the anticipated conduct of AI service providers and clients that use AI in certain domains. To be uniformly enforced and relevant to all providers and clients, such criteria would need to be backed by new norms, standards, rules, or laws.

**Transparency** regards the ability to explain why an AI system behaves in a certain way in order to boost people's confidence and trust in the accuracy and appropriateness of its predictions. When considering what degrees of explanation are appropriate, keep in mind the criteria that would be applied to a human decision-maker in the same situation. It is important to consider what kind of explanation is most appropriate in a given context. Different audiences require different needs. For example, an oncologist may find it difficult to explain why he or she gets the feeling that a patient's cancer has returned. In the same situation, an AI system could be able to give biomarker levels and past scans from many comparable patients as a reference and forecast an 80% likelihood of cancer. An accident investigator searching the reason why a house is cold can find the simple answer "the heating is switched off" good enough. Definitely, the more the users feel they understand the overall AI system, the more inclined and better equipped they will be to use it.

There are several debates over what constitutes **fairness**. However, a global judgement regarding shared values and common moral norms must be made, and they must be transmitted into AI systems as well. The fairness principle also guarantees that any possible bias in historical data or human-induced bias is taken into account and reduced. In summary, fairness must ensure that AI systems are ethical, free from bias, free from prejudice and that protected attributes are not being used. However, there are many conflicting situations where fairness is hard to be complied with overall satisfaction, whether decisions are made by humans or machines. For example, is it fairer to give a chance to everybody who meets the qualifying standards, or to an equal number of persons from diverse demographic segments in order to prevent replicating past inequity? This problem can be partially mitigated if when developing an AI tool to aid decision-making, it is vital to decide on the exact fairness technique to use up front and make them

transparent. Because there are so many different viewpoints and techniques to defining fairness, some definitions may directly contradict one another, while others may encourage justice at the price of accuracy or efficiency. However, if done properly, an algorithmic method can assist to improve decision-making consistency, particularly when contrasted to the alternative of humans deciding based on their own personal (and hence likely variable) ideas of fairness.

Regarding **safety**, it is critical to take measures against both inadvertent and intentional abuse of AI that poses a threat to human safety. However, this must be done in a reasonable manner, taking into account the potential for harm and the practicality of the suggested preventative measures in terms of technological, legal, economic, and cultural factors. It is not possible to forecast all possible AI system behaviours and downstream impacts in advance, especially when applied to issues that are difficult for humans to solve. It is also difficult to design systems that give both the security constraints and the flexibility needed to produce innovative solutions or react to unique inputs. Safety problems can also be related to accidents or by an exploit in security and an intentional hack. For instance, AI systems learn in real-time in a real-world environment and what happens if the data are corrupted? Is the AI able to react and mitigate their impacts? Another example is how can we ensure that if the training data is incomplete and leaves out certain important details, or if significant features of the world have changed after the training data was acquired? These kinds of aspects need to be tackled and proper mechanisms tested and validated.

Finally, there is the necessity of having a **human control** of the technology, meaning that people need to be in one or more points in the decision-making process of an otherwise automated system. The problem is identifying whether and where people should have a part in the process, as well as what that involvement should entail, while keeping in mind the system's goal and the larger context in which it is used. Humans and AI systems have distinct strengths and shortcomings in the end. Choosing the most sensible combination requires a holistic evaluation of how to best guarantee that an acceptable selection is made in the current conditions. However, making this determination is not easy. For instance, while most of the focus has been on the dangers of poorly designed and implemented AI systems having built-in bias, the same dangers exist for individuals. On the other hand, we may have the *computer says yes syndrome* [15], where employees who have spent a long time dealing with a system where errors are infrequent (as should be the case for commercial AI systems) grow naturally less likely to challenge the system's correctness over time. As AI technology has progressed, it has become a strong tool for detecting problematic information rapidly and at scale, such as violent extremism and child exploitation. However, AI-based algorithms continue to make numerous mistakes in context-sensitive jobs, which is why keeping a person in the loop while reviewing new information is fundamental. This human aspect maintains responsibility while also spotting classifier mistakes and producing better training data, resulting in a model that is better for future iterations. Definitely, regardless of how precise an AI system is or the time/cost benefits of full automation, there will almost certainly always be delicate situations where society wants a human to make the ultimate judgement.

### 5.3 Skills & competencies (AidLearn)

There is little doubt that AI will impact humans' way of living. While much attention has been paid to the fear of jobs being replaced by machines, less focus is put on the perspective that it is not the jobs themselves that will become inherently obsolete, but rather that the way of working will shift and that certain skills and competencies will gain importance whilst others will be discarded (Anton et al., 2020). In fact, the benefits of using AI systems highly depend on the competencies and skills of those operating them, with the lack of AI skills being the number one problem for enterprises within AI projects (Anton et al. 2020). Therefore, implementing an AI consciousness and related challenges in the educational curriculum has been identified as crucial to tackle the change of working experiences and businesses (Chrisinger, 2019).

According to a recent adaptation of typology by Paschen et al. (2020), AI as a driver of innovation within companies can work both competence-enhancing or competence-destroying. While the first promoting existing skills and knowledge and the latter obsoleting them. This typology can be specifically useful for managers to identify and

predict the impact of implementing AI in their company’s competencies. Whereas at the moment, as the authors observe, most applications of AI foster competence-enhancing innovations, in the future an increase of competence-destroying innovations is predicted due to the amelioration of machine-learning, problem-solving and reasoning (Paschen et al. 2020).

With the pandemic, AI started to be more widely used in education, and is likely to be the way of the future in education. A working paper by Pedro et al. (2019) highlights the opportunity of AI to enhance personalisation and better learning outcomes. More specifically, AI enables (marginalised) people to benefit from learning despite not being able to be there in presence. It facilitates the possibility of adjusting and personalising the working progress to the individual by offering ways to create learning plans, preferences and trajectories. This can for instance be through the help of a MOOC, through which not only a vast number of students can be reached, but which also includes a flexible learning approach for learners of all kinds. On the side of the teachers, AI technology can depict a tool for assessment of grades, as well as an aid for the implementation of the lesson and the monitoring of discussion groups. Due to the socio-emotional and creative components of effective teaching, Pedro et al. (2019) rates the replacement of teachers by AI technologies as rather unlikely. Nonetheless, they underline the importance of teachers to adapt to the new digital era by developing new skills. According to Luckin et al. (2016), these include:

- an understanding of AI systems to decide about their respective values
- research and data analytical skills to comprehend the collected data
- management skills to manage all disposable resources
- critical thinking to interpret both the up and downsides of AI and the skills necessary for its usage
- the ability to delegate specific tasks to AI technology for having more time for other aspects of teaching and coaching.

A recent paper by Chen et al. (2020) further distinguished three main areas of how AI can function in education: administration, instruction and learning (see Table 3).

Table 3. The functions of AI in educational scenarios (Chen et al., 2020, p. 75272).

	The work AI can do in education
Administration	Perform the administrative tasks faster that consume much of instructors’ time, such as grading exams and providing feedbacks
	Identify the learning styles and preferences of each of their students, helping them build personalised learning plan
	Assist instructors in decision support and data-driven work
	Give feedback and work with student timely and directly
Instruction	Anticipate how well a student exceed expectations in projects and exercises and the odds of dropping out of school
	Analyse the syllabus and course material to propose customised content
	Allow instruction beyond the classroom and into the higher-level education, supporting collaboration
	Tailor teaching method for each student based on their personal data
	Help instructors create personalised learning plans for each student
Learning	Uncover learning shortcomings of student and address them early in education

	Customise the university source selection for students
	Predict the career path for each student by gathering studying data
	Detect learning state and apply intelligent adaptive intervention to students

While the implementation of AI in an educational context provides a great number of benefits, the downsides of this process should not be neglected. According to Pedro et al. (2019), the development of a comprehensive public policy for the implementation of AI to foster sustainable development is essential. Even though AI itself can depict an opportunity for inclusion for example through the possibility of distant learning, challenges such as electrical, hardware and internet availability, data costs, basic ICT skills, the language as well as the cultural appropriateness of content are only some aspects that need to be taken into consideration. This is specifically the case for “less developed” countries, which are in danger of being left behind even more if those challenges are not recognized and tackled in a thorough manner. Similarly, AI consists of the data which it is fed, therefore the quality and inclusiveness of such should be one of the main priorities when developing AI technologies. Through transparency and a clear ethical code, it can be prevented that AI perpetuates inequalities (Pedro et al., 2019).

Regarding the implementation of curricular modules fostering AI skills and competencies for the future, digital competencies and computational thinking have been identified as most crucial. Scholars widely agree that the integration of such contents is essential to ensure a beneficial transition into the AI era (Chrisinger, 2019; Dondi et al., 2021).

Indeed, a recent large-scale study by Dondi et al. (2021) concluded that the need for physical, basic cognitive and manual skills will reduce due to the taking over through AI, while in particular higher cognitive skills, technological as well as social and emotional skills will be more demanded (Dondi et al., 2021). The authors have identified 56 DELTAS (distinct elements of talent, attitudes and skills) split across 13 skill groups which themselves are split under four main categories - Cognitive, Interpersonal, Self-leadership, and Digital. These include the aforementioned critical thinking, teamwork, etc., but also others like Digital Fluency and Citizenship, Software Use and Development, and Understanding Digital Systems. These findings are in line with other recent research, such as Anton et al. (2020), Rampersad (2020) and Shiohira (2021), highlighting the necessity for data, technological and digital knowledge as much as competencies in problem solving, empathy, communication, innovation, critical thinking, and teamwork.

#### 5.4 People & lifestyle (BAEHF)

Prospects for the development of AI are directly related to the development of computer technology, ICT, electronics, automation and others (Mirkin, 2010, Mahindra, 2021). Their application will become more tangible and will be a permanent part of online shopping and commerce (especially during epidemics), healthcare, transport, cybersecurity and others (Chenzhuoer et al. 2020). AI will turn from a service into a permanent part of people's lives. The change in actual and future people's lifestyle become more and more true, globally the presence of AI is associated to (APR, 2019):

- Exemption of people from routine activities, replacement or reduction of the intensity of intellectual work in certain professions until complete replacement of specialists from certain professions with intelligent devices;
- Building a digital interactive information technology space where people and thinking machines will collaborate;
- Fully integration of thinking machines such as robots into complex and dangerous places for work, rescue operations and others.
- Making responsible decisions in complex situations and processes;



- Increasing the efficiency of information processing with large volumes of data;
- Improving the quality of assistance in a routine area of everyday life;
- Improving the quality of professional assistance;
- Others.

When talking about AI related to people & lifestyle, we should also take into account the attitude of individuals and different societies on this issue. This refers not only to the purely technical and practical, but also psychological and social aspects, as well as the comfort zone of the individual and others. Generally speaking, it is necessary to take AI into account in people's lives and the necessary ethics (Ovchinnikov, 2017).

It is clear that Artificial Intelligence is a technology that is evolving along with digitization (Sousa et. Al. 2021). People use AI in their daily lives, but they realise that this process of intellectual digitization must be carefully monitored (European Parliament, 2020). This requires a responsible attitude of each individual and the society.

Many see the impact of AI on humans and lifestyle in increasing human capabilities, but some predict that the growing dependence of people on automated systems will undermine their ability to think independently, take action and communicate effectively with others.

Artificial intelligence has great potential to change a person's life and make it more productive, efficient and easier. Life will continue to change rapidly and one must be able to adapt to new conditions. Advances in AI will affect what it really means to be human in the 21st century. The changes that AI will bring to life will have positive and negative effects on people's daily lives, as artificial intelligence transforms the world in which we live. Comparing the risks and benefits of what lies ahead is complicated. Here are some of the consequences we need to think about how to deal with, as well as some of the positive effects of artificial intelligence.

The consequences of the implementation of artificial intelligence can be summarised as positive and negative impact on lifestyle. The positive impacts could be:

- AI can improve the efficiency of human work and increase people's free time. If people do work that is more enjoyable for them, it can increase a person's happiness and satisfaction with life.
- AI will present new opportunities and abilities to improve lifestyle, providing technologies and opportunities for people to develop their natural interests and talents.
- With better monitoring and diagnostic capabilities, artificial intelligence can affect healthcare. The potential for personalised treatment plans, for awareness of the person, will change the quality and lifestyle.
- One will gain time and productivity with the introduction of autonomous transport and AI. Without travel to work, people will be able to spend their time in various other ways.
- One will feel more secure. The detection of crimes will increase with artificial intelligence.
- AI virtual assistants who use natural language processing to understand and perform tasks given by people will change lives.
- Automated systems powered by artificial intelligence are changing games and home life.
- AI can keep the family connected and informed with the right data and reduce the mental strain of household management.
- AI will allow for greater individualization, such as training based on human needs and intellectual abilities.
- AI will lead to infrastructure improvements (traffic relief, supply chain improvements, etc.).

On the contrary, the negative ones could be:

- AI will make the workforce reorient and many people will lose their jobs because of the machines. According to PricewaterhouseCoopers, 7 million existing jobs will be replaced by AI in the UK from 2017-2037, but 7.2 million jobs can be created. Uncertainty and how a person will earn a living are under discussion.
- AI will have economic, legal, political and regulatory implications that will affect Lifestyle. Will people be able to control machines with intelligence in all situations?
- The purpose of AI is to benefit humanity, but whether it will be restricted from crossing ethical or legal boundaries in the work it is designed to do. This is important for the person and his lifestyle.

- AI algorithms are powered by data. This data is collected for each person and the confidentiality of personal information is violated.
- Limiting personal space. The widespread use of AI by large technology companies leads to the destruction of digital privacy.
- Socio-economic inequality. With the disappearance of millions of low-skilled to medium-skilled jobs, the income gap between medium-skilled and high-skilled labour will be huge. According to the UN, "71% of the world's population lives in countries where inequality has risen" and "the share of income that goes to the top 1% of the world's population has increased in 46 of the 57 data countries."

AI raises the question of man's understanding of himself and freedom. Some people tend to be very conservative because they are not comfortable with technology that takes decisions out of their hands.

The hope is that artificial intelligence will have a more positive than negative impact on humans. He is a model of human activity. Human beings with their will and consciousness remain the source of intentions and the judge of all results. Machines are created to provide ease and efficiency in the journey from intention to outcome. AI will work to improve human activities and experiences, save time and increase people's life satisfaction.

## 6. Interaction with people

The previous sections summarised the information available in literature regarding the challenges and opportunities of adopting AI in our society and its impact in four specific ambitions. In order to have a better and deeper understanding of it, we have considered it appropriate to have a complementary source of information.

This second source consists of gathering information by interviewing people. Therefore, we have organised and conducted (when possible) two different focus groups in each of the project partners' countries: one focus group with only experts in AI and one focus group with only non-experts in AI. The project defines the term *expert* as a person who is partially/very familiar with AI and works with AI on a daily basis. The number of participants for each group was set to a minimum of 5 per partner group.

The sole exception to the two focus groups was in the expert group in the ambit of skills and competencies. Due to conflicting schedules and COVID restrictions, this focus group was substituted for a questionnaire. The questionnaire was created with similar questions to a focus group, and a disclaimer was placed asking them to write as much as possible about each. Additionally, as there is no moderator guiding a discussion in a questionnaire, a larger number of questions including focused questions based on the literature review were created. This served to ensure that we were getting the information we needed from the experts.

A summary of this second source together with the specific details are provided in the following sections.

### 6.1. AI definition, challenges and opportunities (OBUDA)

Two focus groups were organised using Zoom online platform:

- 8 experts (7 males, 1 female) aged 28-61 years old with a university degree, members of at least one professional-scientific organisation, been working in areas related to artificial intelligence, digital society, human-robot interaction, industry 4.0 for at least 5 years and given/participated in at least 3 presentations at scientific and professional conferences
- 5 university students (2 males, 3 females), aged 20-28 years old, currently enrolled in Master's degree at Óbuda University.

#### Content analysis of the expert focus group interview with AI experts.

The experts we interviewed were exposed to AI at different ages, depending on their age (youngest 28, oldest 61). The youngest of our experts was introduced to robotics and AI as part of it in high school, while the majority were introduced either during their university studies or in further education afterwards. It was mentioned that they would also rephrase their first encounter with AI as having encountered the data science and algorithmization behind AI at

an earlier stage, but only later on the concept of AI. In their view, their knowledge of AI is much more sophisticated due to their prior knowledge of cybernetics and its mainly theoretical models, and their anticipation that computing, in particular computational capacity, would develop to the point where theoretical models could be tested on large amounts of data in practice.

Our experts were asked to give a definition of artificial intelligence. Each of the eight experts outlined a definition, but after several rewrites we could not agree on a definition that would be the essence of the definitions that were created separately. The differences were due to the fact that on the comfort-safety axis, some considered safety to be more important and subordinated the comfort provided by AI to it, while others considered that if the use of AI (including inter-faces) was uncomfortable, difficult to understand, then the average user will not take advantage of the possibilities offered by AI, so that even if improvements are made, the money spent on improvements will not be recouped in all areas or at all.

A major factor in the scientific and professional engagement with artificial intelligence and closely related fields has been the desire of our experts to use AI to find solutions to problems which, because of their complexity and sophistication, can only be solved by human effort and not by conventional computers and programs, or only after long and time-consuming computations. All the experts stressed the importance of the classics of science fiction and robotics literature (e.g. Karel Čapek's "Rossum's Universal Robots", Ira Levin's "The Stepford Wives", Isaac Asimov's "I am the Robot", Stanisław Lem's works and the writings in the popular Hungarian magazine Galaktika), science fiction and science fiction-horror films (e.g. Alien, Robocop, The Day the Earth Stood Still, Forbidden Planet, Rise of the Wild West, The Bounty Hunter, Terminator, The Matrix). As one expert put it:

*"I think I know the difference between science and fantasy, but it is the interaction between these two fields that has led to the development of both."*

Another participant believes that

*"In our field, it is important to see and read how science fiction artists think, so that we can be inspired to develop real-world solutions supported by artificial intelligence to help humanity evolve."*

Our experts have encountered AI in almost all walks of life. The following areas have been identified: smart homes (domotics), personalised medicine and medication, personal assistants, intelligent biometric identification systems, information security and IT systems protection, industry 4.0 solutions, military and national security solutions, smart cities, megapolis management, transport, self-driving/self-driving cars, environment, agriculture, genetic engineering, economic and financial forecasting, Chinese social credit system and similar systems based on human behaviour analysis, personalised teaching, knowledge transfer, personalised mental and physical development methods. Our experts gave mixed reviews of their experience in these areas. They distinguished between fun and professional AI-based solutions. For the first group, where the functionality was more about convenience and fun, our experts thought that ease of use was important, while professional solutions were considered unthinkable without appropriate data and information security requirements. Satisfaction also included the perspective of how the failure of AI applications and solutions (whether due to cyber-attack, faulty teaching or faulty programming) could directly or indirectly threaten or harm the human or the professional or organisation using AI, in terms of money or other resources. When the damage is negligible, our experts are more lenient on malfunctioning, but for more serious damage, they have set much stricter standards for the operation and safety of AI.

Our experts believe that because the last ten to fifteen years have been about AI, it is almost certain to evolve in all areas of life. More than average development is likely in areas where the use of AI is either a security issue (e.g. military and national security) or where the purchase of AI-based applications will provide developers with very large revenues. Whether the focus is on security or profit, our experts believe that, unfortunately, we should expect to see the emergence of solutions that either serve the power needs of a narrow interest group or that do not or do not sufficiently emphasise the need for ethical AI in their development. However, the sufficiently bleak picture is coloured by confidence in a happier, safer, more comfortable future, with a better quality of human life, more efficient

solutions to global problems, more rational and prudent use of resources through AI, and the ability to reverse or reverse negative trends. As one participant put it

*"We who are actively involved in shaping the future through AI cannot help but think that we should only support development directions that our children and grandchildren will look up to and that will serve as an example for our children and grandchildren".*

Our experts agree wholeheartedly that the debate should no longer be about whether AI is important or useful, but about how to or should prepare as many groups in society for change as soon as possible. One expert says:

*"Society is fundamentally unprepared for the rapid changes brought about by AI".*

To do this, we need teaching materials that are easy to understand and technically up-to-date. As far as our experts' own vision is concerned, they are optimistic about the world of artificial intelligence and their own role: they want to be agents of change, rather than victims of it. They believe this can be achieved through continuous professional development, deepening their knowledge and learning in other related areas.

According to the experts in the discussion, happiness and worry will be mixed in a world infiltrated by AI. In AI-based virtual worlds and metaverse worlds, people will find the happiness they seek in vain in the real, physical world. From the worries and problems of the physical world, they can escape into metaverse worlds, where we or our avatar can be happy and content, and in the sit-ins they have the chance to be heroes, or at least to represent their interests properly.

During the discussion, our experts touched several times on ethical AI. We asked them specifically how AI can be developed in ways that do not endanger the future of humanity. They told us that the European Union and several international organisations dealing with AI have recommendations for the development of ethical AI based on the Asimov principles, which is good. Experts involved in education said that they and their teachers take it for granted that they raise students' awareness of the importance of ethical development of AI and that they only call for proposals for projects where the development of AI can be based solely on ethical principles. As researchers, we believe that the attitude of the eight experts we interviewed is the most acceptable one for professionals, experts, consultants and trainers working in the field of AI and related areas. At the same time, it is clear to us and to our experts that there is an increasing number of developments - not only in the military field - for which neither the ethical nor the humane adjectives are true.

*"Recommendations, regulations and laws on artificial intelligence are only as good as the amount of them that are followed. While punishment may be a deterrent in some cases, unfortunately, it can be said that, in general, no punishment will deter those who develop AI with malicious intent and for their own ends"*

In formulating our vision of the future, we have also linked our expert opinions to a specific year, 2032. What will the world look like in ten years' time? Our experts' opinions are partly subjective and partly objective. Their subjective opinion is optimistic. They are confident that social and economic trends will take a direction that will be more positive for the world as a whole. However, their objective opinion is not so optimistic. There is a strong likelihood of developments financed by various interest groups to serve their own interests. We should expect to see cases where the consequences of the malfunctioning of AI could be far more cata-strophic than if it had not been used.

To conclude our discussion, we asked our experts to summarise their views. Some experts focus on the AI vs humanity relation like:

*"The world's development is unthinkable without artificial intelligence. It is up to us humans to decide whether humanity wins or loses".*

*"In the past it was man against man, then technology against technology, and now it seems that artificial intelligence against artificial intelligence. Maybe we would be better off if we chose cooperation instead of fighting".*

*“We know that AI will one day be smarter than us. But it matters how an entity smarter than us relates to us. We have to work to make it see us as a friend”.*

*“Artificial intelligence will be what we develop it to be. A normal thinking professional might have an interest in tuning it against us. I sincerely hope not”.*

*“We can say that artificial intelligence was, is, will be. Just as we can say that man was, is. Whether or not there will be a future for man depends on whether we as professionals are sufficiently vocal when the development of AI goes in a direction that we believe is already harmful to humanity”.*

Others focus more on understanding AI better:

*“What we don't know, we usually fear, and our fear often takes the form of rejection and hatred. And so it is with AI. There is only one way for humanity: get to know artificial intelligence so that you can consciously decide whether you love it or hate it”.*

*“Among the utopias and dystopias about AI, it is difficult to find a realistic and acceptable scenario. It's up to the experts to do this and then to communicate it to people in an understandable way”.*

*“I'm not sure I can put into a sentence the lessons of today's conversation. But I am sure that such discussions are useful for all of us in the development of our respective fields”.*

### **Content analysis of the focus group discussion with non-AI experts.**

We were curious to see how the participants could define artificial intelligence in their own words. They were: “a program designed to learn and evolve in order to make our lives easier”, “it brings positive change to our lives but we need to know it not to fear it”, “it is neither good nor bad but a reflection of its creator”, “if it can learn it can change, so it may not be what it was created to be”.

Participants encountered AI in all aspects of life: online commerce platforms, online social media, security devices and solutions, personal assistants, metaverse. In their own area of expertise - information security - AI has appeared in facial recognition, number plate recognition, biometric identification, motion tracking, voice recognition, handwriting recognition.

The use of smartphones is a natural part of this age group, so the focus group participants are familiar with their capabilities and the applications they run. Fingerprint recognition, built-in personal assistant, learning (maths) apps, automatic typing of spoken text, virtual nanny talking to children were among the AI-enabled features mentioned. It was mentioned that some applications are unfortunately not or only with loopholes available due to country restrictions, and the language of the applications is usually only available in one of the world languages, therefore, in order to use them meaningfully, one has to speak some world language, such as English, in addition to Hungarian. In relation to the maths solving application, we were curious to know how much trust participants have in AI as a service. They said they had mixed views and preferred to use the application to check their own calculations, as in many cases it gave the wrong solution. When the result calculated by the student and the result calculated by the machine were the same, the student accepted it, but when they were not, the student accepted their own result. As one of them put it:

*“I only believe in machine intelligence when it gives the same result as human intelligence”.*

It was raised with the participants that we believe that AI will improve in certain areas compared to the average, and that there will be areas that will lag behind. Participants see that there will be significant differences in development not only between different areas per se, but also between different countries. Among the pull sectors mentioned are health care, including non-medical diagnosis, and machines that supply and serve health systems (e.g. complex security solutions, the possibility of preventing accidents and damage, the widespread use of smart homes (domotics), more advanced and faster analysis of log files in the field of information security, cyber defence and the other side of the coin cyber-attacks, education and within this personalised education.

Our next major area of investigation was the exploration of the threats and opportunities of AI. The most prominent among the threats was the loss of jobs and, in this con-text, the need for people to prepare themselves in time for these changes, because if they are not able to do so, they will lose out to artificial intelligence. They feel that there is a danger that AI will become so autonomous that it will become self-aware and unleash itself. To avoid this, they consider it important to put in place an appropriate *emergency button*. The optimal solution is seen by the participants to be that, as technology develops, our trust in AI-enabled devices increases, but that this trust can only go so far as it is still possible to take control of the AI safely at any time.

Among the options, the importance of human comfort and safety was highlighted, as was mentioned several times during the discussion. It is considered important that devices, equipment and machines with AI (e.g. cars) can be connected to each other in order to make good decisions together, and this requires an appropriate infrastructure (e.g. 5G network). Nevertheless, the interconnection of AIs is still viewed in mixed terms, suggesting that AI is evolving through collaboration in ways that can be both bad (machines turning against humans) and good (interconnection enhancing security).

The emergence of artificial worlds (virtual worlds, metaverse) alongside the real world, with AI as the IT basis, is an increasingly common theme in the media and in films. In this context, the focus group members believe that, at the moment, most people can still distinguish between the real and the virtual world, but that in the coming decades we can expect to see a world similar to the one depicted in the film *The Matrix*, where the distinction between the real and the virtual worlds will become increasingly blurred and it will become increasingly difficult for people to know what is real and what is virtual.

Participants believe that AI will be able to provide some solutions to some or all of the global problems of the future. At the same time, however, we should not leave our lives to the solutions of AI alone, because solving global problems now and in the future will require responsible human decisions that can be translated into laws, rules and regulations. This does not, of course, exclude the possibility, participants argue, that decision-makers should not rely on AI to support their decisions. On the contrary, one participant said:

*"Human decision making can be better if a lot of data is processed by AI, so that humans can better understand the conclusions that can be drawn from the data".*

In education, a discussion emerged among focus group members on what AI should be taught. We concluded the discussion with the consensus that if the participants are going to be involved in teaching and developing AI as graduate engineers, it is important that AI learn everything from human history so that it can make properly in-formed decisions, but it is also important to teach AI what is good and what is bad, so that it can distinguish between these concepts and the specific events associated with them.

Participants will draw a clear distinction between the potential and directions for the development of AI in civil and military domains. For civilian development, they believe that the above-mentioned international, independent, humanistic team of experts in AI for human development is important. It is also important that the members of the team come from different disciplines and that their life experience should be an example of humanistic thinking guiding them in the teaching of AI. With regard to the potential military applications of AI, the question has again been raised as to how much autonomy would be allowed for future military and civilian humanoid or, more generally, AI-enabled robots. The question left the participants uncertain, with some trying to argue that for machines, aggression should be limited and minimised, and that if the robot is disconnected from the network, it should switch to a simpler operation that allows it to perform minimal functions (e.g. to find the nearest connection point), although this was not seen as a realistic solution for military robots, precisely because of their specific use.

The focus group participants tried to *predict* the future - what the world will look like in 10 years' time, in 2032. The name and work of Elon Musk was mentioned, a chip that can be built into the body to give our disabled, paralysed people back their freedom of movement. We agreed that technology is evolving at an accelerating pace, and that progress can be both good and bad, and that there are many roadblocks to progress that make it difficult to see the future based on realistic facts. Participants said:

*"Maybe in 10 years artificial intelligence research will be where it is today, maybe in 10 years artificial intelligence will be at a level where everyone will be driving self-driving cars".*

*"I would be much more relaxed if there was a positive world view in 10 years time and I could say that thanks to AI my parents are safe in the smart home".*

Although in 10 years' time, the focus group members would basically like to live in a happier, safer, more comfortable world thanks to AI, they would not want to be so spoiled that they are left with the *experience* of a boring life in every aspect of life.

## **6.2. Business (ACEEU)**

Two focus groups were organised using Zoom online platform:

- 7 experts (7 males) aged 26-50 years old with a university degree, members of at least one professional-scientific organisation, been working in areas related to artificial intelligence, digital society, human-robot interaction, industry 4.0 for at least 5 years and given/participated in at least 3 presentations at scientific and professional conferences
- 7 university students (3 males, 4 females), aged 22-30 years old, currently enrolled in Master's degree.

### **Content analysis of the focus group discussion with AI experts.**

In the introduction part, the experts talked about their first experience with artificial intelligence (AI). Half of them had already a long history with AI and its implementation in their workplaces, businesses and professions. The ones who were not directly working with AI stated that they interact with it every day both intentionally and unintentionally. Most of the experts agreed that everybody who is having smartphones and smart technology directly interact with AI. An example is when people use banking systems, they also use AI unintentionally, or their data is being used in an AI-supported system to enhance the banking network. Experts mentioned banking systems that are implementing AI to analyse data and create opportunities/offers for customers accordingly. Experts called AI "a revolution" several times and agreed that it can be considered a tool that is changing our daily lives by solving issues and by becoming more common day by day.

When asked about benefits and disadvantages that AI can bring to the business environment, experts mostly agreed on the fact that AI speeds up the tasks, particularly the ones that do not require complex processes and that therefore it reduces simple mistakes while saving time. Some comments given by experts on the benefits and disadvantages of AI included:

*"We use AI to have sentiment analysis and these all are advantageous. The cost related to these activities can be disadvantageous, as well as finding people who can manage these processes is problematic."*

*"There are algorithms which are not properly regulated, which can be an issue. I'm also skeptical that AI would not do human errors. But what if the algorithm was trained falsely or with some bias(racism)? In this case AI can do mistakes. So, who is to make the last decision - AI or the human? we don't know how AI comes to a decision. Why whatever decision was made, we don't know. Thus, there needs to be made with effort to make AI systems more explicable to understand why it decides for or against things."*

Generally, experts agreed that AI is a fundamental contribution to their business as it reduces the complexity within different situations, it personalities their products and it saves time. One expert stated that AIs are tools that help with specific tasks. When asked about the current impact of AI on business and their work environment in particular, experts highlighted the changes that AI brought to their work experience. According to them, AI creates differentiation and increases the efficacy in specific fields such as the medical one. On the other hand, one expert indicated that AI can also have a negative impact as it can make people/employees feel useless and uncomfortable within such an innovative and automated environment.

On a general note, experts expect AI to reduce complexity even more in the near future, but they also expect it to add new and complex tasks as well as opportunities, which would need to be learned and practised by humans. The general opinion is that everything depends on the field of work.

*“AI can open doors for new tasks but in some fields, it can just replace the human labor and reduce the complexity. So, it really depends.”*

When asked about the AI development in the university learning process, experts agreed that AI has already changed the higher education environment as now everybody can learn new skills individually.

*“AI is expected to create flexible and personalized education by analyzing and detecting students’ weak or different points”*

Experts underlined that higher education in general has a crucial role in teaching the technology-based mindset and in providing best practices and real examples from business cases. In their opinion it can bring different and rather innovative teaching methods, which can become one of the advantages.

When concluding, some experts indicated that the most important needs that AI can provide include saving time, shortening tasks, automatization, having the ability to analyse big data more efficiently and reducing the complexity of some fields, especially finance and medicine. More specifically, one of the experts highlighted the importance of the ability of AI to enhance the capabilities and perspectives in business, however it was also stated that AI should not replace human capability and decision-making.

*“Humans are the ones who can distinguish the things in fields like biomedicine. But we can still AI for simple detections. And in larger medical fields it is important to use AI but we should be sure that it is safe and will not cause big errors. Expert knowledge shouldn’t be replaced by AI but rather enhanced. It should give recommendations but should not decide. I would prefer AI to enhance what humans can do. We are very far from that point where AI can replace the human knowledge anyway. Plus, it can be dangerous. Also, the responsibility (trolley problem) is another issue to consider when it comes to AI making decisions.”*

### **Content analysis of the focus group discussion with non-AI experts.**

In the beginning, all participants stated that they have never taken part into a focus group before this survey.

Most of the participants stated that their first association with the term Artificial intelligence was with machines able to perform independently without the need of a human presence and agreed that the general view on AI had been influenced by science fiction.

When asked about which interaction they think they have had with AI, most of the participants mentioned virtual assistants such as general chatbots and Amazon’s robots “Earnie and Bert” which are part of Amazon IU development and are generally used to help warehouse workers with packages and deliveries.

By the answers provided, it resulted that all participants agreed to have had some sort of interactions with AI, especially when navigating websites and using different platforms (e.g. LinkedIn). In this regard, one of the participants mentioned that they are aware that tools such as Google SEO and more generally marketers have indeed integrated some sort of AI in their systems.

In reference to the benefits and disadvantages that AI brings to business life, most non-AI experts agreed that AI brings benefits such as forming reference models to solve future problems using past data as in the case of finance and providing process optimization in business. Another AI benefit identified during the survey is the support that AI provides to companies and brands in terms of image innovation, individualisation and personalization in order to attract customers.

Nonetheless, almost all participants raised concerns about AI. In this context some of the disadvantages that have emerged from the survey include the cost optimization that follows the implementation of certain AI and that results in higher levels of unemployment for humans. The participants also reported concerns concerning AI reliability and their ability to predict human moves (e.g. automatic email composition).



*“Companies can benefit from AI to innovate their image and it leaves a good impression. Also cost optimization in human resources. It is good for business perspective. But as for CSR and human labour it can be problematic as AI replaces some jobs.”*

When asked about the meaning of “AI management in business” most participants agreed that it had to do with data collection. On the one hand, some participants highlighted the connection between data collection and decision-making, especially in marketing environments and social media, as AI has the ability to influence users’ choices. On the other hand, other participants stated that AI management in business concerns the “infrastructure and different operations of the companies” and the way how they collect and store data, from which AI can learn and improve.

Following, non-AI experts were asked to tell whether they need AI in their current/future job. According to most of them, knowing about AI technologies and their use is necessary to be more competitive in today’s working context and it will become even more a need in the future. In addition, two among the participants have stated that AI is already visible everywhere such as in public services, higher education, and even governments.

*“When it comes to needing AI, it is necessary, but we don’t need it necessarily. To stay competitive, it is a need for companies but for individuals it is tricky. Too much reliance on it might arise new problems. Like getting a job after having been interviewed with a robot is likely realistic”*

Concerning the AI impact on (their) business environment, most participants agreed that AI is creating new types of jobs, but that there is also a shift in the workforce where several jobs are being replaced by machines. Non-AI experts working in the educational field highlighted that people are currently studying and that they are getting ready to teach things that are still unknown.

However, a participant stated that AI improved the quality of their work in the fashion industry. When asked about how they expect AI to affect people’s business lives, most participants reported that AI will bring several benefits and opportunities (e.g., in the medical sector and in costume care) as it will be integrated more and more into everyone’s working life. Despite this, the answers collected show that the participants agreed that human interaction will still be needed and that thinking about the ethical issues related to AI is necessary.

*AI cannot be fully implemented as we need interaction and we need to speak with real people. I was also thinking of ethical issues. People need to think about this particular subject. And it is prone to impact society as well as business life”*

Towards the end of the survey, it was asked to the participants which direct experiences did they have with AI and almost all of them reported that they had some kind of problems with automated virtual assistants and that only by connecting “with a real person” it was then possible to solve their issues.

In conclusion, non-AI experts were asked to identify which need, among those discussed, was the most important. Most of them reported that AI development should be tested, as it is supposed to make human life easier by taking care of their tasks, by saving lives and by improving productivity “instead of making them feel paranoid”.

Finally, they recommended that education institutes should provide classes for the younger students to learn about AI and technology.

*“Human interaction is important while having AI. We should also preserve some freedom and decision-making process as humans”*

*“It could be useful to give some AI classes for younger students so they know how to deal with it and know the risks/challenges. We already use it but it is still tricky and we don’t reflect on it a lot. Maybe it can be useful to have these courses at school to learn about it more.”*

From the conversations held with the two focus groups have emerged relevant considerations about AI and its role in the business environment.

From the analysis of the answers provided by the AI experts of Focus Group 1, it is clear that AI technology is already a big part of everyone’s daily-life and work. AI has great potential especially when it comes to saving time,

facilitating tasks and bringing innovative solutions, especially in fields such as medicine, biomedicine and finance. Nonetheless AI experts agreed that AI should not replace human capability and decision-making.

The same consideration was raised by the non-AI experts of the Focal Group 2, who on several occasions mentioned that AI should be approached from an ethical perspective and that human freedom to make decisions should be prevented from being influenced by AI-driven tools. Also, non-AI experts agreed that AI is a type of technology that is spreading in several working environments (e.g. higher institutions, public and governmental offices) and that such a trend will increase in the future.

In conclusion, the main recommendation coming from both Focus Groups is the necessity to provide teachings, courses and training in schools and higher education institutes to facilitate the use and adoption of AI for young people and future generations.

### 6.3. Governance (UPC)

Two focus groups were organised in a room prepared with a video and audio recorder:

- 9 experts (7 males, 2 females) aged 35-70 years old with a university degree, members of at least one professional-scientific organisation and been working in areas related to AI, digital society, human-robot interaction, industry 4.0 for at least 5 years.
- 10 non-experts (7 males, 3 females), aged 22-70 years old, from civil society with no previous knowledge on AI.

#### Content analysis of the focus group discussion

Prior to the analysis of the criteria that should guide the use of AI systems in governance, two general considerations need to be made beforehand in order to contextualise the debate. These considerations refer to the very notions of “governance” and “artificial intelligence” that were mobilised throughout the focus groups.

A definition of what is meant by the use of AI in governance has not been articulated throughout the focus groups. Therefore, a broad definition has been adopted that refers to the use of AI-based systems in decision-making processes, whether governmental, global, or private.

From the use of the term *governance* from this generalist point of view, in both groups the discussion is based on an inseparable relationship between the AI governance and the use of AI systems in governance (as described in Section 4.2). Thus, throughout the discussions, governance is understood in reference to both terms because both function as communicating vessels.

In the debate on AI this is conceived in two different ways:

- Restrictive view

*“AI is technology and a technology is not for everything, it is for what it is”.* (expert)

- Disruptive vision.

*“It simply came to our notice then. He has come to change society and, moreover, we will not be able to go back”.* (expert)

These two ways of conceiving AI appear alternately throughout the debate, allowing the focus to be on different issues and proposals.

From a restrictive point of view of AI, the dilemmas posed by this issue are limited and solved by establishing a very clear line as to why AI can be used or not. In this sense, it is considered that AI can be very useful for data management and analysis, or for information support for decision making and evaluation, but instead should not be used to make automated decisions. In this sense, it is considered that those decisions that directly affect people must be made by people.

In contrast, from a disruptive view of AI, in contemporary societies any form of governance integrates or will integrate AI. This ability of AI to be used in decision-making processes is applicable to several areas. It is in these

specific areas that the risks of using AI systems need to be assessed. At the end of the focus groups, there has been a discussion especially about the risks in the business, communication or medical field.

- In the *business* field: The risk is related to finding a balance between the economic interests of companies and the non-violation of the rights of citizens in matters related to privacy and individual freedom.
- In the *communication* field: It refers to the proliferation of fake news or the aggravation of certain harmful or harmful behaviours for young people. In this sense, special attention is paid to the "loop" mechanism of social networks, which provide content and information related to the history of searches and interests expressed by users in their use of social networks. A group that is considered particularly vulnerable in this regard are young people and children, who are highly influenced by this "loop" effect of communication made possible by AI-based systems.
- In the *health* field: This is an area in which AI is considered as a technology that enables an intense improvement in diagnostic processes, an area in which the benefits are considered more than the risks.

There is a general consensus on the need to discuss the limits in the development of AI systems, because their use can have very important negative consequences for people's lives, or reproduce social models that are considered morally reprehensible.

*"An investigation to recognize a person from the iris was funded through tax haven funds, to identify women with burkas and whether or not they were with their husbands. I was very surprised [...]. How to do it? Getting here, yes? Getting here right? What's the limit?"* (non-expert)

The boundaries, however, are unclear, and it is difficult to establish or agree on an ethical, political, or regulatory framework that can regulate the development of forms of AI that can then have a high impact on social decisions. One of the difficulties that emerges in this regard, especially from a disruptive view of AI that understands in a more problematic way everything that has to do with the limitations to the development of AI, is the tension between a series of guarantees for citizenship and, at the same time, competitiveness in research and innovation.

In order to organise the definition of boundaries, especially in the expert focus group, the ability to intervene in decisions in three different stages or stages is considered throughout the discussion:

1. In the management of the data that allow to make the decision.
2. In the evaluation of the decisions taken.
3. In the decision itself - a stage that is initially considered to be unique to humans.

*"In the end they are algorithms and we should not let them decide for us"* (expert)

In order to limit the use of AI systems in decision-making processes and / or to establish how this use should be made, both focus groups discuss issues related to: data bias, justice, decision automation and privatisation.

### **The bias of the data**

As specified at the beginning of the paper, the analysis of the social and ethical considerations of AI governance is inherent in the analysis of the use of AI in governance, an idea that captures the concept of data governance.

For this reason, in any decision-making process in which AI systems are used, participants in both groups have stressed the need to ensure that the data collected are not biased on the grounds of gender, socio-economic status, ethnicity, etc. This needs to ensure the diversity of data and their composition refers to the use of AI at all stages of the process, whether in data collection, decision-making itself or evaluation).

*"We humans make a lot of decisions based on an ideology (...) A machine is also going to make a biased decision. Biased by whom? For the data, for the engineer who designed it or the company behind it, or the ideology of the state that financed it".* (expert)

As illustrated in this quote, the concern to take into account how databases are constructed responds to the idea that any decision-making process, whether more or less automated, is biased, there is ideology. Despite the apparent supposed neutrality of AI and other artefacts, the use of decision-making machines is not exempt from this ideology underlying any decision. These ideologies can represent the interests of various actors, be they political, technical or

economic, an important issue to be resolved in order to ensure that the data collected and its use meet the objectives for which they are designed.

### **The justice**

AI systems work by compiling a series of data, which can predict the statistical possibility of a phenomenon. Beyond the data used, automated decision-making, regardless of whether the data is biased or not, is a matter of justice, because efficiency prevails over justice.

*“[The AI] decides based on statistics. I'm a fan of Rafa Nadal. If we look at the statistics, he wouldn't have won and he won. It is not fair that in a case of parole, the statistics apply. It should be banned. We are forgetting the human factor, which AI does not take into account. AI is just the rational part, everything else, emotional intelligence, where is it? This is very important”.* (expert)

Using the ability to manage large volumes of data and make statistical predictions is considered an important value of AI, and is information that needs to be taken into account when making contrasting decisions. But this information cannot be used to make automated decisions that affect aspects directly related to people's lives.

From a more disruptive point of view of AI, from which it is assumed that although we do not want AI to participate in many aspects of our daily lives, it is necessary to make an assessment of the costs and benefits, depending on assessing what if the decisions made by AI systems were wrong. If decisions affect non-substantive issues for people's lives, this error in AI decisions can be considered a minor issue and therefore, AI could be used to make decisions on that particular issue. On the other hand, if the decisions affected substantive issues in people's lives, a wrong decision could have terribly unfair effects that would condition the person's life, and therefore in that matter decisions should not be made by systems.

*“Over the years we have built an important judicial system, which we want to maintain. There are areas where the impact [of decisions made by AI] on the person is very important. This should not be the case with AI”.* (non-expert)

### **The automation and accountability**

However, decisions are now being made automatically in a number of areas, even if AI systems are not used. There are many processes in public administration that are already highly standardised and involve a significant amount of work and time. Following the example of the legal field:

*“In justice, most of a judge's time is spent on very standard sentences. Less complicated decisions, for example on business issues, can be delegated to algorithms. 90% of the sentences are very simple”.* (non-expert)

During the discussion, participants pointed to a process of process automation that goes beyond the development and use of AI systems. In other words, in relation to automation, a restrictive view of AI is assumed, because what is considered really disruptive is the introduction of automated systems in more and more areas of our lives. This process, which has to do with the definition of standardised indicators and the difficulty of negotiating some processes, predates the popularisation of AI systems. Therefore, the debate on limiting the automation of decision-making processes cannot be limited to AI, just as AI cannot be considered solely responsible for the automation of decisions.

The problem with AI is that those who design an algorithm are not able to explain its decisions, as well as when users do not know by what criteria the designer has designed the algorithm. Regardless of the final decision or prediction, ensuring the transparency and explicability of the whole process is crucial in order to be able to use AI systems in governance.

### **The privatisation of governance**

One of the main concerns in the use of AI systems in general and especially in the field of governance, which has appeared especially in the group of experts, is the important control of data and the accumulation of knowledge that

some large companies or corporations currently have. Given the high economic and technical capacity that is increasingly needed to make intensive use of data, this phenomenon poses a threat to democratic decision-making.

Certain companies or corporations are accumulating a lot of algorithmic knowledge about the behaviour of the population, which means a lack of guarantees that this data or this knowledge is done respecting agreed principles or ethical values. In this sense, the accumulation of data and knowledge in AI by entities outside the scope of government oversight involves the privatisation of governance, an issue that needs to be corrected.

*“We have to think carefully about the human relationship and how we organize ourselves in a different way to promote AI for the benefit of the people, not for the benefit of the companies”.* (expert)

Faced with this situation, and in order to ensure an AI that makes fair decisions and respects democratic values, it is necessary to align the three legs that are considered to shape the governance of AI (citizenship, technology and administration). With this in mind, in addition to developing legal regulations, it is proposed to carry out audits of data and algorithms on private companies.

*“I think that regulatory institutions should be set up, just as there are institutions that regulate banks and you can see what they are doing with the money. These companies, like Google, Netflix and so on, should be audited to see what their algorithms are really doing”.* (expert)

### **The freedom**

Freedom is one of the issues of most concern in both focus groups, as AI is considered a very powerful tool for social control.

*“It's a very powerful tool for control”* (expert)

The threat to freedom posed by the use of AI systems in decision-making processes can be understood from two different levels.

The first dimension refers to the strategies used by AI to achieve greater publicity or visualisation, based on algorithms that involve users in loop-type processes, which use companies such as Meta or Twitter. Such processes can lead to significant manipulation of more influential or less educated groups of people, such as young people. In this dimension, it is considered necessary to legislate the operation of these loops to avoid harm to people.

*“I have teenage children, who believe what they see: fake news, the bleach he drank to cure his covid. I have a 12 year old daughter. I see the information they see as a brutal danger. People are influential and this is very complicated. When you start seeing content, when we were young we look for news that is as you expect, we are more influential. If you see a video coming out ... Well you say ‘I want to go to Malibu’, ‘I want a Prada bag’. The algorithm is soft”.* (non-expert)

The second dimension, related to the first but taken to the extreme, has to do with a very disruptive view of AI. In this sense, it warns of the ability of AI to control emotions and regulate feelings. Given the digital footprint that all citizens are leaving on every move they make on a daily basis, obtaining and using this data for commercial or authoritarian purposes can be very dangerous. According to this view, the problem is not the predictive power of AI systems in governance processes, but the use that can be made of these predictions. Faced with this situation, the solution proposed by the participants is based on questioning the supposed objectivity of the predictions and, therefore, proposes a use of predictions based on subjective and contextual criteria, which can be known, negotiated and discussed.

AI changes the scale of decisions, has global effects, and therefore global control measures are needed. This nature of AI transforms the way we understand governance and the ability we can have to govern its effects. Global control and regulation mechanisms are needed, but at the same time it points to the need to develop local mechanisms that promote accountability.

### **Testing**

The focus group of experts raises the idea that decisions about whether we should use AI in governance in one area or another and how it cannot be a final decision, because we do not have enough knowledge about its effects and

their consequences. One of the major difficulties in introducing ethical and responsible criteria for the use of AI systems in decision-making processes is their global and interconnected scale. Faced with this situation, a response is proposed based on the development of small-scale forms of experimentation and monitoring. In this way, the responsible decisions must come from the result of testing processes of applications implemented in a controlled way in very limited local areas, which allow to know the repercussions of the use of these technologies in specific areas and different cases. Because AI has global effects, it is difficult to think at the local level, and it is precisely this scale that needs to be introduced into governance.

### **Multiplicity**

This issue is also related to the different forms of technological development that AI is adopting. Just as there is more than one model in politics (different parties with different ideologies proposing different actions), AI for governance must also represent this diversity. There is no single technological answer. This proposal developed during the discussion represents a powerful alternative to the technocratic determinism that often accompanies AI: Technique gives us tools to find the best solution, but there are always many better possible solutions. In this sense, it is considered essential to accompany the emergence of open source experiences, experimental techniques, etc. that allow to develop bottom-up strategies that represent this multiplicity of possibilities that can offer the AI in the governance.

In conclusion, both experts and non-experts agree on one important aspect: the need to train citizens in the operation, potential and possible effects of AI.

*“We must have an educated population”.*

*“Rules need to be put in place and citizens need to be put at the center ... and those people need to be educated. There has to be an ethic in AI. And engineers don't have to”.*

*“Citizenship is needed with artificial intelligence. And I don't think that's clear to AI technicians yet ... or they don't realize that citizens are very important in various aspects of AI research and implementation, or it's not valued”.*

Similarly, AI experts themselves consider that they do not have enough knowledge to be able to decide on ethical and social issues, a knowledge that should be integrated in an interdisciplinary way.

*“I think we need more technical people, more knowledge about the evolution of society [...]. And also on the other hand, to the people who are more in the field of governance [...] who also understand this new partner who has a way everywhere ... At the educational level we must try to make an effort to integrate this AI into the whole existing knowledge base”.* (expert)

### **6.4. Skills & competencies (AidLearn)**

Two focus groups were organised:

- 9 experts (6 males, 3 females) with a university degree and working in Tech or in VET were interviewed through an online questionnaire.
- 5 master students or recent graduates, with no previous knowledge on AI participated through Zoom online platform.

### **Content analysis of the questionnaire with AI experts.**

When it comes to the expert group, due to their experience with Tech and AI and/or skills and competencies, we were able to obtain more specialised responses on the impact of AI. Unlike the non-experts, first associations with AI were very elaborated, almost always referring to machine learning as nowadays “almost synonymous with AI”, highlighting its “self-learning” aspect and high intelligence as well as its vast number of varieties of possible applications. There is also the notion that AI processes have to be well prepared and labelled, pointing out that in the

general public it is understood rather one-dimensionally to create fear or underline benefits of a product by naming specificities.

Regarding the interactions of the tech experts with AI, some referred more to their personal lives while others focused on their professional life. For the latter one, the answers included very specific AI systems such as the air transport tracker, AI for computer vision of robotics systems or the research and funding of AI projects and platforms. In terms of more personal usage, as in the non-expert group, AI as supporting to facilitate the daily lives was mentioned most often, including translation systems like deepL, the Via Verde system (the Portuguese Electronic toll system), Netflix recommendations or Instagram filters, as well as chatbots/AI (voice) assistants for banks or hospitals, and facial/print recognition in phones.

Focusing on jobs that are disappearing due to AI, respondents agreed on three categories of jobs that are replaced by AI: repetitive/routine jobs where AI can replace humans, decrease the risk of errors and increase the productivity (such as warehouse/factory jobs, drivers, pilots, toll employees); office/white-collar jobs (like secretaries, recruiters, lawyers, tax consultants, assistance, translators, paralegals); and finally physically demanding jobs (as truck (un)loading, box (de)palletizing). More generally, the participants pointed out that AI is taking over “the easier issues relieving humans for the most complex ones” and one participant highlighted the “potential for collaboration between humans and AI”.

When it comes to jobs that are changing, there appears to be a slight overlap with the previous question. This makes sense as currently some jobs are changing but are likely to disappear in the future. Hence, jobs with daily routines, advertising jobs as well as customer services, lawyers etc will change in a way that they will include AI in their work flow. Particularly the health sector was perceived as changing due to AI, naming as an example that doctors will use AI tools to facilitate the identification of problems whereas not replacing them entirely; supporting the administrative procedures such as booking appointments, recognizing symptoms or escalating emergency cases to save time. Other participants argued that jobs will change in a way that they will shift from the manual execution to the management of robots/autonomous moving robots

*“For example, a warehouse worker who currently uses a forklift to move pallets around may soon be managing a small fleet of autonomous moving robots (AMRs)”*

More generally speaking, AI was expected to change jobs through

*“A reduction of complexity and quick support based on data can significantly support people in their work”.*

When having to choose the most common consequences, tech experts had varying opinions, however none assumed that there will be a pure increase of jobs. In fact, most of them saw both sides of change and disappearance, recognizing that many jobs will need retraining and having doubts about how AI can create an equal number of jobs as those being lost. It was also outlined that especially jobs where human interaction/connection is necessary will not be replaceable through AI. Participants also were disagreeing in regards to the timeframe of this change, as some pointed out that we are facing a rapid change, while others argued it is not happening “from day to night”, and yet others perceived it as “just the flow of technological evolution”. Focusing specifically on the impact of AI on menial/dangerous jobs, most participants assumed that these types of jobs will disappear, while the opinion about the consequence of this varied: some believed it will make space for more worthwhile jobs, while others highlighted that the access to more worthwhile jobs depends on the level of education and on the personal preferences of working style. At the same time, it was recognized that many jobs will be lost, pointing out the difficulty to create new jobs to replace the ones disappearing. Finally, one participant emphasised that AI after all is just a tool and the consequences emerging out of its use are solely in the hands of those who have the power over this tool.

More specifically, experts could give very precise lists of competencies and skills they expect to gain relevance/become obsolete through AI, which are summarised in the following table. While there was a very clear consensus on soft skills and IT/mathematical skills to become more relevant in the AI age, in terms of skills and

competencies becoming obsolete, the answers were mostly related to the jobs mentioned to become obsolete as well (such as skills for manual work; pattern recognition skills etc.).

Table 4. Skills & competencies becoming obsolete vs gaining relevance

Obsolete	Relevance
<p>Generally</p> <ul style="list-style-type: none"> <li>● any skills that can be replaced by machine learning models</li> <li>● Any task that can be done by a human in less than 5 sec.</li> <li>● None, “they’re always gonna be needed at some degree”</li> </ul> <p>Concrete examples:</p> <ul style="list-style-type: none"> <li>● Data analysis/pattern recognition (like stock trading)</li> <li>● Physical skills for manual work</li> <li>● Assembly line related skills</li> <li>● Accounting, office, language skills</li> </ul>	<ul style="list-style-type: none"> <li>● Soft skills (most mentioned) such as creativity, empathy, complex/analytical/strategic/critical thinking, body language perception, negotiation, collaboration, innovation</li> <li>● IT skills / software skills</li> <li>● Mathematics/programming/statistics</li> <li>● (Data) Research</li> <li>● Domain expertise in fields outside</li> <li>● STEM/skills that cannot be replaced by an AI, such as nursing, care-giving, and teaching</li> </ul>

Experts in the field of technology had difficulties to pinpoint the effect of AI on competences as purely enhancing or destroying. After all, there was an overall consensus on that it depends on who is using them - when there is “greed and lack of supervision” as well as the strive to more profit, it is likely they are destroying competences (as for instance also taxi driver losing their sense of navigation/ following AI systems without questioning) while in other cases such as in healthcare or in recruiting situations it can be enhancing human competencies and thus decisions (as for instance doctors increasing accuracy of diagnosis or recruiters making more just decisions). These answers underline the notion that AI is a tool that is used by humans, and therefore both its benefits and downsides will follow with its usage more or less.

Focusing on the offer of adequate training for competencies that are gaining value now and for the future, participants recognized that in particular the younger generation grows up with the technology at hand, as well as the offer of courses and programs that promote requalification, technical skills etc. Nevertheless, it also becomes clear that there is room for improvement on several levels, in particular the school curriculum to include more digital tools and complex and critical thinking. Differences between countries in regards to preparing relevant competencies for a life in AI were as well pointed out.

Concluding the questions, all participants highlighted that it is highly pertinent to educate, train, raise awareness and inform about AI, tools and skills through education, training and preparation. It was emphasised that it is a tool after all and the outcome and results of it depend on the humans using this tool. Most participants shared the hope that it will be used in a beneficial, enhancing way that contributes to “create valuable impact for society”.

**Content analysis of the focus group discussion with non-AI experts.**

Even though none of the participants had previous knowledge of AI, all of them had some kind of association with the term AI. The answers participants gave can be categorised in three sections. Firstly, participants mentioned very direct appliances of AI, such as search engines in the internet (like Google) and our phones, virtual assistants like Siri/Alexa or self-driving cars. Secondly, more overall and AI-related technologies were listed, such as Machine Learning, Human Simulation Intelligence, the automation of processes and manufacturing processes. And thirdly, an immediate association of AI with its danger both when it comes to privacy and people’s dependence on technology and AI, which seemed to be a very strong concern of all participants. Therefore, and reflecting in their answers, AI



was associated with a tool and support for our lives but also with its downsides. It became pertinent that participants knew the concept of AI, but only very scarcely and not in detail, as one participant mentioned “I don’t really know how does that work [sic]”.

Regarding their interaction with AI in their educational career, this very same pattern could be found, as all participants agreed that they are sure about AI involved in their educational lives, but could not pinpoint specific tools besides translators and language programming. Only one of the participants had attended a course about programming, where the person came to understand the complexity of AI processes. Another participant similarly had an interaction during their driving classes which used simulation and resembled virtual reality somewhat. It could be observed that all participants had difficulties to differentiate between general technological appliances (such as online quiz platforms like Kahoot) and AI in specific. Nonetheless, there was a general concordance that AI is involved in a way that is not necessarily visible for them, not only in the educational area but more over all, making it “scary”.

While there were basically only the translating tools mentioned as experiences with AI in their educational path, the participants found many ideas on how AI could be further implemented in education and universities. It was pertinent to observe that before the moderator dwelled more on potential risks of the application of AI in education and universities, participants only collected ideas of how AI can support education. The answers can be categorised in two sections: AI for educators and AI for students. Regarding teachers and professors, the simplification of bureaucratic processes like correcting tests, assignments etc. was suggested as well as using AI as a tool to identify weaknesses of a class to understand where attention should be prioritised. Facilitating the lessons by the usage of AI (or more generally technology) was mentioned, giving the example of schools using QR-codes to inform and educate about the environment thereby creating a form of immersive learning. Also, with regards to libraries, the idea to use AI to support the search in libraries was given, which participants acknowledged as already implemented in at least some libraries. For students, AI was recognized as a supporting tool, for instance giving the opportunity to provide them with more individualised feedback and adjusting students' learning journey to their needs given that everyone learns differently. Moreover, students with disabilities were mentioned specifically to possibly benefit from AI to accommodate their special needs. On the downsides, participants had varying views on the actual impact that AI may have when used in education. All participants were certain that there is the necessity to be critical when it comes to the usage and particularly interpretation of AI results, as it can be biased. As they concluded, “it takes intelligence to deal with AI”. A discussion emerged on the impact of AI on humans, and whether its usage makes them trust too much in it thereby decreasing their capabilities to make decisions and be critical about the interpretation of the data. Once again, it referred to the notion of dependence on such technologies, visualising it by the scenario of “what if there is no electricity one day”. The immense impact AI has on our lives was underlined thereby. One participant found that AI has the risk of making humans “weak” in the sense that life gets too easy. This idea was dwelled on, concluding that in fact it is not really life getting easier but rather the tasks, and that there will be a shift in the focus of work. Nevertheless, another participant highlighted that there will be a loss of jobs due to the emergence of AI, such as the job of a cashier who is replaced by a self-checkout machine in the supermarket.

Following this aspect, the participants collected further jobs that may disappear or appear due to AI. There was general concordance that many “mechanical and monotonous” jobs will become obsolete, particularly mentioning cashiers, banking jobs as well as jobs in the medical area of surgery. Participants underlined the need to “create new jobs or work less generally”. This was dwelled on with the change in organisations already happening, where staff is working less to do the same tasks, as these are facilitated by AI and thus became easier and less time consuming. Regarding new jobs, in particular jobs in programming and IT were found to become more important. When it comes to jobs in the field of education, participants agreed that these jobs will adapt to the context for instance by reducing face-to-face interactions, but that the change will depend on the content. More specialised content (such as a Master degree) was expected not to be replaceable by AI technologies, while small courses were. Hybrid systems as a new solution to integrate technologies in education were encountered with criticism, emphasising the necessity to keep in mind students' needs.

The most important skill participants found as becoming crucial in a life with AI was critical thinking when using AI. Examples were the identification of deep fakes, the need to interpret data critically as in that people “need to keep on thinking and criticising”. Other skills and competencies that were mentioned were the capacity to change and adapt to new environments given the constant and rapid change that technology brings along; leadership skills; emotional intelligence; creativity. In fact, participants discussed the aspect of creativity, disagreeing about the impact of AI: some found creativity as irreplaceable by AI given that they view it as a feature specifically human and predicted the emerge of more artists due to a higher need of creativity (“artivism”), while others acknowledged that “AI wants to be creative itself”, giving examples of AI composing symphonies, thus endangering humans’ creativity. This discussion transitioned to a more philosophical approach to the question, doubting which skills AI would want to promote or not promote and concluding in the notion that there is a difference between what is important and what would be promoted. There was a general consensus about the fact that after all AI is a tool and the real danger or benefit of it goes along with who is using it and who has the power, money and resources over it. Therefore, the participation of all in the whole process of AI implementation was found essential.

Finally, participants finalised the focus group with the conclusion that they will pay more attention and reflect more upon how AI is integrated in our everyday lives already. Concluding this report, one can say that the focus group showed that there is a general perception and association of risk when it comes to AI. This also reflects in the comprehension of AI being part of our everyday lives in a way that is difficult to actually identify or pinpoint. Nevertheless, AI’s benefits, particularly in the field of education and support for personalised learning, are recognized as well. Drawing from the participants' answers, AI seems to be integrated in educational life rather scarcely while the usage of technology in general seems to be more common. However, a lot of room to increase this usage was identified. Further, it could be noted that there is a general confusion about the difference between AI and technology/digitalisation, being used as synonyms often.

### **6.5. People & lifestyle (BAEHF)**

Two focus groups were organised:

- 6 experts (4 males, 2 females) aged 29-59 years old with a university degree, been working in areas related to ICT, human-robot interaction, 3D design, telecommunication networks for at least 7 years and given/participated in at least 10 presentations at scientific and professional conferences participated through MS Team online platform.
- 15 university students (4 males, 11 females), aged 20-24 years old, participated in a face-to-face focus group.

#### **Content analysis of the focus group discussion with experts.**

Regarding their opinion on the most important benefit that AI can bring to humanity, they believe that there are many benefits from it. Priority is given to the storage of huge databases, which through appropriate algorithms can be used in AI applications. AI also automates complex processes that keep users active, as well as save time, increase productivity in conditions of limited resources. AI can replace people working in hazardous areas. It helps a person with information and replaces the person physically in dangerous activities. The disadvantages are different. The main is the possible loss of control over AI by humans. There is a lack of information and research on how much AI can be controlled. Dangerous is human stupidity, which limits the functions of the brain, as well as inaction. Limited human thinking and lack of self-development can lead to human dependence on the presence of artificial intelligence, which leads to a decline in the development of the human being.

Asked how they define AI in their lifestyle, experts define it as good at this stage. They see its development as a means of transparency of certain processes and speed of decision-making. There is also a negative effect - the majority of society has focused entirely on AI, other major trends and fundamentals in people's lives are ignored.

People lose their sense of true values in life. AI attracts and directs the attention of people in areas where someone blames them, rather than pointing their attention to personal self-development. Makes people more dependent on advertising and external influences. This separates them from the tranquillity of life with nature.

Currently, the influence of AI in their lifestyle is partial (professionally and as a consumer). AI is not so well implemented at the moment. When surfing the Internet, they use it through the ads it generates.

In the future, they expect AI to affect people's daily lives, depending on the control of the people who run these systems, as well as their permissible application in society. Some professions will disappear.

AI will make people addicted. This will make them lazier and will rely on his intellect rather than his natural intellect. This will make their lives easier, but also deprive them of social communications and closeness between people. The lie will disappear because of the transparency of public information. In some cases, this will have a positive effect (for people who understand or have an idea of AI), and in cases where people are not aware of AI (have superficial information about AI from the Internet, television, etc.), it is likely to have a negative impact.

The discussion was on how AI should be developed in the process of studying at the university. The comment was that the education system and universities in particular, needs to adapt to current global trends, where AI will expand its presence. Students must have personal knowledge as well as some professional skills related to AI.

It is important to learn from people so that they do not accept artificial messages as reality. AI should be presented in the learning process, but only with the presumption that students will continue research (engineering) work in this field.

Of all the needs that were discussed, the most important for the experts was to have control over AI and ethical standards. Important are the technical aspects of AI - high speed decision-making and transparency for society, the role as a human supporter. It's important to replace the person in dangerous activities and as a source of information is an important application of AI, as well as the control and automation of processes that a person neglects during his dynamic daily life.

### **Content analysis of the focus group discussion with non-AI experts.**

The members of the focus group said that they have no experience with artificial intelligence and their first association with the term is the use of sound commands in the smartphone - Siri Voice Assistant on iPhone and this helps them in everyday life. They associate it with an algorithm, the inclusion of many technologies, hard work, and art. For some, it is a maintenance tool / program designed to maintain already established knowledge, a group of instructions that change in real time according to input parameters. AI is a program that evolves over time, recognizes objects in the video cameras of smart devices, because as well as optimising the operation of the devices through the data collected by them, which are subsequently analysed and optimised by AI. Artificial intelligence is the intelligence demonstrated by computers, it is also the science of concepts in computer science that makes computers capable of performing tasks that can be considered intelligent. AI is convenience, automation, robot or robotic object.

We asked them to give us an example of the interaction they think they had with AI. The answers were Siri or another voice assistant. 30% say they do not have such an interaction. They include Google and nVidia forecasting machines, Google Assistant and site cookies, hacking attacks, sculpting programs, various online communication systems such as chatbots, and a robotic vacuum cleaner.

About what is the most important benefit that AI can bring to humanity and what are the disadvantages, they believe that there are many advantages, but so far more disadvantages. Helps a person in everyday life, but facilitation would lead to habituation. If people use AI in more difficult situations and if one does not have AI, a person can panic. There are possibilities for mistakes - if there are sound commands and the person does not have good diction (or AI is not tuned to the speech of that particular person), errors can occur.

The benefit is for industrial automation, to develop the economy, huge calculated power in real time. The advantage is that some unpleasant and dangerous tasks that people perform at work will be automated, bringing convenience,

saving time in which a person can develop in another direction. In this hectic daily life, he can do housework for us, such as cleaning. The disadvantage is that the emotion is exhausted, a person can get used to AI and this can affect his health - desocialization. Global job losses are also possible - the collapse of the economy we are seeing, people will lose their jobs. Artificial intelligence aims to completely replace human actions that are not considered completely normal, leading to the devaluation of human labour in the middle statistical sector. certain goals, ie the performance of some machines will be optimised. There may be less and less need for human precision at the expense of machines, but it is possible that there will be a bug in the system.

Answering whether they have heard of AI control and what they mean by that, they say they have heard the term and believe that it is control using artificial intelligence, complex process automation or a stand-alone automotive robot in production. Some believe that AI management is the work done by artificial intelligence, real-time management scripts, or a mobile network, such as AI network management. They associate this with car manufacturing robots and a camera that needs to take clearer pictures at night. For them, the management of AI is primarily a substitute for human resources, a program that manages mostly alone, studying the process. It is a computerised control and automatic service system, using a huge database of possible situations, which takes us through a service based on constant criteria and requirements, based on our specific desires for certain parameters. The work of individual researchers and the solution of specific tasks leads to differences in the approach to building artificial intelligence, as well as the use of completely different, sometimes incompatible technical means. They don't remember where they first heard of the term.

When asked if they need artificial intelligence in their lifestyle, it became clear that about 40% answered yes, 25% said they do not see the need, and others - to some extent, can do without AI, but do not see any problem with it and to use it. The answer is that it would be useful to automate some commonly used services, for example, much of the bureaucracy.

When commenting on the current impact of AI on their lifestyle, students felt it was relative. It is primarily through the phone or computer. The presence of such automation gives them more convenience, especially when physical actions are slow and / or incompetent. They emphasise the use of AI in sites that select and offer products in the ads that interest us. They have a negative impact on filtering spam information created by AI. One third believe that AI has not yet affected them.

According to them, they expect AI to affect people's daily lives in different ways, but above all successfully. The impact will be bipolar - younger people will adapt more easily and quickly to automated systems, and older people will find it increasingly difficult to keep their skills and knowledge of working with them up to date. The impact of AI will be more intense in the future. AI will give people more time for themselves. It can make life easier to some extent, for example it will be useful for people with disabilities or people with diseases, it can make life easier for them and their loved ones (if they are not alone). Some students expect it to have a negative impact on humanity. So far, technology is weak, but it will intensify in the near future, especially marketing techniques. The social impact will be positive, but the economic one will be negative.

For better or worse, AI definitely has and will have an increasing share in our daily lives in the future, based on the path of development we have generally chosen directly or indirectly. So it is good to have professionally trained staff in this line of thinking. However, it is desirable that people are familiar with the mechanical implementation of processes that are automated. It would be good to have an elective discipline to teach.

Finally, there was a discussion about what was important to them. The answers were: the disadvantages of AI; to study AI in the learning process so that more people know what it is and what it is used for; possible dangers; automation for people who need extra care. The opinion was expressed that it is important to emphasise that it is good for factories or similar, but that we need to pay more attention to people who need help in their daily life. The interaction and help of artificial intelligence for man is important. It saves time from the same recurring obligations to use some services, for example. Moreso, AI gives the lower probability of errors, assuming that automation can offer it. However, these processes should definitely be monitored by informed and trained staff. AI is also important

for improving the learning process. The study of the possibilities for creating such programs or devices, called intelligent agents, is the subject of a separate section of computer science. Optimising AI performance and practical application were also of interest.

## 7. Discussion and conclusions (UPC)

AI came to stay in our daily lives. This is an obvious conclusion and we need to deal with it. So, how can we do that?

In this document we have reviewed many literature sources and talked directly with experts and non-experts to have a better understanding of the problem, the concerns, the opportunities AI can bring to humanity and its impacts to our society. Thus, we can now provide a set of conclusions and guidelines.

Both sources indicate that AI is conceived in two different ways:

- a) **Restrictive view:** AI as one more technology and therefore needs to be treated like any other technology.
- b) **Disruptive view:** AI as a different technology, which marks a before and after in human society and the relationship with technologies

These two ways of conceiving AI appear alternately throughout the sources, allowing the focus to be on different issues and proposals. It is therefore considered that, while seemingly restrictive and disruptive views may be understood as contradictory, they are in fact complementary views that make it possible to grasp the complexity of opinions, concerns and proposals around the use of AI systems.

From a restrictive point of view, AI tends to be seen as a chance: it can create new, very qualified and remunerated jobs, open new markets and business opportunities, make life easier and healthy, and bureaucracy faster. The common idea is that AI is useful in decision-making processes. The challenges that may be raised by these processes are considered restricted and possibly overcome by drawing a clear border between when AI may be employed and when it cannot. In this sense, AI is thought to be particularly effective for data management and analysis, as well as information assistance for decision making and assessment, but not for automated decision making. In this sense, it is thought that decisions that have a direct impact on people must be decided by people.

In contrast, from a disruptive view of AI, the impression is that in contemporary societies any ambit integrates or will integrate AI. It is thought that, while we do not want AI to participate in many aspects of our daily lives, it is vital to analyse the costs and benefits, based on assessing what would happen if AI systems made incorrect decisions. This may affect several areas of our environment and it is in these specific areas that the risks of using AI systems need to be assessed. Justice, the people's privacy (i.e., freedom), the algorithms themselves (aka, the bias of the data), biomedicine, finance are only a few examples of the areas identified.

A shared concern, which is mostly associated with a restrictive view of AI, and which appears both explicitly and implicitly throughout all sources, has to do with the relationship of AI systems with science fiction imaginaries or with the idea that AI can solve all problems of any kind. Numerous applications have been developed in the field of AI, and can be applied in many fields, but there is a significant gap between current functionalities and technical capabilities and the narrative of what AI could do in the future. This type of narrative around AI, which does not correspond to current developments, is considered to have two types of negative effects: i) The difficulty of articulating a proven public debate on accountability when using forms of AI in decision-making processes; ii) The emergence of a series of catastrophic imaginaries that generate reluctance towards AI between public opinion and citizens.

Regarding the specific ambits analysed in this document, we can summarise that:

- In business: AI is seen as a great potential especially when it comes to saving time, facilitating tasks and bringing innovative solutions, especially in fields such as medicine, biomedicine and finance. Risk is related to finding a balance between the economic interests of companies and the non-violation of citizens' rights in matters related to privacy and individual freedom.
- In governance: there is global agreement on a fundamental set of five AI principles that are functionally algorithm-agnostic, technology-agnostic and sector-agnostic to provide a trade-off between company's

strategies and objectives, legal requirements, and ethics: accountability, transparency, fairness, safety, and human control.

- In skills and competences: the need for physical, basic cognitive and manual skills will be reduced due to the taking over through AI while digital competencies, critical thinking, teamwork, empathy, communication, innovation, higher cognitive skills, technological as well as social and emotional skills will be more demanded. Education systems' priorities need a shift to reflect this to better develop students' abilities. Major risk is related to "less developed" countries which are in danger of being left behind even more.
- In people and lifestyle: AI should contribute to making a person's life more productive, efficient, secure and easier. We may have personalised monitoring and diagnostic capabilities, an increased free time, the possibility to develop our natural interests and talents, a better and faster infrastructure, etc. Major risk is related to the fact that AI can be biased and perpetuate or even increase the gender and racial disparity and inequity.

It is worth mentioning also the topics not highlighted in the debates of the focus groups. One of them, probably the most important one, is the impact of AI on our environment and how it can help with the current crisis due to climate change. On the one hand, AI is a major energy consumer given the complexity of training and inferencing on big data, above the fact that the entire ICT ecosystem is already one of the major contributors to greenhouse gas emissions [1]. On the other hand, AI has also been presented as the solution to climate change due to its multipurpose capabilities, which include tracking and cutting emissions, allowing creative economic models to aid the environment, and enhancing climate resilience. For instance, a study commissioned by Microsoft<sup>4</sup> concluded that using AI for environmental applications has the potential to boost global GDP by 3.1 – 4.4% while also reducing global GHG emissions by around 1.5 – 4.0% by 2030 relative to business, up to 2.2% in energy and up to 1.7% in transport.

One shared opinion is that humanity's social and intellectual skills like creativity, empathy, teamwork, and innovation are irreplaceable by AI. In the short term, the vision is that we will face the emergence of more artists. Nonetheless, this vision seems too optimistic: AI is already able to compose symphonies, paint pictures, write poems, songs, and stories and play games. Some countries like Australia<sup>5</sup> already accepted that an AI machine can be registered as an inventor in a patent. In the future, it is likely that these capabilities will be even more explored.

A common opinion is also that AI should not replace human capability and human freedom to make decisions should be prevented from being influenced by AI-driven tools. In particular, ethics is a recurrent problem raised in all our sources. Even the experts we have interviewed consider that they do not have enough knowledge to be able to decide on ethical and social issues, a knowledge that should be integrated in an interdisciplinary way.

In order to avoid this type of narrative and its negative effects, actions related to information and citizen participation are needed:

- **Information:** Ensuring that the media reports ethically and honestly when talking about AI systems, which allows for a clear distinction between speculative futuristic visions and current developments and possibilities. Develop a pedagogical task that allows the public to know how AI works and what applications are being developed.
- **Participation:** Involve the public in the establishment of priorities for the development of AI, in the service of needs. This is considered to be the added value of the European AI development strategy, compared to other strategies that may be more technologically advanced or in terms of implementation, such as China or the United States. It is considered that the European strategy can incorporate as an added value to its AI the integration of citizens in the establishment of priority areas in which to develop or apply it.

In conclusion, AI is a technology that in its design and development is so far removed from everyday life that experts believe that the population is not trained enough to make decisions about how to use AI. Although, at the

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<sup>4</sup> <https://www.pwc.co.uk/services/sustainability-climate-change/insights/how-ai-future-can-enable-sustainable-future.html>

<sup>5</sup> [https://www.wipo.int/wipo\\_magazine/en/2021/03/article\\_0006.html](https://www.wipo.int/wipo_magazine/en/2021/03/article_0006.html)

same time, it is considered necessary for citizens to make decisions and decide on the course of AI. For this reason, we point out the necessity to train citizens in the operation, potential and possible effects of AI. We need therefore to provide teachings, courses and training in schools and higher education institutes to facilitate the use and adoption of AI for young people and future generations. This is indeed the main goal of the HEDY project. Throughout the next two years, HEDY will provide a Massive Open Online Course with exactly the aim of reaching higher education audiences and show them the capability of AI, the opportunity our society has at this moment to change our environment to a better one but also the risks we are facing from different points of views. This material will be complemented with the Rootkit: a set of supporting multimedia tools with the ability to have a more immediate and visual impact to the audience.

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## Conclusions

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