



AI Skills Strategy for Europe



STRATEGIC PLANNING FOR DEVELOPING AI SKILLS IN
EUROPE

30 September 2023



Co-funded by
the European Union

List of abbreviations and acronyms

AI	Artificial Intelligence
ARISA	Artificial Intelligence Skills Alliance
CAGR	Compound Annual Growth Rate
CIO	Chief Information Officer
D	Deliverable
DG	Director General
EC	European Commission
e-CF	European e-Competence Framework
EQF	European Qualification Framework
ESCO	European Skills, Competences, and Occupations
ESG	Environmental, social, and governance
EU	European Union
HE	High Education
LLMs	Large Language Models
M	Month
NLP	Natural Language Processing
Q	Quarter
R&D	Research and Development
SME	Small and Medium-sized Enterprise
SO	Strategic Objective
T	Task
VET	Vocational Education and Training

Table of contents

1. INTRODUCTION	5
1.1. ON THE URGENCY FOR A SECTORAL SKILLS STRATEGY ON AI	5
1.1.1. <i>AI is revolutionising industries, raising considerations for responsible AI</i>	5
1.1.2. <i>Challenges in the AI Workforce</i>	5
1.1.3. <i>Mismatch between offerings and needs</i>	6
1.2. MAIN TRENDS AND DRIVERS ON AI	6
1.2.1. <i>AI: the Size of the Prize</i>	6
1.2.2. <i>Leveraging AI for Environmental, Social, and Corporate Governance (ESG) Initiatives</i> ..	7
1.2.3. <i>Impact of AI</i>	7
1.2.4. <i>Challenges of AI deployment</i>	8
1.2.5. <i>Navigating ethical and trust considerations</i>	9
1.2.6. <i>Building trust for responsible AI adoption</i>	10
1.3. STATE OF PLAY ON AI SKILLS DEVELOPMENT	10
1.3.1. <i>Professional AI roles to focus on</i>	11
1.3.2. <i>Non-AI professionals</i>	12
1.3.3. <i>Fostering inclusivity in Europe</i>	12
1.4. DIRECTIONS FOR STRATEGY FORMULATION	13
2. METHODOLOGICAL APPROACH	13
2.1.1. <i>Definition of the AI sector skills Alliance mission and strategic objectives</i>	14
2.1.2. <i>Stakeholders engagement for validation of the mission statement and strategic objectives</i>	14
2.1.3. <i>Defining activities for each strategic objective</i>	15
2.2. STRATEGY IMPLEMENTATION	16
2.3. STRATEGY EVALUATION AND ITERATION, TWO CYCLES	16
3. VISION & MISSION OF THE AI SKILLS ALLIANCE	16
3.1. GENERAL VISION	16
3.2. MISSION STATEMENT	17
4. AI SKILLS STRATEGY FOUNDATION	17
4.1. AI SKILLS STRATEGY SUCCESS FACTORS	17
4.2. SCOPE OF THE STRATEGY	18
4.3. ROLE PROFILES AND SKILLS	18
4.3.1. <i>AI Professionals: AI Practitioners, AI Management & Support</i>	19
4.3.2. <i>Non-AI Professionals: Organisational Decision-makers and Policymakers</i>	19
5. STRATEGIC OBJECTIVES AND ACTIVITIES	20
5.1. SO1: OUTLINE THE POTENTIAL AI SKILLS MISMATCHES AT THE EU LEVEL	22
5.1.1. <i>Activity 1.1 - Analyse AI skills requirements in the EU</i>	22
5.1.2. <i>Activity 1.2 - Analyse the AI skills learning offerings in the EU</i>	22
5.2. SO2: DEFINE IN-DEMAND AI-RELATED ROLES AND SKILLS REQUIREMENTS	23
5.2.1. <i>Activity 2.1 - Define the AI role profile structure</i>	23
5.2.2. <i>Activity 2.2 - Update the AI role profile structure</i>	23
5.2.3. <i>Activity 2.3 - Align AI roles and skills with existing European ICT roles and skills frameworks and standards</i>	24

5.3.	SO3: DESIGN OF EDUCATIONAL PROFILES, CERTIFICATION FRAMEWORK AND ACCREDITATION PROCESS	24
5.3.1.	Activity 3.1 - Define key educational profiles (programmes and unit learning outcomes)	25
5.3.2.	Activity 3.2 - Design the European AI skills certification framework.....	25
5.3.3.	Activity 3.3 - Design accreditation procedures.....	25
5.4.	SO4: DESIGN MODULAR AI SKILLS LEARNING OFFERINGS	26
5.4.1.	Activity 4.1 - Deliver fit-for-purpose core curricula for AI skills across the EU	26
5.4.2.	Activity 4.2 - Widen access to AI skills learning offerings	26
5.4.3.	Activity 4.3 - Foster diversity and inclusion within AI skills training	26
5.4.4.	Activity 4.4 - Develop the trainer-the-trainer programmes	27
5.5.	SO5: ESTABLISH AND NURTURE AN ACTIVE COMMUNITY OF STAKEHOLDERS FOR AI SKILLS DEVELOPMENT	28
5.5.1.	Activity 5.1 - Develop a value proposition to engage and support companies, learning providers, and public organisations	28
5.5.2.	Activity 5.2 - Grow a sustainable AI Sector Skills Alliance.....	28
5.5.3.	Activity 5.3 - Develop new collaboration avenues between industry, academia, NGOs and governments.....	29
5.6.	SO6: PROMOTE AND INCREASE OVERALL UNDERSTANDING OF AI	30
5.6.1.	Activity 6.1 - Raise awareness about AI principles, opportunities and challenges	30
5.6.2.	Activity 6.2 - Ensure diversity in the working field of AI	30
5.6.3.	Activity 6.3 - Support the narrative of ethical, inclusive, human-centred AI with decision and policy makers.....	31
5.7.	SO7: ACCELERATE AI UPSKILLING AND RESKILLING AT DIFFERENT LEVELS	32
5.7.1.	Activity 7.1 - Advance the narrative on AI upskilling and reskilling with national governments.....	33
5.7.2.	Activity 7.2 - Map and promote funding opportunities for AI skills development	33
5.7.3.	Activity 7.3 - Capacity building to key stakeholders to engage the national and local communities.....	33
5.8.	STRATEGIC ROADMAP: AI SKILLS STRATEGY	35
6.	CONCLUSIONS	36
7.	REFERENCES	36

List of figures

Figure 1. AI application fields	8
Figure 2. Areas to be prioritised in the implementation of the European AI Skills Strategy	11
Figure 3. Systematic approach followed to define the AI Skills Strategy	14
Figure 4. Strategic roadmap: AI Skills Strategy	35

List of tables

Table 1. Examples of EU initiative for ethical and trustworthy AI	6
Table 2. Success factors for the AI Skills Strategy	18
Table 3. Detailed skillsets	22
Table 4. Strategic objective 1: activities, milestones and KPIs	23
Table 5. Strategic objective 2: activities, milestones and KPIs	24
Table 6. Strategic objective 3: activities, milestones and KPIs	26
Table 7. Strategic objective 4: activities, milestones and KPIs	28
Table 8. Strategic objective 5: activities, milestones and KPIs	30
Table 9. Strategic objective 6: activities, milestones and KPIs	32
Table 10. Strategic objective 7: activities, milestones and KPIs	34

1. Introduction

Artificial Intelligence (AI) is reshaping industries, fundamentally impacting the ways organisations operate, from Research and Development to Operations, from HR to Marketing (ARISA, 2023). The transformative impact of AI on various sectors brings opportunities (such as increased efficiency, cost savings, data-driven decision-making, and improved customer service). However, to materialize these opportunities, challenges related to the evolving AI workforce and the mismatch between current skill offerings and dynamic demands need urgent attention.

1.1. On the urgency for a sectoral skills strategy on AI

The AI Skills Strategy for Europe explores the multifaceted dimensions of the urgency for a sectoral skills strategy on AI, touching upon the transformative impact of AI on various sectors, the ethical and responsible considerations it raises, the formidable challenges posed by the evolving AI workforce, and the stark mismatch between current skill offerings and the dynamic demands of an AI-driven economy. Together, these facets make a compelling case for the immediate development and implementation of a strategic plan to bridge the skills gap and ensure the effective and responsible integration of AI technologies across sectors.

1.1.1. AI is revolutionising industries, raising considerations for responsible AI

Artificial Intelligence has seen remarkable growth and transformation in recent years, revolutionising various industries and shaping the future of technology. With advancements in computing power, the availability of big data, and breakthroughs in machine learning algorithms, AI has experienced exponential growth. It has the potential to significantly impact a wide range of roles and functions across industries, performing complex tasks that were once exclusive to human intelligence (Sheikh, Prins & Schrijvers, 2023, p.161). The AI market is expanding, with predictions suggesting it will reach unprecedented levels in the coming years. This growth presents numerous opportunities for organisations and governments to innovate, improve efficiency, and deliver new services to clients and citizens. However, it also raises important considerations regarding ethics, transparency, and responsible AI development.

1.1.2. Challenges in the AI Workforce

As industries integrate AI-driven solutions and technologies into their operations, the European Union (EU) grapples with two main challenges. First, the surge in demand for AI-related expertise is quickly outpacing the current supply of qualified professionals. Secondly, as with any groundbreaking technology, there is a paramount need to ensure that AI is developed and deployed ethically and equitably.

Growing demand for AI skills

The EU faces a growing demand for AI skills. The key challenges are the shortage of qualified AI professionals who possess advanced degrees in AI-related fields, and non-AI professionals who lack the necessary skills to keep up with rapid advancements in AI technology (ARISA, 2023). To address these challenges, it is necessary to invest in education and training programmes that provide individuals with the skills and knowledge they need to succeed in the AI field and to open Europe to new business opportunities.

Equality and ethical challenges

Recognising the transformative potential of AI, the European Union has taken significant steps to shape the development, deployment, and regulation of AI technologies. The EU's policy initiatives, among which the EU Artificial Intelligence act (European Commission, 2023) (see table 1) aim to ensure ethical and trustworthy AI, while fostering innovation and competitiveness.

EU AI policy initiatives	Description
European Commission's AI Ethics Guidelines	Guidelines to promote the development of AI systems that adhere to ethical principles.
High-Level Expert Group on AI (AI HLEG)	Published "Ethics Guidelines for Trustworthy AI" with seven key ethical principles for AI systems.
EU Artificial Intelligence act (2023)	A legal framework for regulating AI, focusing on high-risk AI applications and ethics.
European AI Excellence Centres	Planned centres to support AI research and innovation with a focus on trustworthy AI technologies.
Funding for Ethical AI Research ¹	Allocation of funding through programmes like Horizon 2020 and Horizon Europe for ethical AI projects (e.g., AI-on-demand platform)

Table 1. Examples of EU initiative for ethical and trustworthy AI

One key aspect of these initiatives is the need to identify biases and promote equality, regardless of race, colour, origin, gender, age, language, religion, political opinion, disability and economic or social status in the development of AI solutions. This AI Skills Strategy must address these diversity and ethical challenges embedded in the training programme by supporting policy and decision makers in the design and development of relevant AI job profiles and skills in the EU labour market.

1.1.3. Mismatch between offerings and needs

A recently published AI Skills Needs Analysis (ARISA, 2023) shows that although there is a growing offer of education, it does not match the demand at this time, both in quantitative and qualitative terms. Moreover, as technologies progress rapidly, VET and higher education will need to be designed in an agile, modular manner that adjusts quickly to new and upcoming requirements. Current initiatives need to be more visible and more accessible to the general public. Across the EU, current initiatives aimed at promoting and developing AI skills need revision to better meet the expectations of stakeholders – especially those working in the education sector.

A balanced assessment of the information stated in this chapter, demonstrates the urgency of shaping an AI Skills Strategy. Yet, the results of the public consultation show that initiators of activities to promote and develop AI skills in Europe are currently rather unsuccessful in achieving their objectives.

1.2. Main trends and drivers on AI

A key step toward realizing the full potential of AI while addressing its challenges is the definition of an AI Skills Strategy that secures Europe's economic competitiveness and prepares professionals for the future. In this section the current trends and drivers navigating AI are discussed.

1.2.1. AI: the Size of the Price

Urgent AI adoption & investment

¹ Source: https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/key-enabling-technologies/artificial-intelligence-ai_en



The AI market is expanding, with predictions suggesting it will reach unprecedented levels in the coming years, registering a CAGR of 32.6% from 2022-2030 (Next Move Strategy Consulting, 2023). A 2022 McKinsey global survey on AI found that AI adoption (the number of companies reporting AI adoption in at least one function) had increased to 56% and had more than doubled since 2017. As AI has become increasingly advanced and accessible, interest and investment have followed. Furthermore, the level of investment in AI has increased alongside its rising adoption: more than half of the respondents report that over 5 percent of their budgets on digitalization went to AI. Most business leaders (76%) expect investment in AI to grow considerably in the coming fiscal year and a sizeable portion expect the investment to stay at similar levels in the upcoming years (McKinsey, 2022).

Realizing rewards from AI

As of 2022, global private investment in AI totalled \$91.9bn, around 18 times greater than it was 2013 (Stanford University, 2023). In terms of investments, Europe has seen an increase in the rate of AI startup deals (25% in Q4 2022) since a dip in 2021 but is still outclassed by its competitors in the US and Asia (31% in Q4 2022) (CB insights, 2022). Value from AI is also increasing. AI's economic return is growing, and greater cost savings are being realised from AI, with the greatest improvements occurring in product and service development, marketing and sales, and strategy and corporate finance (McKinsey, 2022). Additionally, progressive AI practices are being rewarded. Companies seeing the biggest earnings increases from AI are not only following practices that lead to success but also spending more efficiently on AI and taking advantage of cloud technologies to a greater extent (McKinsey, 2022; Deloitte, 2022). Recent estimates imply that AI adoption could boost the EU's annual productivity growth by 1.5pp (FX-weighted average) over a 10-year period, a similar rate to the US although we would likely expect a more delayed impact in EM economies (Goldman Sachs, 2023).

1.2.2. Leveraging AI for Environmental, Social, and Corporate Governance (ESG) Initiatives

IBM and McKinsey recent surveys (2022) indicate that there is an increasing share of companies applying AI to accelerate their ESG initiatives. More specifically, McKinsey's survey findings suggest that many organisations that have adopted AI are integrating AI capabilities into their sustainability efforts and are also actively seeking ways to reduce the environmental impact of their AI use (McKinsey, 2022). Across most markets, AI is viewed as having the greatest potential to solve sustainability challenges related to business process efficiency and data accuracy, for example, by automating the collection and maintenance of climate-related data (IBM, 2022). Furthermore, organisations with greater investments and a more advanced level of maturity in AI are 1.4 times more inclined to report initiatives where AI contributes to sustainability and to state that they are actively taking steps to reduce AI-related emissions. Notably, these actions are more frequently observed among organisations located in Greater China, the Asia-Pacific region, and developing markets, while respondents in Europe and North America are less prone to report such practices. For instance, in Europe, 39% of organisations declare using AI in their sustainability efforts versus 61% in Greater China and 54% Asia-Pacific.

1.2.3. Impact of AI

AI technologies, including natural language processing, generative AI, and computer vision, are catalysing transformation across industries. These advancements are not only driving economic growth but also presenting organizations with critical challenges in adapting to the AI-driven landscape.

AI's impact across Industries

AI-technologies, like natural language processing, generative AI and computer vision are transforming industries across the globe, from the evolution of autonomous vehicles to new opportunities for medical diagnosis, and from banking and insurance to the media and communication industries. The AI Skills Needs Analysis (ARISA, 2023) showed that the most common fields of application for AI are Research and Development (R&D), closely followed by new product development and operations management (see figure 1).

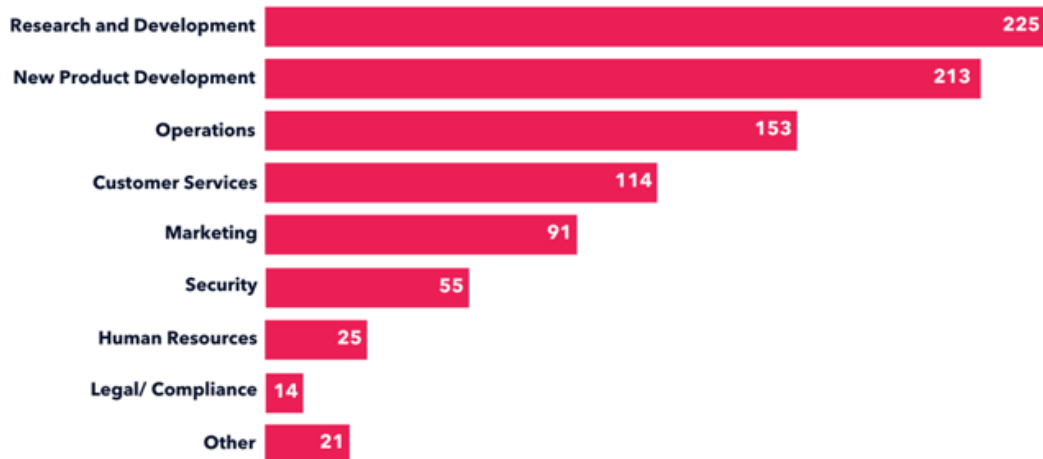


Figure 1. AI application fields

Driving economic growth through AI

The adoption of AI in businesses and government is driving economic growth and productivity improvements. Organisations are leveraging AI to gain insights from data, automate processes, enhance customer experiences, and develop innovative products and services (Davenport and Mittal, 2023). Hence, AI holds the capacity to profoundly reshape industries by ushering in innovative services and entirely novel business models. The economic influence of AI will be propelled by factors that profoundly change the way companies work. For instance, via enhanced productivity by businesses automating processes, by businesses augmenting their existing labour force with AI technologies of assisted and augmented intelligence, transforming client offerings (greater product variety, with increased personalisation, attractiveness and affordability) and enabling new business models (PWC, 2022; Deloitte, 2022).

Organisational challenges

Currently, the biggest impact in revenue is found in marketing and sales, product and service development, and strategy and corporate finance, and the highest cost benefits from AI are in supply chain management (McKinsey, 2022). These transformations have triggered major concerns in research, namely "how organisations should re-envision organisational structure, job function, and skills, and educate future workforce (students)" (Loureiro, Guerreiro, & Tussyadiah, 2021).

1.2.4. Challenges of AI deployment

Despite the growing recognition of AI's potential as discussed in the previous section, a significant challenge has been the limited economic returns from AI projects, with many companies failing to realize expected value. Data shows that in many European countries, the deployment of AI is still a challenge, emphasizing the need to address the skills gap and reimagine organizational operations for AI success.

Economic returns

Even if, as previously presented, the value of AI for companies is increasing, one of the challenges in recent years has been that projects involving this technology have frequently lacked sufficient economic returns. Recent data show that approximately half of companies are not getting enough value from their investments (Deloitte, 2022). In the same vein, IDC's 2022 survey established, only 22% of organisations reported that AI is implemented on a large scale as part of the enterprise.

Regional deployment disparities

One of the reasons for the lack of returns was that relatively few projects were deployed into production; instead, they stayed at research/small scale pilot level (Davenport & Bean, 2022). The AI Skills Needs Analysis (ARISA, 2023) showed that around 33% of organisations used AI for a single purpose. As the authors note deploying AI in production can indeed pose challenges, as it typically entails integration with existing systems and processes, the need for workforce reskilling, and the capability to effectively scale AI technology. Data shows that there is a lower deployment rate in Europe compared to China or India (IBM, 2022). Chinese and Indian companies are leading the way, with nearly 60% of organisations already actively deploying AI, a higher rate than in European markets (Italy 42%, France (31%), Germany (34%), Spain (31%)) and US (25%). These data show there is still room for improvement on deployment in Europe and accelerate up-skill and re-skill could be one of the keys.

Skills gap

Lack of skills hinders indeed AI adoption and deployment: more than costs, lack of tools or project or data complexity, lack of skills remains the biggest barrier (IBM, 2022). According to Deloitte's 2022 survey findings, AI technology cannot deliver transformative results unless organisations reimagine operations: how work is structured and executed (i.e., rethinking operations including the business workflow, and within their IT and data science team processes). Successful cases show that an interesting solution is to create new roles (and train employees for these roles; Deloitte, 2022) to help in communication between business stakeholders and model development teams and serve as the bridge between overarching business strategic goals and AI technical requirements. The AI Skills Strategy will be addressing these key new roles in the organisations.

1.2.5. Navigating ethical and trust considerations

AI growth presents numerous opportunities for organisations and governments to innovate, improve efficiency, and deliver new services to clients and citizens. However, it also raises important considerations regarding ethics, transparency, and responsible AI development. Loureiro, Guerreiro, & Tussyadiah (2021) indicate that when it comes to the societal impact of AI, a major concern highlighted by research is the ethical and legal issues regarding data protection of citizens and the new role of AI in society. As indicated by UNESCO (2021) there is also urgency in understanding the ethical dimensions of AI, with a large debate on what constitutes ethical AI (Jobin et al. 2019). Gillespie et al. (2023) listed risks and recent failures: risk of codifying and reinforcing unfair biases, infringing on human rights such as privacy, spreading fake online content, deskilling and technological unemployment, and the risks stemming from mass surveillance technologies, critical AI failures and autonomous weapons. These issues are causing public concern and raising questions about the trustworthiness and governance of AI systems (OCDE, 2019; Gillespie et al. 2023).

1.2.6. Building trust for responsible AI adoption

Building trust for responsible AI adoption is crucial for realizing its benefits while mitigating risks. However, research indicates that individuals' confidence in the responsible use of AI and organizations' implementation of responsible AI practices both lag behind. Expertise, training, and leadership are key factors to accelerate such implementations.

Recognizing AI benefits & Risks

Achieving the advantages offered by AI and maximizing the return on investment in these technologies hinges on upholding the public's trust. It is crucial that individuals have confidence in the responsible and reliable development and utilization of AI. This trust forms the bedrock for the continued acceptance and widespread adoption of AI in society (Choung et al. 2022; Zhang et al. 2021). However, research suggested that individuals recognise the many benefits of AI, but only half believe the benefits outweigh the risks (Gillespie et al., 2023). Recent ARISA research with European AI experts (ARISA, 2023a) indicates that promoting transparency in AI is a key success factor for increasing trust in the technology and its adoption among non-technical people. Yet, organisations are lagging behind: while AI use has increased, there has been no substantial increases in reported mitigation of any AI-related risks (e.g., cyber security, regulatory compliance, individual privacy, *explainability*, etc.) to bolster trust (McKinsey, 2022).

Factors inhibiting responsible AI

Renieris, Kiron and Mills (2022) also observe that although leaders agree that responsible AI should be a top management concern, few have prioritized such initiatives. The authors also investigated factors preventing organisations from starting, sustaining, or scaling responsible AI initiatives. The most common factors were shortcomings related to expertise and talent, training or knowledge among staff members, senior leadership prioritization, funding, and awareness. The conclusions are confirmed by the results of an IBM (2022) survey where nearly two in three companies say they lack the skills and training to develop and manage trustworthy AI. Along the same lines, the AI Skills Needs Analysis (ARISA, 2023) shows that AI professionals, and specially decision makers, should have a good understanding not only of the capabilities of the technology itself, but also of moral, ethical, accessibility and the legal aspects of applying AI.

1.3. State of play on AI skills development

To navigate the AI landscape effectively and leverage its potential for societal benefit, it is crucial to stay informed about the latest advancements, policy developments, and best practices. Across Europe there is growing demand for AI roles and skills driven in part by evolving technology developments, including generative AI technologies (e.g., ChatGPT), prompt engineering, ethical and explainable AI to eliminate bias in automated decision-making systems.

Working with AI-powered machines

An article by Marr (2022) in Forbes suggests augmented working will see an increase in workers working alongside intelligent machines, in areas including maintenance and manufacturing to identify hazards and safety risks, and in leadership teams to provide real-time dashboards of operational effectiveness. Developing the ability to work with these smart machines and AI powered virtual assistants will become an increasingly indispensable work skill. In addition, the need for companies to reduce their carbon footprint and minimise their impact on the environment will see the rise of sustainable AI so that a more green and renewable energy powered AI infrastructure can be developed and implemented. By developing courses for upskilling and reskilling (future) workers, organisations can harness the potential of AI for their and society's benefit.

1.3.1. Professional AI roles to focus on

In terms of roles, the AI Skills Needs Analysis (ARISA, 2023) states that an AI Skills Strategy for Europe should address urgently the following role groups: *AI practitioners, AI management & support* on the one hand; and *non-AI professionals such as decision-makers, and policymakers* on the other. The first two groups are AI professional roles. The other two groups need some AI knowledge and skills to make better-informed decisions on AI-related initiatives and AI-related decisions.

Hiring is challenging

Recent studies show that hiring professionals for AI-related jobs represent a challenge (ARISA, 2023) and this can pose a potential impediment to the rapid transformation of certain companies (McKinsey 2022). There is a growing need for professionals in the field of AI and data analytics. More specifically, the AI Skills Needs Analysis (ARISA, 2023) shows the AI-related roles with a growing need in the marketplace are machine learning engineers including NLP engineers and computer vision engineers. An emerging role in relation to the very recent upsurge in LLMs that needs urgent attention is that of a prompt engineer. For these roles, hiring fitting professionals is challenging and re- or upskilling professionals seems the answer.

Closing the gap by re- & upskilling

The AI Skills Needs Analysis (ARISA, 2023) revealed that AI professionals need to be skilled, reskilled or upskilled to be able to close the gap between supply and demand of AI professionals. McKinsey survey data (2022) shows that when it comes to sourcing AI talent, the most popular strategy (47% of the organisations) is upskilling technical and non-technical employees on AI (see Davenport, Barkin and Tomak, 2023 for examples: AT&T and PWC). These results are in line with IBM data that indicated 39% of AI investments are in reskilling and workforce development (IBM 2022). Recruiting from top-tier universities as well as from technology companies that are not in the top tier, such as regional leaders, are also common recruitment strategies. Therefore, these organisations need to be prepared with effective AI skills education & training programmes combining technical skills needs (such as natural language processing/LLM, visual image recognition, robotics, machine learning, neural networks and data engineering) but also soft skills, transversal skills and skills related to effective functioning in organisations. It is expected that many new roles will be at bachelor level and up (i.e., EQF level 6-8), given the complexity of the role and its connectedness to different parts of the organisation, ecosystem, and society. The creation of AI education and training programmes is indeed the area that should be given the highest priority in the implementation of the AI Skills Strategy (see figure 2 - extracted from ARISA, 2023a).



Figure 2. Areas to be prioritised in the implementation of the European AI Skills Strategy

1.3.2. Non-AI professionals

Basic AI knowledge needed for decision-makers

Decision-makers within organisations also need basic AI knowledge. They need, for example, to understand proposals for AI initiatives made by AI professionals and also be able to assess the impact of AI on business processes (ARISA, 2023). These roles should possess not only an understanding of the technology itself but also a comprehensive grasp of its moral, ethical, accessibility, and legal dimensions. Additionally, they should be well-versed in the intricacies of successfully implementing these technologies. Currently, the course supply addressing decision-makers' needs to be expanded to also include their preference for short duration workshop-style training (ARISA, 2023).

Upskilling policymakers

Beyond AI professionals and decision-makers in organisations, the results of the AI Skills Needs Analysis (ARISA, 2023) indicate that the upskilling of policymakers on national and international levels is urgent. Policymakers can be divided in a group that needs basic AI knowledge & skills like parliament members, DGs and lobbyists. More advanced AI knowledge and skills is needed for AI advisors, national CIOs and specialised committee members, and the supply of learning programmes for this target audience is lagging behind (ARISA, 2023).

Demystifying AI

Finally, AI impacts, and will continue to impact, all aspects of society. This means that, besides the already mentioned target groups, every worker and every citizen, needs to know about how AI works and how it affects their work and everyday life (for instance - how AI works as an interface, how to improve productivity by generating predication, content etc. and how they are engineered - from AI Skills Needs Analysis, ARISA 2023). These results call, just as some other findings (ARISA, 2023a) for the promotion of a societal approach for the Implementation of the AI Skills Strategy for Europe.

1.3.3. Fostering inclusivity in Europe

The conclusions of this report, AI Skills Needs Analysis (ARISA, 2023) also suggest several ways to bridge the skills gaps, including increasing collaboration between academia and the labour market, implementing rapid reskilling programmes, but also promoting diversity and inclusion by creating welcoming work environments. For instance, results of the focus groups with AI experts (ARISA, 2023a), recognize the significance of creating welcoming work environments and promoting women's inclusion in the AI sector.

In terms of the level of diversity within organisations' AI-focused teams, data shows there is significant room for improvement at most organisations (McKinsey, 2022). The average share of women on these teams is around 27 percent and is similar as regards of the average proportion of racial or ethnic minorities 25 percent.

With a severe skills shortage within Europe, it is imperative that AI Skills Strategy considers individuals from diverse backgrounds who have the ambition to build a career in AI. Finally, it is important to note that data also shows that the jobs decrease with the progression of AI are often among the lowest wages jobs, therefore helping workers in lower-wage, shrinking occupations move into better-paying jobs with more stability will require access to training programmes and training practices by employers.

1.4. Directions for strategy formulation

There is an urgent need for AI upskilling programmes. First, not enough AI professionals are being educated or trained in advanced learning programmes. Second, non-AI professionals need also to be addressed via tailored and short education programmes focused on basic AI knowledge. Most of the current programmes analysed are applicable specifically to AI practitioners but less so for non-AI professionals, such as managerial decisionmakers and policy makers who tend to prefer short duration workshop-style training.

Iterative approach, agile and modular education and training offerings

The AI Skills Strategy needs an iterative approach to adjust for new technologies, with room for quick testing and prototyping. While educational opportunities are expanding, they currently do not align with the existing demand, both in terms of quantity and quality. Additionally, as AI technologies advance rapidly, there's a crucial necessity for educational and training programmes to possess flexibility and modularity, enabling them to swiftly adapt to the ever-changing requirements. For example, there is a noticeable scarcity of educational resources catering to emerging AI-related roles like prompt engineering. Finally, the development of the offering should also consider how to include (design) elements related to inclusion and diversity.

Two target groups

Educational and training offerings should be targeted at two groups: AI professionals with a need for further education in their specific areas of expertise, and non-AI professionals (policy- and decisionmakers) who need a basic understanding of AI, and deeper skills on implementing AI in organisations or policy. A more detailed description of these two target groups and their needed skills is incorporated in Chapter 5 on the AI Skills strategy and its scope.

Pi-shaped professionals

It is essential to develop Pi-shaped professionals, who have a technical AI expertise and expertise of the specific context/sector (the two legs of the π), combined with an ability to reach out and communicate with people from different disciplines.

Range of education and training offerings and EQF levels

There is need for a broad range of course offerings spanning from knowledge clips to 2-hour seminars, MOOCs, and even full-blown Master and/or PhD/Professional Doctorate programmes. The inclusion of industry related projects, challenges, problem-based learning into AI courses is a great way to foster innovation that can be applied to real world challenges. Numerous emerging positions will fall within the EQF levels 6 to 8 due to their intricate nature and their integration with various facets of the organisation, ecosystem, or society.

2. Methodological approach

The systematic approach followed to define the AI Skills Strategy is based on the validated strategic planning and strategic-management models (such as David, 2011 and Poister 2010). It involves 3 steps: strategy formulation, strategy implementation and strategy evaluation and iteration (that informs systematically the strategic objectives and their implementation) as detailed in figure 2.

This chapter illustrates the process and methods used in developing the final version of the AI Skills Strategy and strategic objectives that will guide the activities during and after the project.

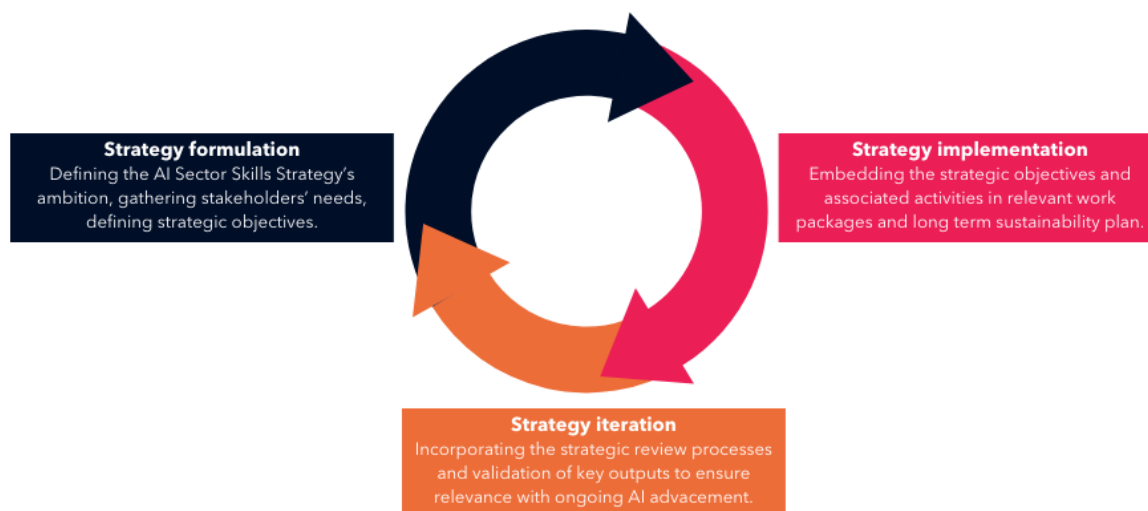


Figure 3. Systematic approach followed to define the AI Skills Strategy

2.1.1. Definition of the AI sector skills Alliance mission and strategic objectives

From needs analysis to strategy

The initial phase of constructing the AI Skills Strategy for Europe entailed conducting a comprehensive assessment of the current AI skills landscape across Europe. The analysis of current and future demand, and supply of AI(-related) skills² (ARISA, 2023) helped in determining AI skills mismatches, identifying trends, and anticipating future skills needs for a chosen set of occupation profiles. Additionally, it also shed light in the urgent and the emergent demand for skills across the chosen occupation profiles - including strategies to address those within non-technical roles - leadership teams and policy makers - and how best to address the deficit of women in Artificial Intelligence roles. Such an assessment provides a data-driven foundation for subsequent strategy development.

Advisory Board

In parallel, an Advisory Board (AB) was formed to guide the strategic formulation, implementation and iteration. The AB comprises of experts from various key sectors, including education (both Higher Education and Vocational Education and Training (VET), AI specialists, corporate representatives, and certification authorities. In interaction with the AB and based on the data collected, areas that require attention to address the most pressing needs and opportunities in AI skill development were defined. Accordingly, the mission and vision for AI Skills Alliance and overarching strategic goals were also outlined.

2.1.2. Stakeholders engagement for validation of the mission statement and strategic objectives

Public consultation

Building a successful AI Skills Strategy necessitates active engagement with a wide range of stakeholders to consider a large range of perspectives. A public consultation was launched to gather and include the views of stakeholders with the aim to iterate and validate the Alliance's mission

² Survey with 409 organisations, 756076 job advertisements from the EU area, 41 policymakers participated across 12 policymakers focus groups and review of 772 courses and programmes in the 12 countries

statement and strategic objectives, and most importantly secure acceptance and consensus from key industry, policy and civil society actors in the AI field. Overall, this collaborative engagement fosters a sense of ownership and collective responsibility in shaping the strategy, ensuring that it aligns with the diverse needs and creates the base from long term sustainability of the AI Skills Strategy.

Questionnaire & focus group

Two methods were used to gather the views of stakeholders, namely an online questionnaire and a focus group. On the one hand, the online questionnaire served to validate the key strategic priorities of the AI Skills Strategy at the national and the EU levels (n= 81 participants). On the other hand, the focus group, which gathered 20 experts from 14 European countries, aimed at validating vision and mission and further refining the initial strategic objectives of the AI Skills Strategy (for more information please refer to the report: AI upskilling and reskilling: Key priorities and enablers, ARISA 2023a). Finally, partners from the AI Skills Alliance were invited during a workshop in April 2023 to provide their insights on Strategic Objectives for the AI Skills Strategy.

2.1.3. Defining activities for each strategic objective

Roadmap

Following the definition of the strategic objectives, specific activities were outlined for each one of them. More specifically, for each strategic objective, an action plan and roadmap were developed outlining the specific activities and timelines needed to achieve them. This involves breaking down initiatives into smaller, actionable steps and assigning responsibilities and deadlines to each one. By articulating these activities clearly, the strategy gained focus and direction and these also serve as a measure of success, allowing for the continuous evaluation of progress towards building a strong AI skills foundation in Europe.

Public consultation

The activities were built starting from the recommendations of the public consultation (ARISA 2023a), from the analysis of relevant best practices, strategies, initiatives, projects (ARISA, 2023b) and from Alliance Partners inputs.

Best practice analysis

For the Analysis of relevant practices and initiatives (ARISA, 2023b), partners, first, collected information on relevant initiatives focused on digital skills and AI skills, which could potentially contain transferable elements for defining the activities in the AI Skills Strategy. Assessment methods were then used in order to select and rank the initiatives, identify the relevant initiatives, success factors and transferable elements. This was done based on a set of criteria such as delivered impact of the initiative, engagement and interactivity, innovation, future-orientation, inclusion and integration, etc.

Online working sessions

Finally, a series of online working sessions and bi-lateral meetings with relevant Alliance partners were organised in June, July, and September 2023 to align on the detailed activities. Partners were invited to contribute on proposed activities, key performance indicators, milestones and also long-term objectives (roll-out plan). Interactive tools (i.e., digital whiteboard) were used to ensure the inputs and feedback from the partners were captured.

2.2. Strategy implementation

The implementation of the AI Skills Strategy is secured by making strategic objectives concrete and actionable: as previously described, a roadmap was developed outlining the specific initiatives and timelines needed to achieve each strategic objective (please refer to figure 4- Strategic Roadmap Timeline).

Moreover, it is secured by embedding the strategic objectives and their associated activities in the short and long objectives and activities. The implementation of the strategic objectives was built during the working sessions and bi-lateral meeting with the relevant partners and can be seen in table 4 (Strategic objectives - Chapter 6).

2.3. Strategy evaluation and iteration, two cycles

Strategy evaluation and iteration is particularly important in the context of AI skills, since AI development is extremely dynamic (ARISA, 2023), with fast transformation of functions and roles requirements. In this context, a constant learning approach is needed, and regular reviews and feedback mechanisms help in identifying deviations from the plan and opportunities for improvement. The AI Skills Strategy evaluation and iteration will follow two complementary cycles.

Short and rapid cycles: Every 6 months the meetings of the Advisory Board will gather to review progress of the strategy and related activities and discuss eventual iterations (short term) needed and ensures that the strategy remains adaptive and reflective of the evolving dynamics within the AI field.

Longer and thorough cycles: There will be also a yearly thorough evaluation and iteration process that will include: (1) a review of skills needs and profiles, (2) a collection of feedback from experts, learning providers and key stakeholders to ensure sustainable long-term output. More specifically, the yearly review process will be based on data collected at a national level in the countries of the AI Skills Alliance partners and secondly at European level. Data collected include both primary data (Focus groups with expert groups, training providers and key stakeholders on the AI Skills strategy) and also secondary data (e.g., trends and sectors reports, labour market reports). The review will also include a validation of key outputs (roles and skills, training materials and methods, curricula and training programmes, certification, etc.) in relation to ongoing AI advancement, to ensure relevance. These processes ensure the sustainability of the AI Skills Strategy and together comprise the strategy improvement process. In chapter 6, we provide further details on the activities of how we will secure the strategy evaluation.

3. Vision & mission of the AI Skills Alliance

3.1. General vision

The vision is to establish robust and sustainable foundations for reducing European skills shortages, gaps, and mismatches in the field of AI. By accelerating the upskilling and reskilling of employees, job seekers, business leaders, and policymakers, the AI Skills Alliance empowers them to thrive in AI-related professions and to open Europe to new business opportunities.

As the AI landscape is marked by rapid technological advancements, evolving skill demands, and emerging AI-related roles, we are committed to developing a Strategy that embodies resilience and adaptability, ensuring our ability to respond to future changes effectively.

Our vision:

Strive for Europe to have a resilient AI-skills foundation for AI-professionals, policy and decision-makers.

3.2. Mission Statement

The overall mission is to provide current and emerging professional roles across four occupational domains – AI practitioners, AI management & support, organisational decisionmakers, and policymakers – in addition to learning providers with the educational and training programmes they need to meet the changing demands for AI skills in Europe.

Overall, the aims are to achieve:

- A long-term alliance of European key players in the field of AI that includes strategic cooperation among education, industry, and policy actors on AI skills development.
- An adaptive approach in providing innovative educational and training instruments that are updated regularly as a response to ongoing AI advancements.

Our mission:

Re- and upskilling AI professionals, building a resilient European AI-skills foundation by addressing and monitoring possible AI-skills mismatches in a long-term alliance of European key players in the field.

4. AI Skills Strategy foundation

The main goal of the AI Skills Strategy is to lead to systemic and structural impact on reducing skills shortages, gaps, and mismatches, as well as ensure appropriate quality and levels of skills to a broad range of stakeholders. We believe that this strategy can serve as a stepping stone for developing operating plans related to AI educational and training activities in Europe, in an innovative, inclusive and ethical way.

4.1. AI Skills Strategy success factors

For the AI Skills Strategy for Europe, the analysis of relevant practices and initiatives (ARISA, 2023b) and the analysis of key enablers (ARISA, 2023a) allowed to identify transferable elements and success factors that are presented in the table below (table 2). These are used as the basis for the development of the strategic objectives and key activities of the AI Sector Strategy.

Success factor	Explanation
Collaborative	<p>Underpins the need to strive for cross-border, cross-disciplinary and cross-expertise collaboration.</p> <ul style="list-style-type: none"> • Foster cooperation between government, learning providers (HE and VET), and industry in developing education and training offerings. • Provide a community space for policymakers, industry, learning providers, educators, and learners to share reliable information on AI.
Learner centred	<p>Refers to the importance of building programmes focusing on specific learners needs, addressing the broad range of stakeholders</p> <ul style="list-style-type: none"> • Develop AI curricula and programmes with foundational skills for decision and policy makers and flexible learning pathways for AI-professionals.

<p>Constantly evolving Flexibility</p>	<p>Emphasizes the need for a dynamic and continuous update of AI learning programmes to ensure a match with the latest labour market requirements</p> <ul style="list-style-type: none"> • Develop education and training offerings in line with current and future market needs. • AI learning offerings need to be modular and updated regularly
<p>Diversity and inclusion</p>	<p>Points out the importance increase gender, racial and ethnic diversity in AI in AI related training and roles, to promote equality and to address the talent shortage</p> <ul style="list-style-type: none"> • Promote AI as a career for under-represented groups (such as women) • Encourage and inspire organisations to put in place programmes to increase AI-related teams' diversity, include train for lower paid workers with shrinking occupations related to AI.
<p>Accessibility</p>	<p>Ensuring access to AI education without restrictions, regardless of economic background, employment status, location, learning difficulties, etc.)</p> <ul style="list-style-type: none"> • Create or support online AI learning platforms that are accessible to individuals with disabilities. Ensure these platforms have features such as screen readers, closed captions, and compatibility with assistive technologies to accommodate a wide range of learners. • Develop flexible AI learning paths that cater to different learning styles and paces. This can include self-paced online courses, evening classes, and weekend workshops to accommodate individuals with diverse schedules and employment status.
<p>Continuous learning</p>	<p>Encouraging a culture of lifelong learning, resonating with the dynamic nature of the technological landscape and disruptive innovation</p> <ul style="list-style-type: none"> • Promote and support learning programmes for professionals across industries, AI professionals and non-technical. These programmes can offer specialized training and certification opportunities to help individuals stay up-to-date with the latest technological advancements. • Create online learning platforms that offer modular courses, allowing learners to pick and choose specific skills or topics to study at their own pace.

Table 2. Success factors for the AI Skills Strategy

4.2. Scope of the strategy

The strategy has a clear demarcation on the subject area of AI, considering specific role profiles and AI-related skills, developing innovative educational programmes designed to match the specific role profiles, and considering the heterogenous needs of a range of stakeholders.

4.3. Role Profiles and Skills

Based on insights from the Needs Analysis Report (ARISA, 2023), the AI Skills Strategy focuses on current and future professional roles across four domains: AI practitioners, AI management & support, organisational decisionmakers, and policymakers. When detailing the AI Skills Strategy and Strategic Objectives (chapter 6), each one of these roles will be addressed.

When it comes to defining the relevant skills for AI, it is crucial to distinguish between AI and non-AI professionals as each group requires a different approach in determining and developing the necessary skill sets. These four domains are therefore divided into two subgroups:

- **AI professionals:** AI practitioners, AI management & Support

- **Policy- and decision-makers:** non-AI professionals who need some AI knowledge and skills to make better informed decisions on AI related initiatives and other AI related decisions.

4.3.1. AI Professionals: AI Practitioners, AI Management & Support

Regarding AI practitioners' roles, there is a growing need for the data-focused roles of data scientist and data engineer, and for AI-focused roles like machine learning engineers including NLP engineers and computer vision engineers. An emerging role that requires urgent attention is the prompt engineer. For AI management & support roles, the most visible need is for AI strategist, AI ethics officers and AI quality controllers (AI Skills Needs Analysis, 2023).

On Needed skills: Each AI professional role has its own specific set of technical knowledge and skills. A data scientist needs data science knowledge and skills, a machine learning engineer needs machine learning knowledge and skills, and a prompt engineer needs prompt engineering knowledge and skills. Of course, each of these technical knowledge and skills sets consists of multiple more specific knowledge and skills.

Starting points to establish the needed specific knowledge and skills are the Stanford University/Lightcast taxonomy and the Headai ontology, which are both described in the AI Skills Needs Analysis report (ARISA, 2023). The actual, specific knowledge and skills that are needed in a certain situation depend on the specific context of each professional.

Besides technical knowledge and skills, each AI professional needs soft skills (e.g., problem solving, critical thinking, communication), skills on transversal topics (accessibility, ethics, privacy, security), and on functioning in organisations (project skills, DevOps, understanding business processes).

4.3.2. Non-AI Professionals: Organisational Decision-makers and Policymakers

Decision-makers within organisations need basic AI knowledge and skills, for example to understand proposals for AI initiatives made by AI professionals and to understand the impact of AI on business processes. As previously noted, there are two levels of decision-makers: business leaders (e.g., CEO, CFO) and middle management (e.g., project managers, business unit managers), who have similar basic AI knowledge & skills needs.

It is important to realise that these decision-makers need to be advised on specific considerations, and for that purpose they need AI advisors that are experts in both the technical aspects and the business aspects with regards to AI. Also, these AI advisors should have a good idea not only of the technology itself, but also of moral, ethical, accessibility and legal aspects of the (ramifications of the) technology, as well as an understanding of what it takes to successfully implement these technologies.

Policymakers are divided into a group that needs basic AI knowledge & skills, like parliament members, DGs and lobbyists, and into a group that needs more advanced AI knowledge and skills, such as AI advisors, national CIOs, and specialized committee members.

On Needed skills: policymakers and decision-makers require a different level of AI knowledge and skills. Their focus lies in understanding the implications of AI and making informed decisions based on that understanding.

The knowledge and skills for policymakers and decision-makers can be divided in basic AI knowledge and skills and AI advisory skills. The basic AI knowledge and skills include basic technical terminology and practice, ethics, and law and regulations. The AI advisory skills include managing

risks of AI, AI compliance, formulating a digital strategy (including AI) or a specific AI strategy, change management & implementing AI.

Both basic AI knowledge & skills and AI advisory skills need urgent attention, since better informed decisions on policy and organisational level are necessary to move forward in the field of AI, and for Europe to keep up with the rapid developments in the rest of the world.

It is important to note that the AI Skills Strategy aims to remain **within the boundaries of the field of AI**. Therefore, only skills directly related to AI and specifically relevant for AI related decision-making are taken into consideration. This approach ensures that the skills emphasized and developed are aligned with the vision, mission and the strategic objectives.

5. Strategic objectives and activities

The AI Skills Strategy is composed of seven main strategic objectives. Each strategic objective has a set of activities, milestones and KPIs involving the Alliance partners and other stakeholders.

This chapter details the strategic objectives and activities to attain them. For each strategic objective, key performance indicator (KPI) and short and long-term milestones are outlined; they will serve as quantifiable measure of performance and to gauge progress over time for each objective.

The formulation of the strategic objectives underscores a comprehensive and dynamic approach to address the evolving landscape of AI skills and knowledge within the European Union. These objectives reflect a systemic perspective, acknowledging that AI skills development is not static but continually subject to change and innovation. First, the focus is on identifying potential skills mismatches, recognizing the need for a constant evaluation of the AI talent pool (SO1). Strategic objective 2 follows suit by defining the most sought-after AI-related roles and skills requirements, responding to the fluid demands of the market. Strategic objective 3 encompasses the creation of educational profiles, certification frameworks, and accreditation processes, embodying a commitment to adapting educational offerings to align with industry needs. Acknowledging the dynamics of the AI sector, the strategy also emphasizes the development of modular AI skills learning programmes, a nod to the need for flexible and responsive training (SO4). Strategic Objective 5 highlights the importance of an AI skills community, promoting collaborative learning and information sharing, that will be the foundation and enabler to keep the strategy always up to date. In a broader sense, the AI Skills Strategy also seeks to sustainably promoting AI awareness, advocating for diversity in the AI workforce, and fostering dialogue on ethical, inclusive, and human-centred AI principles and challenges with decision-makers and policymakers (SO6). Lastly, the AI Skills Strategy aims to fast-track AI upskilling and reskilling initiatives at various levels, while advancing the discourse on these programmes with national and local governments, actively identifying and advocating for funding opportunities, and providing capacity building to engage key stakeholders within national and local communities (SO7). Together, these objectives illustrate a strategy designed not just for the present but one that evolves alongside the AI landscape, ensuring Europe remains at the forefront of AI expertise.

The table below outlines the strategic objectives (SO1 to SO7) that the AI Skills Strategy aims to achieve and details the critical activities associated with each strategic objective.

Strategic Objectives	SO1: Outline the potential AI skills mismatches at the EU level	SO2: Define in-demand AI-related roles and skills requirements	SO3: Design of educational profiles, certification framework and accreditation process	SO4: Design modular AI skills learning offerings	SO5: Establish and nurture an active community of stakeholders for AI skills development	SO6: Promote and increase overall understanding of AI	SO7: Accelerate AI upskilling and reskilling at different levels
Activities	1.1. Analyse AI skills requirements in the EU 1.2. Analyse the AI skills learning offerings in the EU	2.1. Define an AI role profile structure 2.2. Update the AI Role Profile Structure 2.3. Align AI roles and skills with existing European ICT roles and skills frameworks and standards	3.1. Define key educational profiles (programmes and unit learning outcomes) 3.2. Design the European AI skills certification framework 3.3. Design accreditation procedures	4.1. Deliver fit-for-purpose core curricula for AI skills across the EU 4.2. Widen access to AI skills learning offerings 4.3. Foster diversity and inclusion within AI skills training 4.4. Develop the trainer-the-trainer programmes	5.1. Develop a value proposition to engage and support companies, learning providers, and public organisations. 5.2. Grow a sustainable AI Sector Skills Alliance 5.3. Develop new collaboration avenues between industry, academia, NGOs and governments	6.1. Raise awareness about AI principles, opportunities and challenges 6.2. Ensure diversity in the working field of AI 6.3. Support the narrative of ethical, inclusive, human-centred AI with decision and policy makers	7.1. Advance the narrative on AI upskilling and reskilling with national governments 7.2. Map and promote funding opportunities for AI skills development 7.3. Capacity building to key stakeholders to engage the national and local communities

5.1. SO1: Outline the potential AI skills mismatches at the EU level

To ensure the effectiveness of AI learning programmes in keeping up with rapid technological advancements, it is crucial to identify both skills that remain relevant over time and emerging skills. The AI Sector Skills Alliance adopts a multi-method approach to accurately identify and address the AI skills requirements in Europe.

This objective is crucial as it lays the foundation for understanding the current state of AI skills in Europe. By continuously identifying potential mismatches, targeted actions can be taken to address these gaps and ensure that available resources are deployed effectively.

Main target groups involved: large organisations, SMEs, recruitment agencies, education and training providers, AI experts, EU and national policymakers.

Key topics: Needs analysis, monitoring skills needs, AI skills requirements, AI learning offerings.

5.1.1. Activity 1.1 - Analyse AI skills requirements in the EU

This activity involves a multi-method approach to collect and analyse both quantitative and qualitative data from multiple sources to provide a comprehensive understanding of the demand for AI related roles and skills. Desk research will be used to identify relevant AI related roles, followed by an industry questionnaire, job vacancy analysis, and focus groups with experts from different stakeholder groups to identify the skill demands for these AI related roles.

Updates will be made annually to respond to the rapid technological advancements. An efficient method will be developed, such as using automation.

The recent AI Skills Needs Analysis study (ARISA, 2023) showed that different skillsets are relevant for AI- and non-AI professions (see also chapter 5). All relevant skillsets will be assessed to create a complete overview of skill demands, see table 3.

AI-professionals - skillsets	Non-AI professionals - skillsets
<ul style="list-style-type: none"> Advanced technical skills related to their own specific role (e.g., data science skills for data scientists) Soft skills (e.g., problem solving, critical thinking) Transversal skills (e.g., ethics, security) Skills for functioning in organisations (e.g., project skills, DevOps skills) 	<ul style="list-style-type: none"> Basic AI knowledge and skills (e.g., terminology, ethics, laws & regulations) AI advisory skills (e.g., managing risks of AI, formulating digital strategies, implementing AI).

Table 3. Detailed skillsets

5.1.2. Activity 1.2 - Analyse the AI skills learning offerings in the EU

In this activity, a biennial examination of AI skills education and training programmes available in the EU is conducted. The aim is to assess the existing landscape of AI learning opportunities, including degree programmes, courses, certifications, and short-term training initiatives on specific skills or for targeted at specific audiences. This contributes to determining the extent to which skill demands are learning offerings are matched, and where there are potential gaps that need to be addressed. A multi-method approach will be used, including reviewing existing education and training offerings, and consultation with learning providers through interviews or focus groups.

SO1: Outline the potential AI skills mismatches at the EU level	
Activities	Short-term Milestones
1.1. Analyse AI skills requirements in the EU.	<ul style="list-style-type: none"> Dissemination of the yearly review analysis of AI skills requirement.
1.2. Analyse the AI skills learning offerings in the EU.	<ul style="list-style-type: none"> Dissemination of the biennial review analysis of AI learning offerings.
KPIs	
<ul style="list-style-type: none"> Yearly updated version of the AI Skills Strategy for Europe report based on insights from activities 1.1 and 1.2. Yearly (1.1) and biennial (1.2) updates available via an online Observatory website available for Europe. 	
Long-term Milestones	
<ul style="list-style-type: none"> Continuous Skills alignment with dynamic nature of AI field. Periodically reviewing of: AI skills requirements, AI learning offerings and AI initiatives. 	

Table 4. Strategic objective 1: activities, milestones and KPIs

5.2. SO2: Define in-demand AI-related roles and skills requirements

Building on the insights on AI skills mismatches in the EU (SO1), the goal of this strategic objective is to provide a structure on essential AI-related roles and skills, that should have a centre stage in education and training offerings. Based on the updates of SO1, the need to update the structure is reviewed annually to ensure long-term alignment between in-demand AI-related roles and skills requirements, and education and training offerings developed and implemented.

Identifying in-demand AI-related roles and their associated skill requirements is key to align education and training efforts with the needs of the job market. It ensures that individuals are equipped with the right skills to meet industry demands, promoting employability and economic growth.

Main target groups involved: large organisations, SMEs, education and training providers, AI experts.

Key topics: structure AI roles, AI skills, alignment with education and training offerings

5.2.1. Activity 2.1 - Define the AI role profile structure

An AI role profile structure will be created that serves as a reference guide defining specific in-demand AI-related roles and skills. This structure is essential to align education and training efforts to the labour market. The proposed method is to use insights from the SO1.1 report and to establish a working group, comprised of AI experts, that will further explore current and emerging AI skills and roles requirements. Findings of the SO1.1 report and the working group will be synthesized into this AI role profiles structure.

5.2.2. Activity 2.2 - Update the AI role profile structure

Based on the yearly insights on AI skills requirements (SO1.1) and through yearly meetings of the working group, the AI role profile structure will be updated regularly if needed. This method ensures that the EU's AI role profile structure remains up to date with the latest developments in the field.

5.2.3. Activity 2.3 - Align AI roles and skills with existing European ICT roles and skills frameworks and standards

In this activity, the goal is to align the AI role profiles and skills with existing European roles and skills frameworks and standards. Possible European frameworks to consider are the European e-Competence Framework (e-CF), in which AI roles could be introduced as generation 3 roles and AI skills can be placed in already existing e-CF competences, and the European Skills, Competences, Qualifications and Occupations (ESCO) framework, that introduced AI skills and some AI roles, and can be informed by the structure developed in this strategic objective. Given the young nature of the field and the rapid and dynamic developments of both roles and skills in this field, we do not consider it prudent to engage in this alignment until several iterations of the Needs Analysis and Strategy have taken place.

SO2: Define in-demand AI-related roles and skills requirements	
Activities	Short-term milestones
2.1. Define the AI role profile structure.	<ul style="list-style-type: none"> Implement working group sessions to define AI role profiles. Completion of the AI role profiles structure.
2.2. Update the AI role profile structure.	<ul style="list-style-type: none"> Completion of yearly updates on the AI role profiles structures (during ARISA project timeline).
2.3. Align AI roles and skills with existing European ICT roles and skills frameworks and standards.	<ul style="list-style-type: none"> Feed the ESCO and e-CF roles and skills or competences into the AI role profiles structure developed within the Alliance.
KPIs	
<ul style="list-style-type: none"> Publication and dissemination of an AI role profiles and skills outline in 2023. Publication and dissemination of an updated AI role profile and skills outline annually for at least the duration of the ARISA project. Aligning most updated AI role profiles and skills structure with ESCO and e-CF in 2025. 	
Long-term Milestones	
<ul style="list-style-type: none"> Continuously enhance the AI role profile structure to systematically identify emerging roles within the AI sector. Maintain active engagement with relevant AI industry associations and organisations, ensuring representation within the EU eco-system. 	

Table 5. Strategic objective 2: activities, milestones and KPIs

5.3. SO3: Design of educational profiles, certification framework and accreditation process

The goal of SO3 is to create and establish comprehensive AI skills education and training programmes that are highly effective in equipping individuals with the knowledge and expertise needed to excel in the field of AI.

With this objective a framework is established for how AI skills education and training should be structured and delivered. Well-defined programmes ensure consistency, quality, and adaptability in AI education, making it accessible to diverse learners and industries.

Main target groups involved: education and training providers, learners, accreditation and certification experts.

Key topics: Educational profiles for AI roles, upskilling & reskilling programmes, localisation of curricula, modularity of curricula.

5.3.1. Activity 3.1 - Define key educational profiles (programmes and unit learning outcomes)

AI skills and roles (SO2.1) are at the basis of formulating learning outcomes for current and emerging AI roles. Defining learning outcomes and educational profiles based on these AI roles ensures that education and training offerings are directly aligned with the skills needed by the labour market.

5.3.2. Activity 3.2 - Design the European AI skills certification framework

This activity involves the design of European AI skills certification framework. This framework provides a standardized way to assess and certify AI skills, enhancing the recognition of qualifications across the EU. In the long term, it ensures that AI professionals possess validated skills, which is vital for industry competitiveness and the continued growth of AI-related roles.

Micro-credentials will be incorporated into the certification framework. Micro-credentials are smaller, focused certifications that can be earned for specific AI skills. This modular approach not only provides more flexibility for learners but also ensures that the certification system is adaptable to the evolving AI landscape, and in that way can be kept up to date.

5.3.3. Activity 3.3 - Design accreditation procedures

Designing accreditation procedures involves creating a systematic framework to assess and certify the quality and relevance of the AI training and education programmes. Accreditation procedures typically encompass defining clear criteria and benchmarks against which these programmes are evaluated, ensuring they meet standards and prepare learning to obtain the intended learning outcomes. Furthermore, these procedures incorporate regular audits, which involve systematic reviews and inspections of the programmes to verify ongoing compliance with accreditation standards. By establishing effective accreditation procedures, it is ensured that training and education programmes remain up-to-date, rigorous, and aligned with industry demands, enhancing the credibility, effectiveness and recognition between institutes and EU countries.

SO3: Design of educational profiles, certification framework and accreditation process	
Activities	Short-term Milestones
3.1. Define key educational profiles (programmes and unit learning outcomes).	Design educational profiles by 2024.
3.2. Design the European AI skills certification framework.	Design an AI skills certification framework by 2024
3.3. Design accreditation procedures.	Design accreditation procedures by 2024.
KPIs	
<ul style="list-style-type: none"> • Publication of at least 4 AI educational profiles and updated versions of these profiles whenever needed based on market developments by 2026. • Publication of an AI certification framework by 2025. • Publication of an accreditation procedure by 2025. 	
Long-term Milestones	

- Develop and maintain a set of comprehensive AI educational profiles that serve as the cornerstone for the standardization of AI learning programmes across Europe.
- Ensure the continued relevance and effectiveness of the AI certification framework for recognizing and facilitating the portability of AI skills obtained by learners throughout Europe.
- Uphold a robust accreditation procedure designed to guarantee the long-term quality management of AI learning offerings in Europe.

Table 6. Strategic objective 3: activities, milestones and KPIs

5.4. SO4: Design modular AI skills learning offerings

This strategic objective aims to develop a flexible and adaptable AI skills curriculum composed of modular courses or modules. These modules can be customized and combined to meet the specific needs and goals of learners, providing a more versatile and personalized approach to AI education.

Creating modular learning offerings enhances flexibility and accessibility. Learners can select specific modules that match their needs, and institutions can easily update and adapt their programmes to stay current with evolving AI technologies and trends. By designing modular learning offerings, we can react to the vastly changing market environment and AI related developments.

Main target groups involved: education and training providers, learners.

Key topics covered: modularity of curricula, individualised learning pathways, developing learning materials, piloting programmes.

5.4.1. Activity 4.1 - Deliver fit-for-purpose core curricula for AI skills across the EU

The core curriculum for AI skills will encompass a wide range of fundamental AI topics, catering to varying skill levels and sectors, and learning objectives aligned with the educational profiles developed under SO3.1. This curriculum will comprise modular learning offerings focused on the latest industry trends, standards and requirements.

Based on the yearly updates from the activities under SO1 and SO2, these modules will be continually updated to stay current with evolving AI technologies and methodologies. Establishing this core curriculum as the go-to resource for AI skill development in the European Union.

Within the modular learning offerings opportunities for micro credentials will be investigated, to ensure that the certification system remains up-to-date and adaptable to the evolving AI landscape.

5.4.2. Activity 4.2 - Widen access to AI skills learning offerings

Our commitment to widening access to AI skills learning offerings involves the creation of flexible and accessible pathways for individuals of all backgrounds, including non-technical enthusiasts. This will be achieved through the development of online degree programmes, blended education formats, and Massive Open Online Courses (MOOCs). These platforms will provide an inclusive learning environment, accommodating diverse learning styles and schedules, thus democratizing access to AI education across the EU. A first instance of a web-based version of the curriculum in the form of a self-paced MOOC will be delivered by 2024.

5.4.3. Activity 4.3 - Foster diversity and inclusion within AI skills training

The AI Sector Skills Strategy noted the key value of 'inclusion' (see also SO6). The goal is to include a diverse group of learners by employing various delivery methods, such as localized content and language options. For this we will create OER (Open Educational Resources) learning modules to

guarantee access and inclusion. Generative AI models can assist in translating the modules to ensure their accessibility across Europe, to speed up the process of availability of new training modules. Additionally, the curriculum will be designed with cultural sensitivity in mind, ensuring it resonates with learners from diverse backgrounds. Implementing a review and continuous improvement process, collecting feedback from training partners and participants, further helps foster diversity and inclusion.

5.4.4. Activity 4.4 - Develop the trainer-the-trainer programmes

The continuous development of trainers is essential to ensuring the effectiveness of our AI skills training programmes. It must be ensured that the modular learning offerings are available to trainers and are offered at different skill levels. As the working field changes vastly, the development of trainers must be supported by informing them of the latest developments. Train-the-trainer programmes will be established to maintain high-quality education standards across the EU. A first of train-the-trainer programme will be implemented by 2025.

SO4: Design modular AI skills learning offerings	
Activities	Short-term Milestones
4.1. Deliver fit-for-purpose core curricula for AI skills across the EU.	<ul style="list-style-type: none"> Design of the core curriculum with a wide range of fundamental AI topics, and learning objectives aligned with the educational profile by 2024 Obtain approval from educational authorities and institutions for the core curriculum.
4.2. Widen access to AI skills learning offerings.	<ul style="list-style-type: none"> Create flexible and accessible pathways for individuals of all backgrounds in the AI skills learning offerings by 2026 Deliver a web-based version of the curriculum in the form of a self-paced MOOC by 2024
4.3. Foster diversity and inclusion within AI skills training.	<ul style="list-style-type: none"> Create OER (Open Educational Resources) learning modules to guarantee access and inclusion Implement a diversity and inclusion focused review process with training partners and participants on content and reach.
4.4. Develop the trainer-the-trainer programmes.	Design train-the-trainer programmes by 2025
KPIs	
<ul style="list-style-type: none"> Develop training programmes for a first set of AI courses by 2024. Complete 5 pilots on Basic AI knowledge for policy & decisionmakers and 3 pilots for prompt engineering (part of the urgent upskilling programme) by 2024 Develop 8 national pilots of AI courses by 2025 OER (Open Educational Resources) learning modules available in at least 2 partners countries 	

<ul style="list-style-type: none"> Finalized training programmes for 3 pilot AI courses with flexible and accessible pathways for individuals of all backgrounds by 2024 Train-the-trainer process adopted by all AI Skills alliance partners by 2026
Long-term Milestones
<ul style="list-style-type: none"> Establish and maintain high-quality education standards across the EU Annual review of educational profiles and modular learning offerings (in response to the yearly review of skills need, included with a quality management review of content).

Table 7. Strategic objective 4: activities, milestones and KPIs

5.5. SO5: Establish and nurture an active community of stakeholders for AI skills development

Building a robust community of stakeholders fosters collaboration and knowledge sharing. It ensures that diverse perspectives and expertise contribute to the development of AI skills, making the AI Skills Alliance holistic and responsive to industry and societal needs

Main target groups involved: education and training providers, accreditation and certification providers, large organisations, SMEs, (potential) learners, EU and national policymakers, and social partners, chambers, networks, associations, and umbrella organisations.

Key topics covered: cooperation, community, sustainability, mobility programme, European dimension, Pact for Skills.

5.5.1. Activity 5.1 - Develop a value proposition to engage and support companies, learning providers, and public organisations

To effectively engage the stakeholders from the European AI Skills community, a compelling value proposition is needed. This proposition will target companies, learning providers and public organisations, aligning their objectives to the need to develop sustainable AI skills initiatives coordinated with technological progress. The value proposition underscores the long-term value of investing in skill development, promoting innovation, resilience, and inclusivity within industries and communities.

This activity is crucial for fostering a robust AI Skills Alliance as this community needs to stay motivated to stay engaged. This motivation comes from a value proposition reflecting what the community stands to gain from engaging in the AI Skills Alliance, both during and after the ARISA project.

5.5.2. Activity 5.2 - Grow a sustainable AI Sector Skills Alliance

These stakeholders play a pivotal role in engaging local communities throughout Europe, representing their needs and leveraging their expertise. The focus will be to strengthen cooperation between training organisations and industry representatives to ensure a better and more swift alignment between industry needs and training offerings. As such, the Alliance will be registered as an interest group under the Large-Scale Partnership of the Digital ecosystem of the Pact for Skills, for knowledge sharing, networking and exchange of good practices with other sectors, fostering cross-sectoral collaboration and innovation.

To achieve an extensive adoption of project results across Europe, we will focus on growing a sustainable AI Skills Alliance network of associated partners. A systematic approach will be taken to identify strategic partners at regional and national levels that can be engaged in the community.

This network will be carefully curated to ensure diversity and inclusivity of participation, balanced geographical representation, fostering a global perspective on AI skills development. We strive for partnerships in Europe with key AI stakeholders from industry, academia and experts from all AI-related areas, strengthening our collective efforts to advance AI skills and knowledge and promote a broad exploitation of project outcomes.

5.5.3. Activity 5.3 - Develop new collaboration avenues between industry, academia, NGOs and governments

To ensure relevance, diverse perspectives and commitment of our stakeholders we will strive to actively develop new collaboration avenues between industry, academia, and governments with whom we will interact through public consultations, expert focus groups, interviews and round-the-table-discussions - serving as good practice for policy development.

By aligning with national and European governmental initiatives and regulatory frameworks, we will ensure that our AI skills programmes remain relevant and compliant with evolving legal standards. Hereby fostering a harmonious relationship between stakeholders.

In the meantime, in our pursuit of establishing our alliance's credibility and reputation, we are committed to aligning our alliance and potentially forming strategic partnership with prominent European entities such as EIT, EIC, European AI-on-Demand platform or branches of these entities, thereby balancing and incorporating business and commercial perspectives with governmental regulatory and policy perspectives.

SO5: Establish and nurture an active community of stakeholders for AI skills development	
Activities	Short-term Milestones
5.1. Develop a value proposition to engage and support companies, learning providers, and public organisations.	<ul style="list-style-type: none"> Memorandum of Understanding (MoU) to start the Pact for Skills on AI by end 2023.
5.2. Grow a sustainable AI Sector Skills Alliance.	<ul style="list-style-type: none"> Engagement strategy for the involvement of national policymakers defined by mid-2024 Report on Pact for Skills on AI published by 2026
5.3. Develop new collaboration avenues between industry, academia, NGOs and governments.	<ul style="list-style-type: none"> Integrate the AI Skills Alliance into the European digital skills community (Pact for Skills) Out roll and replication of the AI Skills Alliance outcomes in local communities and at national level
KPIs	
<ul style="list-style-type: none"> A total of 75 AI Skills Alliance members by 2025. 	

<ul style="list-style-type: none"> Measurement completed on satisfaction of Alliance members and their perceptions of the community's value, with 70% of members that respond to the yearly evaluation survey selecting "satisfied".
Long-term Milestones
<ul style="list-style-type: none"> Regular review of strategy and vision in revisiting value proposition to create a European, self-sustainable Alliance striving for AI skills development in Europe.

Table 8. Strategic objective 5: activities, milestones and KPIs

5.6. SO6: Promote and increase overall understanding of AI

Promotion of AI both on opportunities but also challenges it poses is critical for inclusivity. It ensures that AI education and awareness reach a wide audience. This objective promotes AI literacy and dispels misconceptions, making AI more accessible and better accepted.

Main target group involved: large organisations and SMEs, learners, decision- and policy-makers.

Key topics: AI awareness, trust in AI, educate to avoid misconceptions, societal impact, diversity and inclusion, minorities

5.6.1. Activity 6.1 - Raise awareness about AI principles, opportunities and challenges

Raising awareness about AI principles, its opportunities but also limitations (e.g., ethical, privacy, biases, etc.) is essential because it helps individuals understand the foundational concepts behind AI technologies and therefore boosts trust. This strategic activity is about promoting a more "aware" culture around AI through education, can help ensure AI is better understood and used. This understanding is fundamental for making informed decisions about AI adoption and engaging in discussions about AI's impact on business enterprises, professional and governmental organisations, as well as society at large. It empowers people to navigate the AI-driven world with greater confidence and competence. Additionally, it also pushes developers and operators of AI systems to provide clear information to users about the AI's capabilities and limitations (as envisions the EU AI Act 2023 - principles of transparency and accountability). As AI regulations and policies are developed, it's crucial that employees, and even broader the public, has a basic understanding of AI concepts, its advantages and limitations.

This enables individuals, professionals, and organisations to participate in discussions, voice concerns, and advocate for responsible AI governance and recognise ethical considerations. Furthermore, a broader understanding of AI fosters informed conversations about AI's societal impact and can lead to more AI-driven projects and initiatives aimed at addressing societal challenges, from healthcare advancements to environmental conservation.

This activity involves developing and disseminating information and educational materials to raise awareness about the fundamental principles that underpin AI technologies and also address eventual misconceptions. It includes creating informational campaigns and conducting workshops, through which we aim to promote a human centred approach on AI.

5.6.2. Activity 6.2 - Ensure diversity in the working field of AI

More diversity in AI refers to the representation of a wide range of perspectives, experiences, and backgrounds in the development and deployment of Artificial Intelligence systems. This includes factors such as gender, race, ethnicity, sexual orientation, neurodiversity and socio-economic status,

as well as representation from different cultures and countries. The goal is to encourage the level of diversity among students and learners attending AI-related education programmes and within organisations' AI-focused teams. Research has clearly demonstrated that there is a correlation between diversity and outperformance (Ely & Thomas, 2020). Therefore, encouraging diversity can not only have an impact on reducing the talent shortage but also could have an impact on innovation levels in organisations. To achieve this, organisations ought to implement diversity focused hiring practices (e.g., new recruiting policies as well as paid internships, apprenticeships, etc.); provide AI flexible and learner centred trainings (digital skills training, classroom instruction, and on-the-job training depending on the profile) and mentorship programmes to individuals from various underrepresented groups and encourage and inspire women to pursue careers in Artificial Intelligence.

Following these observations, the AI Skills Strategy should engage with those who have implemented (aiming to implement) programmes to increase diversity and build their advice and guidance into the design of skills programmes. With a severe skills shortage within Europe, AI Skills Strategy considers diversity as a key success factor and has included these elements when design the learning programmes (please refer to SO3). The Alliance must also work closely with stakeholders at European and Member State level to learn from current initiatives (see Analysis of relevant practices and initiatives, 2023 for an overview on relevant initiatives) and build upon these various frameworks to determine how best to position AI skills development in order to encourage diversity into the industry and to break down barriers preventing those from diverse backgrounds considering AI as a career.

5.6.3. Activity 6.3 - Support the narrative of ethical, inclusive, human-centred AI with decision and policy makers

The European Union, via its development of the AI Act (2023), is lending great support to the narrative of ethical, inclusive, human-centred AI. This strategic activity focuses on raising decision and policymakers' awareness of how AI is used in different contexts and industries, with study visits and real-life examples (AI upskilling and reskilling: Key priorities and enablers, 2023). These initiatives could further promote and develop ethical, inclusive, human centred AI, taking into account for instance privacy, potential biases, and trust. Further than also debunking "fake news" about AI, the emphasis should be put on promoting and raising awareness about the added value of AI and present real-life examples of its benefits in different contexts to governments and policymakers. This activity could also encourage government-appointed AI ambassadors that could support on demystifying AI, explaining its value and potential threats, providing an online community space for policymakers, industry, academia and NGO representatives, educators, and learners to share trustworthy and reliable information on AI.

SO6: Promote and increase overall understanding of AI	
Activities	Short-term milestones
6.1. Raise awareness about AI principles, opportunities and challenges.	<ul style="list-style-type: none"> Information campaign on opportunities and challenges of AI in the workplace launched by 2025 Development of educational materials to explain fundamental concepts, opportunities and risks of AI among Alliance's partners by 2025.

6.2. Ensure diversity in the working field of AI.	<ul style="list-style-type: none"> • Exchanges with students and learners on diversity included the pilots done by 2025 • Promote pilot courses among a large potential audience to boost diversity in the classroom • Cross-collaboration with other initiatives on promoting diversity is initiated
6.3. Support the narrative of ethical, inclusive, human-centred AI with decision and policy makers.	<ul style="list-style-type: none"> • 3 pilots for AI advisory course directed to decision and policy makers (including references to the principles of ethical, inclusive or human-centred AI) completed by 2024 • Results report on engagement of national policy makers completed in 2026 • Content and reference to the principles of ethical, inclusive and human-centred AI integrated on all communication channel of the AI skills Alliance (e.g., Career guidance and alumni online space) by 2025
KPIs	
<ul style="list-style-type: none"> • Statistic-gathering completed on number of students and learners from diverse background attending the pilot courses (I.e.: gender, ethnicity, and neurodiversity indicators). • Diversity-specific criteria incorporated in the blended mobility scheme by May 2024. • At least 1 session per pilot course dedicated to the principles of ethical, inclusive and human-centred AI. 	
Long-term Milestones	
<ul style="list-style-type: none"> • Raising awareness regarding AI principles and staying updated regarding challenges to come. • Increase diversity and inclusivity among students and professionals who choose to take up AI-related roles. • Keep engaged in the narrative on ethical considerations with policy makers. 	

Table 9. Strategic objective 6: activities, milestones and KPIs

5.7. SO7: Accelerate AI upskilling and reskilling at different levels

Speeding up upskilling and reskilling efforts at the national (even local) levels is essential for addressing the rapid changes in the AI landscape. This objective helps individuals and organisations adapt quickly to AI advancements, staying competitive in the global AI ecosystem.

Main target groups involved: education and training providers, accreditation and certification providers, EU and national policymakers, and social partners, chambers, networks, associations, and umbrella organisations.

Key topics covered for reskilling and upskilling: Fundamental AI & data literacy, programming and coding, Machine Learning, AI ethics, Large Language Models and Natural Language Processing.

5.7.1. Activity 7.1 - Advance the narrative on AI upskilling and reskilling with national governments

To accelerate AI upskilling and reskilling at the national level, we will proactively engage with national and local governments. We will work to advance the narrative on the importance of AI upskilling and reskilling, emphasizing the need for identifying companies' and public needs on reskilling and upskilling topics. The approach, focused on the evolving needs, is necessary to stay aligned with industry demands on different levels (e.g.: national level, European level).

By fostering dialogue and awareness at government levels, we aim to create a supportive environment for AI skills development, aligning policies and initiatives with the evolving needs of the workforce and industries. We will strive to advise the different governments levels in a way that enables Europe to stay closely aligned with the specific needs in the job market. Our needs-focused approach ensures Europe stays flexible in a rapidly evolving field, where a one-size-fits all and a top-down approach quickly becomes outdated.

5.7.2. Activity 7.2 - Map and promote funding opportunities for AI skills development

Our efforts will include mapping and promoting funding opportunities for AI skills development initiatives across the European Union. We will identify existing funding sources, both public and private, and disseminate ways to access funding to our associated partners. While the Alliance is not able to directly grant funding, the Alliance is able to provide information regarding funding applications.

We intend to accelerate investments within the EU in AI skills development by identifying funding opportunities and providing advice and information on these opportunities, further accelerating the upskilling and reskilling process.

5.7.3. Activity 7.3 - Capacity building to key stakeholders to engage the national and local communities

Capacity building is a key component of our strategy to enhance the AI skills level in the EU. The AI Skills Strategy fosters the provision training and supports key stakeholders, including government officials and community leaders, to enable them to engage effectively with national and local communities in accelerating AI skills development.

SO7: Accelerate AI upskilling and reskilling at different levels	
Activities	Short-term Milestones
7.1. Advance the narrative on AI upskilling and reskilling with national governments.	<ul style="list-style-type: none"> Developing guidelines on governmental efforts (micro-credential validation, existing certificates to support, improvement of AI awareness-raising) by 2024.
7.2. Map and promote funding opportunities for AI skills development.	<ul style="list-style-type: none"> Database of funding opportunities for AI skills development across the EU created by 2026.

<p>7.3. Capacity building to key stakeholders to engage the national and local communities.</p>	<ul style="list-style-type: none"> • Pilots on urgent upskilling programme completed by 2024
<p>KPI's</p>	
<ul style="list-style-type: none"> • Establish active partnerships with at least five national and local governments by 2026 that advocate for AI upskilling and reskilling initiatives. • Publication of funding opportunities list in 2026. • Deliver at least four training sessions or workshops delivered to empower key stakeholders to actively engage their local communities in AI skills development initiatives in the year of 2025. 	
<p>Long-term Milestones</p>	
<ul style="list-style-type: none"> • Gain and maintain strategic view of educational and training eco-system (including training programmes in the AI sector) • Identification of funding lines at the national and local level to accelerate AI skills development across the EU. • Guidelines on governmental efforts (micro-credential validation, existing certificates to support, improvement of AI awareness-raising) developed, refined, and updated. 	

Table 10. Strategic objective 7: activities, milestones and KPIs

5.8. Strategic roadmap: AI Skills Strategy

		2022	2023	2024	2025	2026	2027	2028+
SO1: Outline the potential AI skills mismatches at the EU level	1.1. Analyse AI skills requirements in the EU	Initial analysis			Yearly update	Yearly update	Yearly update	Yearly update
	1.2. Analyse the AI skills learning offerings in the EU	Initial analysis			Biennial update		Biennial update	Biennial update
SO2: Define in-demand AI-related roles and skills requirements	2.1. Define the AI role profile structure	Initial structure proposed				Biennial update		Biennial update
	2.2. Update the AI role profile structure				Yearly update	Yearly update	Yearly update	Yearly update
	2.3. Align AI roles and skills with existing European ICT roles and skills frameworks and standards				Align with with ESCO and e-CF	Maintain active engagement with eco-system		
SO3: Design of educational profiles, certification framework and accreditation process	3.1. Define key educational profiles (programmes and unit learning outcomes)	Design educational profiles				Update educational profiles based on market developments	Yearly update	Yearly update
	3.2. Design the European AI skills certification framework	Design an AI skills certification framework					Ensure the continued relevance and effectiveness of the AI certification framework	
	3.3. Design accreditation procedures	Design accreditation procedures					Uphold a robust accreditation procedure designed to guarantee long-term quality management of AI learning offerings in Europe	
SO4: Design modular AI skills learning offerings	4.1. Deliver fit-for-purpose core curricula for AI skills across the EU	Design of the core curriculum			8 national pilots of AI courses finalised	Roll-out of programmes (continuously evolving)		
	4.2. Widen access to AI skills learning offerings	A web-based version of the curriculum - self-paced MOOC				Flexible and accessible pathways in the AI skills learning offerings	Ongoing update	
	4.3. Foster diversity and inclusion within AI skills training	Diversity focused review process						
	4.4. Develop the trainer-the-trainer programmes				Implementation of a train-the-trainer program	Ongoing update and results tracking		
SO5: Establish and nurture an active community of stakeholders for AI skills development	5.1. Develop a value proposition to engage and support companies, learning providers, and public organisations	Proposal formulation					Report results	Yearly update
	5.2. Grow a sustainable AI Sector Skills Alliance	MoU	MoU and continued recruitment of associate and strategic partners					
	5.3. Develop new collaboration avenues between industry, academia, NGOs and governments	MoU	On-going engagement activities					
SO6: Promote and increase overall understanding of AI	6.1. Raise awareness about AI principles, opportunities and challenges				Use-cases collected and communicated	Educational materials available	Workshop implementation	
	6.2. Ensure diversity in the working field of AI				Pilot courses - including content related to diversity	Map potential cross-collaboration with initiatives promoting diversity	Ongoing initiatives with partners	
	6.3. Support the narrative of ethical, inclusive, human-centred AI with decision and policy makers	Pilots for AI advisory course		Engagement strategy for the involvement of national policymakers		Results report on engagement of national policymakers	Ongoing initiatives with partners	
SO7: Accelerate AI upskilling and reskilling at different levels	7.1. Advance the narrative on AI upskilling and reskilling with national governments	Initial analysis			Mapping of opportunities		Establish active partnerships with at least 5 national and local governments	
	7.2. Map and promote funding opportunities for AI skills development					Database of funding opportunities for AI skills development across the EU		
	7.3 Capacity building to key stakeholders to engage the national and local communities	Initial analysis		Pilots on urgent upskilling programmes		Biennial update		Biennial update

Figure 4. Strategic roadmap: AI Skills Strategy

6. Conclusions

In the rapidly evolving landscape of Artificial Intelligence, the AI Skills Strategy for Europe aims at addressing the pressing skills needs in the AI sector. This strategy, resulting from extensive research and collaboration, offers a roadmap to ensure Europe can meet the growing demand for AI professionals while fostering inclusivity and adaptability.

Key objectives of the strategy include defining AI skills mismatches at the EU level, outlining in-demand AI-related roles and skill requirements, and designing effective education and training programmes. It also focuses on promoting diversity and inclusion within AI, engaging stakeholders, and fostering a supportive ecosystem for AI skills development.

For policy makers, this document provides valuable insights into the actions planned to bridge the AI skills gap. It underscores the importance of aligning policies and initiatives with the evolving AI landscape and fostering collaboration between academia and industry. Additionally, it highlights the need for proactive engagement with national and local governments to advance the AI upskilling and reskilling narrative.

To organisations with AI needs and educational institutions, this document serves as a resource and source of inspiration, showcasing the AI Skills Alliance's commitment to building a robust AI-skilled workforce in Europe.

We invite policy makers and stakeholders to engage with ARISA and explore opportunities for collaboration in addressing the dynamic challenges of AI skills development. This strategy is a living document, subject to annual revisions to ensure alignment with evolving market trends and AI skill demands. Together, we can shape a resilient AI skills foundation for Europe's future.

7. References

ARISA (2023). AI Skills Needs Analysis, https://aiskills.eu/wp-content/uploads/2023/06/ARISA_AI-Skills-Needs-Analysis_V1.pdf

ARISA (2023a). AI upskilling and reskilling: Key priorities and enablers. Artificial Intelligence Skills Alliance.

ARISA (2023b). Analysis of relevant practices and initiatives. Artificial Intelligence Skills Alliance.

CB Insights (2022). State of AI 2022 Report. <https://www.cbinsights.com/research/report/artificial-intelligence-trends-2022/>

Choung, H., David, P., & Ross, A. (2022). Trust in AI and its role in the acceptance of AI technologies. *International Journal of Human-Computer Interaction*, 1-13.

David, F.R. (2011). *Strategic Management: Concepts and Cases*, Global Edition. 13th Edition, Pearson Education, Inc., Upper Saddle River, 235-240.

Deloitte (2022). *Becoming an AI-fueled organization*, Deloitte's State of AI in the Enterprise, 4th Edition

European Commission (2023). Artificial intelligence act. Available at: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI\(2021\)698792_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI(2021)698792_EN.pdf)

- Ely, R. J., & Thomas, D. A. (2020). Getting Serious About Diversity: Enough Already with the Business Case. *Harvard Business Review*, 98(6), 114-122. <https://hbr.org/2020/11/getting-serious-about-diversity-enough-already-with-the-business-case>
- Gillespie, N., Lockey, S., Curtis, C., Pool, J., & Akbari, A. (2023). Trust in Artificial Intelligence: A Global Study. The University of Queensland and KPMG Australia. doi:10.14264/00d3c94
- Goldman Sachs (2023). The Potentially Large Effects of Artificial Intelligence on Economic Growth. Retrieved September 17, 2023, from <https://www.statista.com/statistics/1378606/industry-employment-automation-risk-euro-area/>
- IDC (2022). AI Strategies View 2022: Standard. https://www.idc.com/getdoc.jsp?containerId=IDC_P43294
- IBM (2022). IBM Global AI adoption index 2022. IBM Corporation. <https://www.ibm.com/downloads/cas/GVAGA3JP>
- Jobin, A., Lenca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature Machine Intelligence*, 1(9), Article 9. <https://doi.org/10.1038/s42256-019-0088-2>
- Loureiro, S. M. C., Guerreiro, J., & Tussyadiah, I. (2021). Artificial intelligence in business: State of the art and future research agenda. *Journal of Business Research*, 129, 911-926.
- Marr, B. (2022, September 12). Top 16 Essential Soft Skills For The Future Of Work. *Forbes*. <https://www.forbes.com/sites/bernardmarr/2022/09/12/top-16-essential-soft-skills-for-the-future-of-work/?sh=13ea05f96151>
- McKinsey (2022). The state of AI in 2022 and a half decade in review. McKinsey Corporation. <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2022-and-a-half-decade-in-review>
- OECD (2019). Artificial Intelligence in Society, OECD Publishing, Paris, <https://doi.org/10.1787/eedfee77-en>.
- Poister, T. H. (2010). The future of strategic planning in the public sector: Linking strategic management and performance. *Public Administration Review*, 70(s1), s246-s254. doi:10.1111/j.1540-6210.2010.02284.x
- Renieris, Elizabeth M., David Kiron, and Steven Mills (2022). "To Be a Responsible AI Leader, Focus on Being Responsible," *MIT Sloan Management Review* and Boston Consulting Group
- Sheikh, H., Prins, C., & Schrijvers, E. (eds.) (2023). Mission AI. The New System Technology. Cham, Switzerland: Springer. <https://doi.org/10.1007/978-3-031-21448-6>
- Stanford University (2023). The AI Index 2022 Annual Report. Stanford Institute for Human-Centred AI. https://aiindex.stanford.edu/wp-content/uploads/2023/04/HAI_AI-Index-Report_2023.pdf
- Zhang, S., Meng, Z., Chen, B., Yang, X., & Zhao, X. (2021). Motivation, social emotion, and the acceptance of artificial intelligence virtual assistants: Trust-based mediating effects. *Frontiers in Psychology*, (12) 3441.



Artificial Intelligence Skills Alliance

www.aiskills.eu

info@aiskills.eu



Co-funded by
the European Union