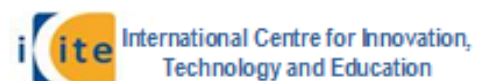# European enterprise survey on the use of technologies based on artificial intelligence

Executive Summary

A study prepared for the European Commission
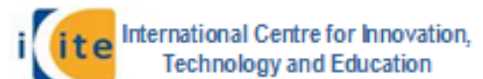DG Communications Networks, Content & Technology
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Ipsos Belgium
Public Affairs
Diestsevest 25, 5th floor
3000 Leuven,
Belgium
www.ipsos.com
Authors: Snezha Kazakova, Allison Dunne, Daan Bijwaard

iCite
Solvay Brussels School of Economics & Management
Université libre de Bruxelles
Avenue Franklin Roosevelt 42
1050 Brussels
Belgium
sbsem.ulb.be/research/research-centres/icite/about-icite
Authors: Julien Gossé, Charles Hoffreumon, Nicolas van Zeebroeck

Internal identification

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Executive Summary

This executive summary presents an overview of the results of the first EU-wide survey on the uptake of artificial intelligence (AI) technologies as part of a project commissioned by DG Connect. The assignment took place in two phases: a conceptual development phase and an execution phase. Phase I included a thorough review of the literature, scoping the definitions of AI-based technologies, identifying the relevant KPIs and developing an appropriate survey instrument.

To assess the state of play of artificial intelligence in European enterprises, a conceptual model was developed based on the literature review and tailored towards the objectives of this study. This model contains three interconnected phases that range from the moment a business becomes aware of a technology to the moment when the technology is embedded in several of its core processes.

The three phases of AI adoption
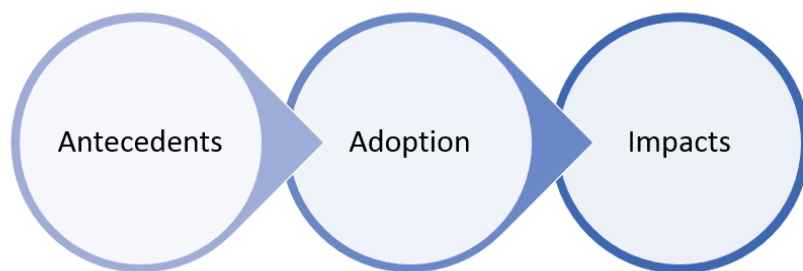
Each phase contains different dimensions on which Key Performance Indicators (KPIs) can be measured. Identifying the key performance indicators to measure was the second key stage of the process leading to the development of the survey instrument to explore the uptake of AI in businesses. During the second phase, the survey instrument was successfully fielded in the EU27, Norway, Iceland and the UK using Computer Assisted Telephone Interviewing (CATI) to obtain representative results at country level. The results of the AI survey, which reached a total of 9640 enterprises across the 30 countries surveyed, are presented in the following sections. They are structured based on the KPIs measured: awareness, adoption, sourcing, as well as external and internal obstacles to AI adoption.

Awareness of AI

At this stage of the digitisation of European businesses, **awareness of AI is almost universal** with 78% of enterprises stating that they know what the term Artificial Intelligence is and only 7% not aware and 15% unsure. At the more granular level, awareness of specific AI technologies is consistently high ranging between 87% for anomaly detection and 96% of enterprises aware of autonomous machines. Awareness

of AI is clearly not a major barrier to the adoption of AI in Europe except amongst a small cohort of businesses.

Adoption of AI

However, awareness is only the first step towards **adoption of AI[1]** within an enterprise. Taking Europe as a whole, enterprises tend to fall into one of two camps, the 'adopters' (42%) who are currently using at least one AI technology and the non-adopters (40%) who do not currently use AI nor intend to use any of the AI technologies (at least in the following two years). The remaining 18% of enterprises represent a sizeable proportion who have plans to adopt AI in the next two years, despite currently not utilising AI solutions within their enterprise. The intensity of adoption also shows encouraging signs as a quarter (25%) of enterprises use at least two AI technologies.

At the aggregate level, large businesses are more likely to be adopters compared to smaller businesses, which is to be expected based on data from other sources, such as the DESI, which suggests the same pattern. Larger companies have the potential to benefit most from the adoption of AI given their larger economies of scale and potential return on investment. Therefore, it is unsurprising to find that almost double the proportion of large enterprises (39%) use two or more AI technologies compared to micro-sized (21%) and small enterprises (22%).

This aggregate level result does not reveal the full picture when it comes to estimating the level of adoption of AI technologies amongst European businesses. The survey digs deeper investigating the level of adoption of ten specific AI technologies. When adoption is considered at the **level of each technology**, adoption in the EU is still relatively low. It ranges from merely 3% of enterprises currently having adopted sentiment analysis to 13% for anomaly detection and process/equipment optimisation, despite 42% of businesses having adopted at least one of these ten AI technologies. Therefore, whilst the uptake of AI is relatively high amongst enterprises and differences in the adoption of specific technologies exist, there is no concentration of a specific technology that has particularly high uptake.

An association algorithm sheds light on which 'bundles' of AI technologies are most likely to be implemented by enterprises in combination. In conclusion, process optimisation is often coupled with another AI technology. As such, the use of this technology represents more a complementary set of tools than a real self-standing objective of utilising artificial intelligence within an enterprise.

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[1] It is important to bear in mind that the approach of this survey was to include enterprises that have a minimum of 5 or more employees. Therefore, a proportion of micro-enterprises are excluded from the survey (and therefore from the results of this survey).

Sector insights

Whilst the adoption of some technologies appears to be related to the adoption of another technology, the adoption of specific AI technologies or bundles of technologies is not universal across business sectors in Europe. Different sectors have different needs when it comes to AI technologies and which ones will serve their business most effectively. AI adoption (of at least one technology) is not surprisingly highest in the IT sector (63%). Nevertheless, AI technologies clearly bring added value to a range of possible applications that tailor to a multitude of business contexts across sectors. If we exclude the IT sector, the differences in AI adoption across sectors is not very pronounced, especially among businesses that adopt two more technologies.

Related to the intensity of adopting different AI technologies the tendency is to use a range of AI technologies within specific sectors. Cluster analysis illustrates that there are forerunners that experiment with all kinds of AI technologies such as IT and the financial sectors. Conversely, sectors such as the construction sector are the lowest in terms of adopting a range of different AI technologies, possibly because the adoption of these AI technologies is less relevant.

The analysis also highlights that sectors do not adopt AI for the same purpose when considering which technologies are adopted by which sectors. Some sectors are using AI more for its ability to scale the understanding of human customers or partners (through natural language processing (NLP), sentiment analysis, etc.), while others use it to either take the human factor out of the equation (by automatising tasks) or to make their process more efficient. Association analysis illustrates that the industrial sectors use AI to optimise and automate processes, whereas service sectors have a more varied approach to adopting various AI technologies. The IT sector combines different sets of AI technologies and seems to offer the most use cases for recommendation engines while the financial sector, which is also exposed to the risk of wire fraud, seems to utilise AI to automate fraud detection.

The similarity in the use of different AI technologies across industrial sectors indicates that the use of AI seems to be relatively homogeneous in comparison to the service sectors. AI adoption may already be exploited broadly among competitors within these industrial sectors.

AI sourcing strategies

The prospect of AI exploration is closely linked to **where enterprises source their AI solutions[2]**. Looking at out-sourcing versus in-sourcing of AI solutions the data highlights that the most common sourcing strategies in the EU are external; 59% purchase software or ready-to-use systems and 38% hire external providers to develop AI applications. Only

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[2] Enterprises may use more than one sourcing strategy

a minority developed AI fully in house (20%) or modified AI software (20% open source and 24% commercial). It is again the larger enterprises that have found the capacity to have fully customised sourcing of AI solutions for their business needs (28% developed fully in-house solutions in large enterprises compared to 16% of micro enterprises). When it comes to in-house solutions, unsurprisingly given their capacity, skills and profile, it is the more technical sectors (IT with 36%, other technical and/or scientific sectors with 28%) that are most likely to develop AI in-house.

Future AI adoption

The results illustrate interesting patterns in terms of the current adoption of AI in terms of intensity and the differences in the types of technologies used by enterprises of different characteristics. This leads us to ask: what will the **future of AI adoption** look like going forward? As already mentioned, 18% of enterprises that do not currently use AI plan to adopt at least one technology in the next two years. The 'adopters' seem to clearly value the benefits of utilising AI in their business operations given that more than half (56%) plan to use it more in the next two years. The remainder expect to continue using AI at a similar rate (37%) while only 4% plan to make less use of AI in the near future. This reflects a dichotomy of EU enterprises falling into two camps: adopters, the majority of whom will continue to use AI or use it more in the next two years, and non-adopters who do not use AI technologies, nor have plans to do so in the next two years with only a relatively small proportion of enterprises falling in the middle.

At the same time, on the level of specific AI technologies, whilst the EU will likely not see short term exponential growth in the use of AI overall given that only 18% of enterprises have plans to adopt AI in the next two years, the diversity in the adoption of AI technologies is set to continue at a fast pace. These findings suggests that the growth in the uptake of AI technologies is diversified across AI technologies and, depending on the barriers businesses currently face, is likely to result in a healthy growth reflective of the current uptake of these AI technologies.

Obstacles to AI adoption

Of course, the future of AI adoption is the measured intentions of enterprises to adopt the various AI technologies. Successful adoption of AI assumes that enterprises are able to overcome any **obstacles to adoption**, whether these are internal or external to the enterprise itself. The survey explored the degree to which various obstacles pose a major barrier for enterprises as well whether external or internal barriers pose the bigger challenge.

In the first instance, all barriers are relevant, although internal barriers are more commonly perceived as relevant compared to external obstacles. Amongst those that find barriers to be relevant to their enterprise, external barriers can negatively impact the adoption of AI technologies. However, enterprises generally find **internal obstacles**

to be a major challenge in comparison to external obstacles. The core barriers to the uptake of AI technologies are challenges internal to an enterprise, which have to be addressed in order for adoption rates to go up. As a result, the two leading barriers that enterprises face are characterised as AI skills needs (lack of skills amongst existing staff 45%, difficulties hiring new staff with the right skills 57%) and the cost of implementation (cost of adoption 52%, cost of adapting operational processes 49%, lack of external/public funding 36%). The skills barrier is especially important given that it is not primarily related to size or sector but rather all enterprises compete in the same labour market and therefore face skills shortages. The two least challenging obstacles are reputational risks linked to the use of artificial intelligence (17%) and lack of internal data (20%).

Looking specifically at external barriers, while regulatory (29% state the need for new laws and regulation as a major barrier) and data standardisation efforts (33% find strict standards for data exchange to be a major barrier) seem important to enterprises, they might not necessarily be the barriers that make projects fail in the efforts to adopt AI in business practice. Reducing uncertainty can undoubtedly be highly beneficial for enterprises. However, they also seem to face other as important, if not more important, external issues in addition to the internal barriers already mentioned. The results draw attention in particular to the liability for potential damages when it comes to adopting AI technologies (33% across all enterprises, but the most recurrent barrier when looking at the level of individual technologies)[3]. This important barrier is followed by the lack of citizens' trust and access to public or external funding associated with the adoption of some technologies when looking at the most recurrent barriers at the level of each individual technology.

Businesses that have already adopted AI (i.e. the 'adopters' who have adopted at least one technology) are the ones least likely to find obstacles to be major barriers to adopting AI. Speculatively, this may be due to already having overcome key obstacles to becoming 'adopters' of AI and therefore, in retrospect, no longer seeing the obstacles as major barriers. Interestingly, non-adopters show a similar pattern to adopters in the proportion that they see the obstacles as major barriers, perhaps reflecting that a proportion of them have not yet gone through the process of adoption and therefore do not find the obstacles to be major barriers (yet). On the other hand, those who currently have not adopted AI technologies, but who plan to adopt in the next two years report the highest level of challenge across all obstacles (both external and internal). Theoretically, this

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[3] Liability for potential damages is the most recurrent barrier across all the technologies covered by the survey, though this is just indicative as the data does not allow for such fine-grained conclusions at the level of the technology itself as enterprises are not asked about barriers specific to a technology, but rather in general for the adoption of AI. It is therefore possible that the trends observed in relation to barriers experienced by enterprises that adopt or plan to adopt that one technology "leak" to the others because those two technologies are often used together.

could be related to these businesses being at the stage of adoption where they are currently facing barriers and obstacles to adopting AI as they make concrete attempts to adopt a given technology.

Next steps

The current findings provide the first EU-wide results from a business survey of enterprises to establish the incidence of the adoption of AI technologies as well as shedding light on both sourcing strategies and barriers to adoption. Furthermore, the patterns related to these key indicators identifying which technologies tend to be adopted together, the primary barriers experienced and by which types of enterprises. This provides an important baseline upon which future editions of this survey can be built bringing further insights as the changes in the adoption of AI technologies in the EU is tracked over the next years.

Future waves of the survey would benefit from nuancing the adoption of AI question even further to identify not only plans to adopt, but whether enterprises have made any attempts to adopt AI technologies or not as well as identifying the relevance of the given AI technologies for their business. This is especially important in order to shed further light on the dichotomy of enterprises between 'adopters' and 'non-adopters' in order to further disaggregate non-adopters into those that have made attempts to adopt or not.

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