accenture

GREECE: WITH AN AI TO THE FUTURE

2019

in collaboration with

Microsoft

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FOREWORD

Artificial Intelligence (AI) transforms our societies, the way we perceive the world, essentially altering our way of living. Today, we are already beyond the "science fiction" discussion. AI is broadly used in everyday applications. From navigating our cars to automatic translation, from intelligent chatbots to shopping recommendations. Smart homes, smart cars, smart cities. AI is everywhere, it is becoming embedded in our reality.

Even though AI isn't new - computer scientists at Microsoft and elsewhere have been working on AI technologies for the past three decades - it is only in the last few years that AI has moved into mainstream products thanks to a confluence of three factors: the massive computing power of the cloud, the availability of enormous datasets that can be used to teach AI systems and the breakthroughs in developing AI algorithms and improving AI methods such as deep learning.

Taken together, these advantages are enabling scientists and developers all over the world to create products and services that use AI to better understand, anticipate and respond to people's needs. At the same time, AI is changing the businesses that adopt it, having a significant economic and societal effect.

It has become clear that the countries that will fare best in the new AI era will be those that embrace these changes rapidly and effectively. This is because new jobs and economic growth will come to those that embrace the technology, not those that resist or delay adopting it. At the same time, there will be challenges coming along with opportunities. We must address the need for strong ethical principles, the evolution of laws, training for new skills and even labor market reforms. This must all come together if we are going to make the most of AI.

The potential is enormous. Our world is becoming more intelligent. But is Greece adopting AI?

We, at Microsoft Hellas, stay true to our commitment: to bring to Greece, the latest global technology discussion, in real time. We strongly believe that technology can provide the key to unlock Greece's potential and play a major role in our country's economic growth and quality of life of its people. Although we recognize that the pace of change is not going to be the same from nation to nation and from region to region, we felt the urgency to observe these changes early and commit not only to foster innovation and progress but also to ensure that our country is not left behind.

We also recognize our responsibility to build AI in a way that fosters trust. We acknowledge the need to work together with governments, businesses, academics, social services and NGOs, since AI cannot be created by the tech sector alone. We need to democratize AI in a manner that resembles the way we made the PC available to everyone, so that its benefits are equally distributed.

This new study in collaboration with Accenture is aiming at shedding more light and demystifying the status, impact and potential of AI in Greek economy and society. While we don't have a crystal ball that shows us the future, we do acknowledge that we are all going to need to spend more time listening to and learning from each other.

The emerging discussion around AI and its impact is more relevant and urgent than ever. I aspire that this endeavor will contribute to a constructive dialogue and sparkle a set of actions on policy, education, research, business and technology which eventually will level Greece up for the future. A sustainable, optimistic, thriving future for all.

Peggy Antonakou
CEO Microsoft Greece, Cyprus & Malta

Artificial Intelligence (AI) has been in development over several decades but is now reaching a scale of massive applicability. AI is all about detecting patterns out of large data sets, unveiling relationships that are hidden to the naked eye. Whether in medicine or manufacturing, traffic flows, maintenance, forecasting, spending habits or customer interactions, the power of AI is expected to go beyond our 5 senses and enhance our understanding of the world. AI is technology's way of modeling intuition. It has now become viable thanks to the combinatorial effect of a series of fast-moving technologies and is set to transform the relationship between people and technology.

Governments, academic institutions and companies around the world are already embracing AI as a powerful force for building value, aiming to become global frontrunners in their respective fields. For countries that adopt AI, a future of increased growth becomes a key target as AI's transformative power can be compared to that of electricity or the internal combustion engine - leading to disruption both directly and indirectly, thus enabling a vast range of complementary innovations.

Following our previous study on "Digital Greece: The Path to Growth" which underlined the low contribution of digital to the country's GDP, and highlighted the importance of a national digital rotation, this study comes in to sustain the national dialogue on the new, technological, forces that are shaping our era.

Sharing the same anxiety and vision with Microsoft on the digitalization of Greece, we joined forces in this study "Greece: With an AI to the Future" aiming to provide strong evidence that AI can play a fundamental role in unlocking trapped value in Greece, both for businesses and society.

We implemented a 360° approach by gathering and analyzing qualitative and quantitative data on the public sentiment of Greek society towards AI, the AI readiness of Greek organizations, AI's potential contribution to our economy along with a framework for policy makers and business leaders to fully exploit its dynamics for Greece. This effort was underpinned by Accenture's globally accredited methodologies and econometric models, that have already been successfully applied in other parts of the world.

Despite the mixed feelings of the Greek population and hesitation shared by the captains of industry towards AI, the potential impact of AI on the Greek economy and society is inevitable and expected to be sweeping. All stakeholders, including policy makers and business leaders, must work towards improving their "AIQ" and reimagine an AI future for Greece, taking also into consideration the challenges and risks associated with its adoption. Our educational system should also embrace this new reality, introducing AI literacy into the classroom, and helping create the interdisciplinary mindset that is at the core of the new way of creating value. AI is not just another technical buzzword but, rather, a major enabler that will completely transform our thinking about how growth is created both at an organizational and macroeconomic level.

AI will unleash exponential creativity, characteristic of the new economy that defines our age. In the journey that lies ahead, Greece can and should seize the opportunity in a spirit of possibility, setting the foundations for a better future for all.

Dr Kyriacos Sabatakakis
Country Managing Director
Accenture S.A.

1. EXECUTIVE SUMMARY

Everyone is talking about Artificial Intelligence (AI). From boardrooms to factory floors, from call centers to logistics fleets, and from governments to venture capitalists, Artificial Intelligence has become the hottest topic in town. However, this constellation of technologies that enables machines to sense, comprehend, act and learn is much more than the latest technology buzzword. In fact, AI might just be the single greatest technology revolution the world has ever seen.

Organizations, industries, societies and countries as a whole have joined the race to explore AI, harness its benefits and become global AI-frontrunners. All evidence indicates that AI is here, and everyone must stand up and take notice.

In Greece, the anaemic growth and the low digital adoption rates set as an imperative the need to transform. AI is a key transformation accelerator and a "game-changer" that we believe deserves the country's attention.

This was the springboard for Accenture to join forces with Microsoft and author this study under the theme "Greece: With an AI to the Future". The study surfaces Greek public's perception, hopes and fears on AI. It reveals the AI awareness and readiness of Greek organizations and estimates the projected economic growth that AI can infuse to the Greek economy over the next 15 years.

The prospect of an AI-led future both excites and concerns Greeks. The fear of the unknown, the uncertainty and the unfamiliarity with AI, makes the majority of the respondents to feel confused, unsure or concerned, about what an AI-led future might entail. This uncertainty however, is offset by people's views on the positive impact that AI can have on society. From personal assistants to medical preliminary diagnosis, Greeks see many ways in which AI can improve lives and work for the common good. At the same time, due to the rapid rise of AI, many questions and concerns remain open. How will AI affect us? Will we have less control over our lives? Will AI decrease the opportunities for humans and could we form relationships with machines in the same way we currently do with people?

Similarly to the Greek public, Greek executives do recognize the strategic importance of AI and acknowledge it as a critical centerpiece for moving forward. It is seen as an "agent for change", yet, they appear to be reluctant to actively invest in it. Several challenges are claimed to slow down their AI efforts: limited skills for implementing and using AI, IT infrastructure and low data quality being identified as the three top-of-mind ones.

Our analysis reveals that AI can act as a new factor of growth for Greece over the next years. In fact, we find that AI has the potential to lead to a cumulative $195 billion GDP uplift over a 15-year period (from 2020 to 2035) - a powerful remedy to the limited growth experienced in the recent years.

In the light of the above, a pressing question is born: what can Greece do to fully seize the AI opportunity? Does the country have the luxury of time to wait until AI technologies and applications mature?

The time to act is now. In order not to lose momentum, Greek policy makers and captains of industry need to work in tandem to improve their "AIQ" and reimagine an AI future for Greece.

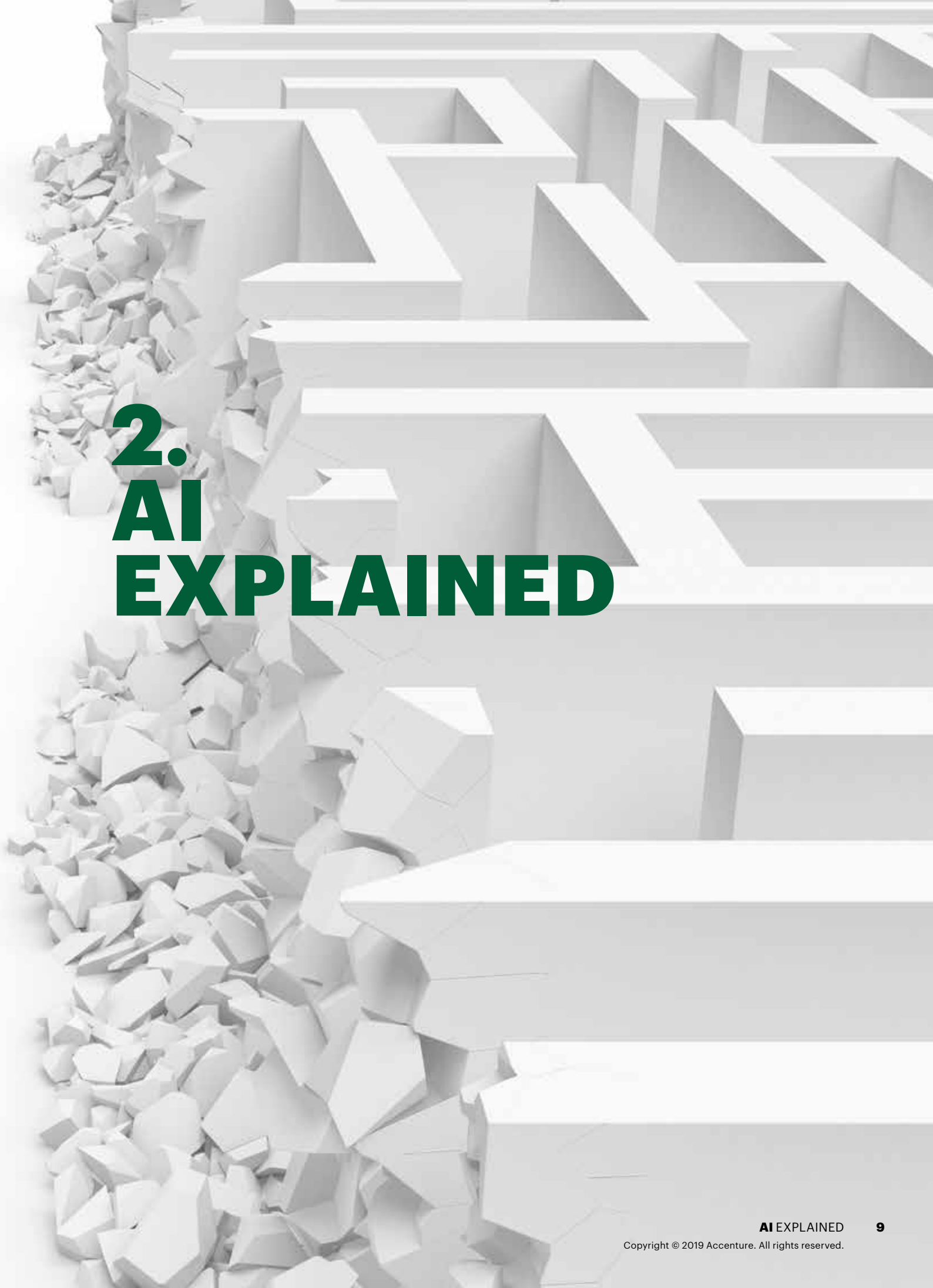
Policy makers must be prepared to address the challenges that go along with it. Namely, organizational, technological, political, ethical and social. To achieve this, policy makers shall gear their efforts and act towards the accomplishment of four goals:

- Accelerate Greece's digital rotation
- Prepare the next Generation for an AI future
- Advocate a code of ethics for AI
- Address the redistribution effects and ensure inclusion

Similarly to policy makers, the Greek captains of industry should move from simply discussing to actively addressing the opportunities that arise from the systematic application of AI technologies across their organizations. To reap the benefits of AI deployment, business leaders must begin to invest now, in order to enable this set of technologies to mature and evolve in sync with the accelerated pace of change. For this, they shall:

- Step beyond automation towards innovation and true growth
- Organizationally experiment and learn
- Take data "off the bench" and "into the game"
- Reimagine work and move from workforce planning to work planning
- "New-Skill" to collaborate with intelligent machines

As economies compete on AI, Greece needs to "reinvent" itself to differentiate and stay in, if not ahead of the game. Reinvention, by nature, means to get into the game early. All else, is called following.



2. AI EXPLAINED

2.1 INTRODUCTION

In a corner of an automotive assembly plant, a worker and robot are collaborating to build a transmission. The worker prepares a gear casing, while a robot arm, sensitive to and aware of its surroundings, picks up a twelve-pound gear. The worker moves on to their next task, while the robot precisely puts the gear inside the casing and turns away to pick another. It all feels as if robot and human are part of a well-choreographed Sci-Fi movie scene. But they are not. This happens now, in BMW plant in Dingolfing, Germany. Thanks to Artificial Intelligence (AI)[1].

Look around you. AI is no longer a futuristic notion. It is part of our lives. From using a virtual assistant to booking a meeting to Netflix and Spotify recommending movies or songs that we may like. AI is a reality. Beyond making our lives easier, AI "promises" to help up solve some of the world's biggest challenges: from treating chronic diseases and reducing fatality rates in traffic accidents to fighting climate change or anticipating terrorist threats. These are some of the many examples of what AI can do. Countless more examples that cannot be imagined today will emerge over the next years.

Everyone is talking about AI. From boardrooms to factory floors, from call centers to logistics fleets, and from governments to venture capitalists, AI is now the "hottest topic in town". But is AI anything more than the latest technology buzzword? The answer is unequivocally yes. In fact, AI might just be one of the greatest technology revolutions the world has ever experienced.

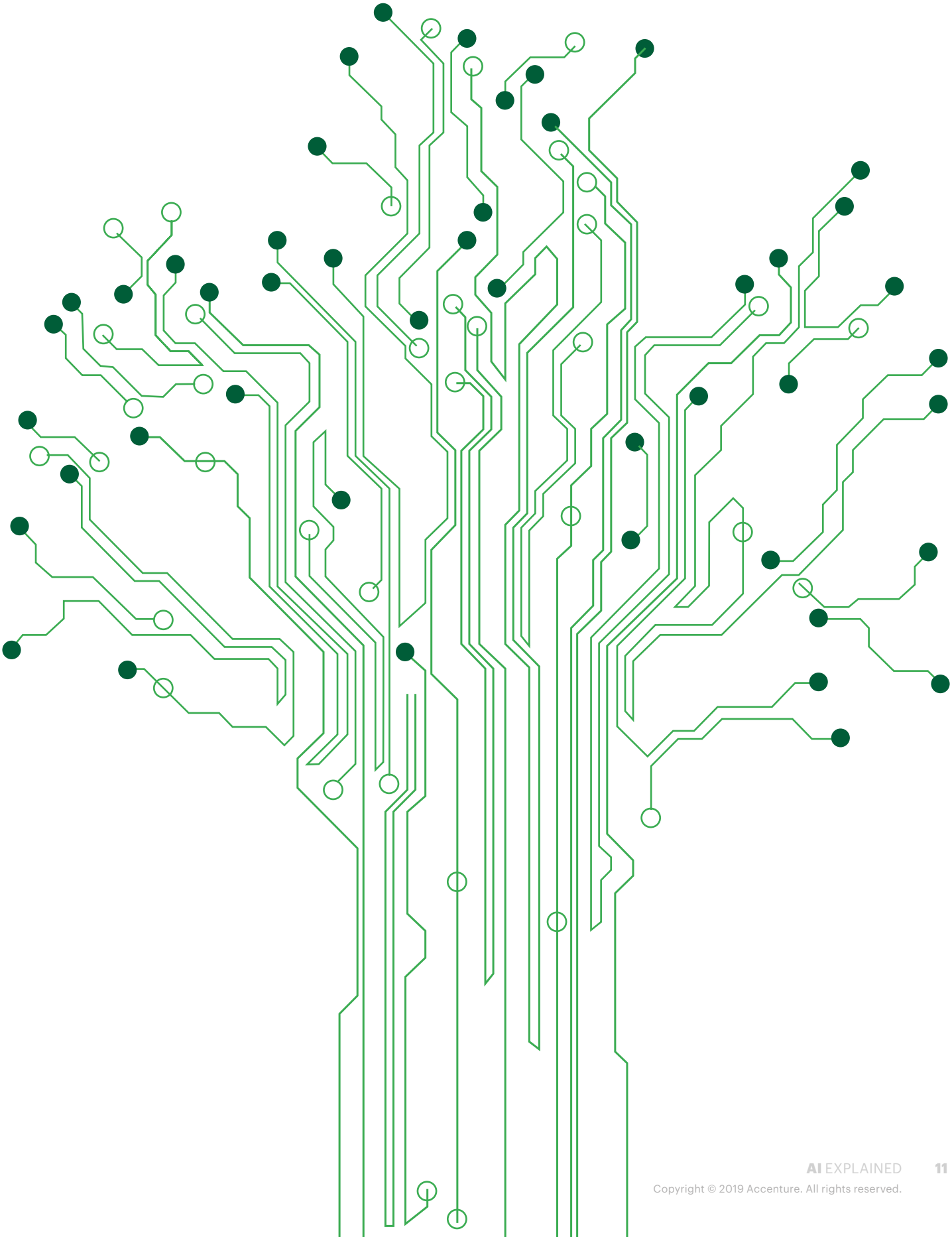
AI is what economists call a "general-purpose" technology. These technologies are a big deal. Think electricity and the internal combustion engine. Electricity made factory electrification, telegraphic communication and all that followed possible. The internal combustion engine gave rise to the automobile, the airplane and the modern transportation and logistics networks. AI is expected to impact economies and societies on a similar scale.

Private investment in AI is booming. For the first nine months of 2017 AI-driven venture capital investment reached $7,6 billion[2] (compared with $5,4 billion for the whole of 2016). The registration of AI patents is at an all-time high, five times the figure in 2006[3]. The number of active AI start-ups has increased by 1400 percent since 2000[4] and twenty-first-century pioneer companies are already using AI to innovate and pivot to the New.

Countries, or entire economic blocks also seek to ensure their economies maximize the benefits from AI. In the past fifteen months, Canada, China, Denmark, Finland, France, India, Italy, Japan, Mexico, the Nordic-Baltic region, Singapore, South Korea, Sweden, Taiwan, the UAE, the UK, Malta and the EU Commission have all released strategies to promote the use and development of AI[5].

All evidence indicates that AI is here, and everyone must stand up and take notice.

1. DPCCars, "BMW Factory Humans & Robots Work Together at Dingolfing Plant" YouTube Video 25:22 minutes, posted March 2, 2017, https://www.youtube.com/watch?v=Dm3Nyb2lCvs&t=152s
2. Faggella, D. (2017, August 24). Venture Investments in Artificial Intelligence - Trends in 2016 and Beyond. TechEmergence. https://www.techemergence.com/venture-investments-in-artificial-intelligence-trends/
3. Hoffman, M. (2016). Artificial Intelligence Patents Growing Exponentially. Hoffman Warnick. http://hoffmanwarnick.com/artificial-intelligence-patents-growing-exponentially/
4. https://news.stanford.edu/press-releases/2017/11/30/artificial-intels-emerging-field/
5. An Overview of National AI Strategies, https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd



2.2
SO, WHAT IS EXACTLY ARTIFICIAL INTELLIGENCE?

So, you've heard all about AI, and you know it is a big deal. But what is it exactly? Answering that question isn't as straightforward as it might seem. In fact, there is no single accepted definition of "Artificial Intelligence". That is because AI, as we know it, is not really a technology in its own right. In reality, it is a constellation of different technologies that can be brought together to enable machines to act with what appears to be human-like levels of intelligence.

Rather than add to the growing list of attempts to describe AI, we prefer to think of this as a framework of capabilities. This is undoubtedly the best way to understand what AI is, and to get a sense of the technologies that underlie it. Our framework is centered around the principal capabilities of AI-enabled systems & solutions. These are to sense, comprehend, act and learn (see Figures 2.1 & 2.2).

- **Sense:** AI solutions are able to actively perceive the world around them by acquiring and processing images, sounds and speech, through the use of computer vision and audio processing technologies. Consider how a border-control kiosk uses computer vision technologies such as facial recognition to sense characteristics of travellers. Integrated with other technologies, an AI-enabled solution here can improve security by identifying people on unauthorized entry lists or others that may pose risk to the host country.

- **Comprehend:** AI solutions can understand the information they collect by recognizing patterns, through technologies such as natural language processing and knowledge representation. These technologies have a wide range of applications across multiple industries. For example, in the health industry, a medical diagnostic system can help doctors identify diseases and suggest treatments. The doctor can interact with the AI-enabled system by speaking or typing in a native language. The system can ask follow-up questions, take the facts of the case, draw from other relevant cases and infer a solution or a treatment. It can also present a conclusion or a suggestion to the doctor, who will use it as expert input into the final diagnosis and treatment plan.

- **Act:** AI solutions can take actions independently in the physical or digital world through technologies such as expert systems and inference engines. Consider the driverless cars, which sense the environment, understand the myriad inputs and then steer the wheels without any assistance from a human driver.

- **Learn:** A distinctive feature of all types of AI solutions is their ability to continuously optimize their capabilities based on experience, rather than require to have all the rules hard-coded. For decades, computers were able to process complex questions and give answers, but applications were rigid, and any change required programmatic modifications. Today, AI systems can be self-learning; they are more like bright students who are given educational material, and then can learn by themselves. For example, self-learning AI solutions are already in use by banks to detect credit fraud. The banks use machine learning models that understand previous spending patterns of a customer and predict the transactions a person may make, flagging unusual activity. These systems are also given real examples of fraudulent and legitimate transactions so that the models can learn to recognize new patterns and evolve as fraudsters alter their tactics.

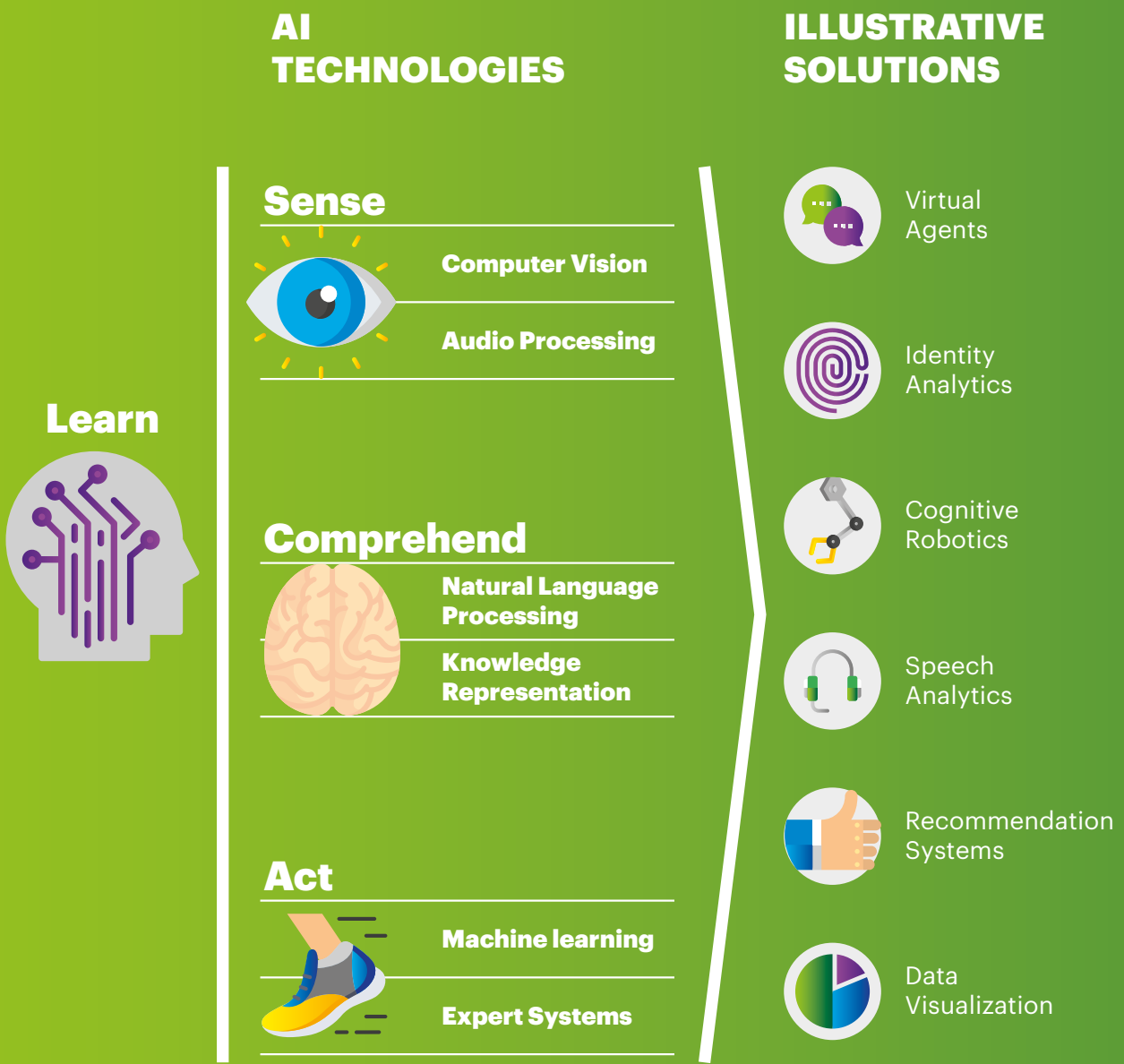


Figure 2.1. Emerging AI Technologies & Solutions

AI Technologies	Definition
Computer Vision	Acquiring, processing, analyzing and understanding images
Audio Processing	Identifying, recognizing and analyzing sounds and speech
Natural Language Processing	Processing, analyzing & generating language in spoken and/or written form
Knowledge Representation	Depicting & communicating knowledge to facilitate inference and decision making
Machine Learning	Using example data or experience to refine how computers make predictions or perform a task
Expert Systems	Emulating the decision-making ability of a human expert and solving complex problems by reasoning, with the information available in its knowledge database

AI Solutions	Definition
Virtual Agents	Autonomous online chatbots which act, directing their activity towards achieving goals, using observations through sensors and consequent actuators. Virtual agents may also learn or use knowledge to achieve their goals
Identity Analytics	Solutions that help define access to critical data and systems, based on information from authoritative systems
Cognitive Robotics	Robots endowed with intelligent behavior that enables them to learn and reason about how to behave, in response to complex goals in a complex world
Speech Analytics	Solutions that recognize speech patterns to identify emotions to improve communication, guide interactions and extract information
Recommendation Systems	Solutions that predict the «rating» or «preference» a user would give to an item. They are usually used for social-media marketing and content targeting
Data Visualization	Retrieval and manipulation of data, regardless of its format or where it is stored, in order to create and study its visual representation. To communicate information clearly and efficiently, data visualization uses statistical graphics, plots, information graphics and other tools

Figure 2.2. The AI Decoder Ring

2.3 CONCLUSION

The race for companies, industries and societies as a whole to become global frontrunners in AI has officially begun. For countries that adopt AI, a future underpinned by accelerated growth becomes a visible target.

In Greece, the recent anaemic growth and the low digital adoption rates[6] set as an imperative the need to transform. AI is a key transformation accelerator and a "game-changer" that, we believe, deserves the country's attention. Greece can no longer sit on the fence and wait to see how AI advances. Businesses and government alike must understand what AI is and find actionable ways to harness it.

6. As per Accenture's Digital Economic Opportunity Index (DEOI) (2017), https://www.slideshare.net/accenture/digital-greece-the-path-to-growth, European Union's Digital Economy and Society Index (DESI) (2018), https://ec.europa.eu/digital-single-market/en/news/digital-economy-and-society-index-2018-report, and the World Economic Forum's Networked Readiness Index (NRI) (2016), http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf

3. THE GREEK AI PUBLIC SENTIMENT

3.1 INTRODUCTION

AI is now entering our lives through digital home assistants, prototype autonomous vehicles and friendly-looking robots. AI represents potentially one of the most influential technologies ever developed. Does the Greek population share this opinion? How do we feel about AI? Do we agree more with Mark Zuckerberg (AI will be a benevolent force for good) or align with Elon Musk (AI will pose an existential threat to humanity)?

How the Greek public feels about AI does matter. For us, the public dialog on AI must focus on humanity rather than purely on technology.

3.2 AI ENTERS THE PUBLIC'S CONSCIOUSNESS

The Greek public recognize that AI is coming, but do they know what it is[7]? To get a sense of this, we started with a simple question: "What is the first think that comes to your mind when you hear the term AI?"

AI appears to have entered the general public's consciousness. Approximately two thirds (65 percent) of the public surveyed first think of AI applications like robots, digital assistants and chatbots. At the same time, only 4 percent relate AI to Science Fiction and Hollywood movies, and 2 percent admit they know nothing about it. It seems that the Greeks recognize that AI is real (see Figure 3.1).

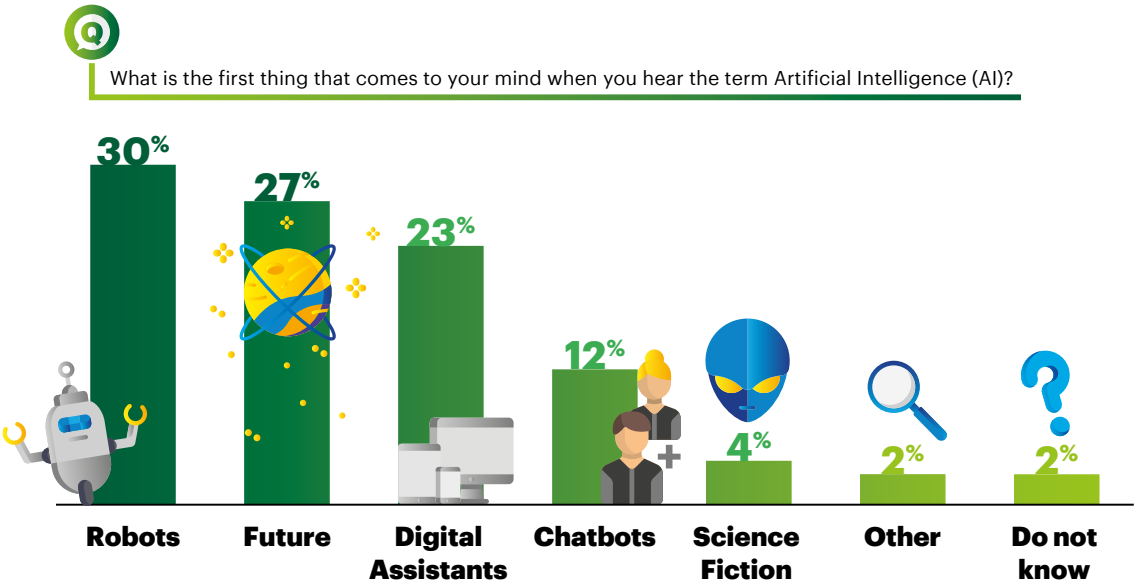


Figure 3.1. Greeks' perception of Artificial Intelligence, (%)

7. The analysis is based on data recorded through the AI Questionnaire for the Greek Public, executed by Focus Bari Market Research SA from January 16, 2019 to February 1, 2019.

3.3 PROSPECTS OF AN AI FUTURE - FOR BETTER OR FOR WORSE?

THE AI PARADOX

Much is made of the positive and potential negative impact that AI can exert on our lives. AI has the potential to help tackle some of the world's most challenging social problems, from diagnosing cancer to helping blind people navigate their surroundings. From identifying victims of online sexual exploitation, to aiding disaster-relief efforts. At the same time, AI being used for illegal activities, or AI robots overtaking the world, is often quoted in the popular press, as images of a dystopian future that lies ahead.

When measuring the overall sentiment towards the implementation of AI applications in Greece, our analysis exposes a critical paradox. The prospect of an AI-led future both excites and concerns Greeks. The fear of the unknown, the uncertainty and the unfamiliarity with these new technologies, makes the majority of the respondents feel confused, unsure or concerned, about what an AI future might entail for their personal lives (see Figure 3.2).

However, no matter the high levels of concern, Greeks also exhibit an optimistic view for AI's potential contribution to society. 1 out of 2 (56 percent) of the respondents believe that society will overall benefit from AI applications (see Figure 3.3).

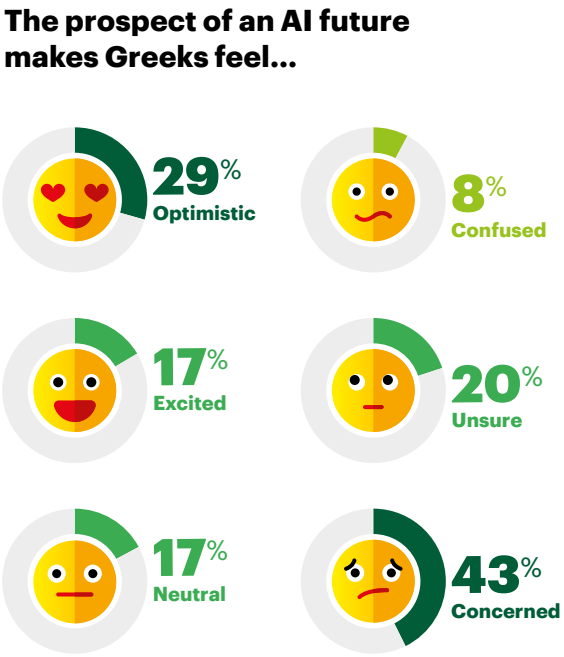


Figure 3.2. Sentiment of the Greek public towards an AI future, (%), (multiple answers)

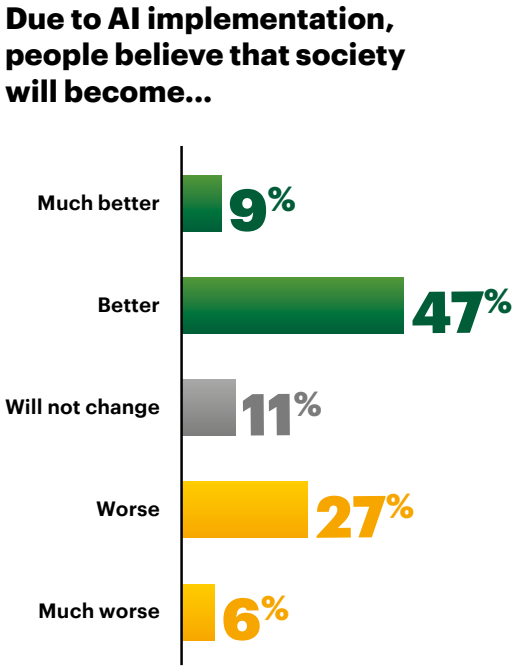


Figure 3.3. The perspective of the Greek public on how society will change due to AI implementation, (%)

AI FOR THE COMMON GOOD

Albeit uncertain about an AI-driven future, Greeks recognize the profound beneficial impact that AI may have on society. Almost all respondents (88 percent) recognize the advancements in areas, i.e. medicine and science, which can help humans and solve societal problems, as the single most important benefit of AI. This comes at a time when medical and health AI applications are becoming increasingly popular. Robot-assisted surgery, virtual nursing assistants, dosage error reduction and preliminary diagnosis are some of the top AI applications, just to mention a few[8]. Just imagine that the global AI health market is expected to reach $6.6 billion by 2021 - that is a compound annual growth rate of 40 percent[9].

Case in Point: AI model learns from patient data to make cancer treatments less toxic

MIT researchers are deploying AI and machine learning techniques to improve the quality of life for glioblastoma (the most aggressive form of brain cancer) patients by reducing toxic chemotherapy and radiotherapy dosing. They have developed a model that can make dosing regimens less toxic but still effective. Powered by reinforcement learning, an AI technique that learns to favor certain behavior that leads to a desired outcome, the model looks at treatment regimens currently in use, and iteratively adjusts the doses. Eventually, it finds an optimal treatment plan, with the lowest possible potency and frequency of doses that should still reduce tumor sizes to a degree comparable to that of traditional regimens. It has flexibility to find a dose that doesn't necessarily solely maximize tumor reduction, but that strikes a perfect balance between maximum tumor reduction and low toxicity.

Source: *http://news.mit.edu/2018/artificial-intelligence-model-learns-patient-data-cancer-treatment-less-toxic-0810*

8. Accenture, "Artificial Intelligence (AI): Healthcare's new nervous system", https://www.accenture.com/us-en/insight-artificial-intelligence-healthcare
9. Frost & Sullivan, "From $600 M to $6 Billion, Artificial Intelligence Systems Poised for Dramatic Market Expansion in Healthcare", https://ww2.frost.com/news/press-releases/600-m-6-billion-artificial-intelligence-systems-poised-dramatic-market-expansion-healthcare

The perspective of AI acting as a personal companion offering help to underprivileged people and the diminishing of human accidents or errors, also tops the list of expected benefits, as cited by two thirds of the questioned sample (60 percent and 59 percent respectively stated the above as key benefits due to AI). Other benefits are also recognized. These include the replacement of tedious and dangerous tasks by robots or intelligent machines (51 percent) and the release of free time for humans (37 percent) (see Figure 3.4).

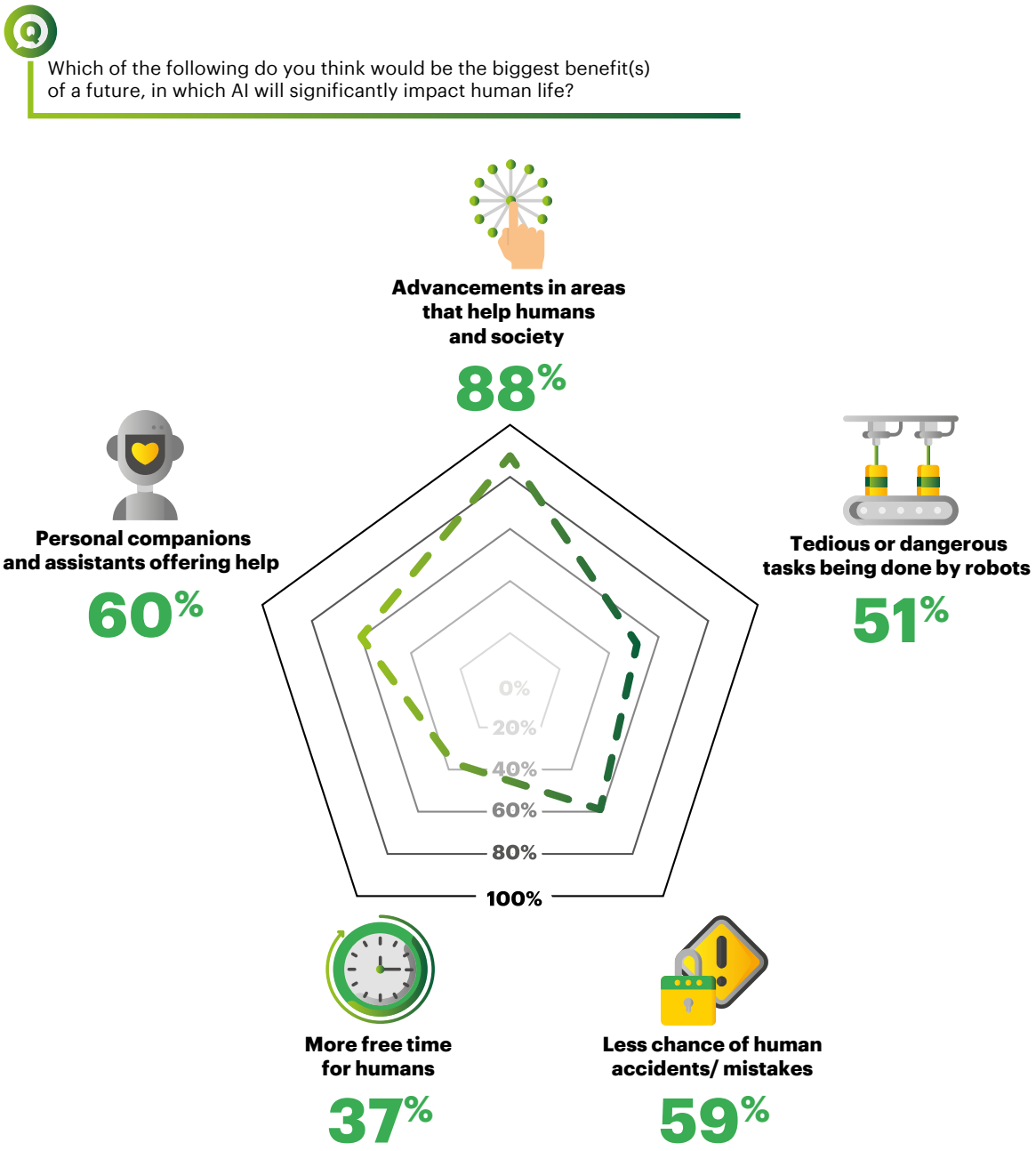


Figure 3.4. The perception of the Greek public on the biggest potential benefits of AI, (%), (multiple answers)

Of all possible benefits, findings indicate that the application of AI for the common good resonates with Greeks most strongly.

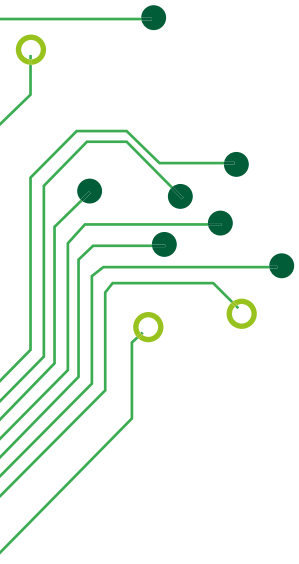
Case in Point: The story of Saqib Shaikh

Meet Saqib Shaikh, a computer scientist and software engineer at Microsoft. Saqib lost his sight at the age of seven, fell in love with computers as a schoolboy in Britain and grew up to become a top software engineer with an inspirational mission. Standing at the intersection of AI and inclusive design, he believes we can create intelligent machines to empower millions of people around the world with disabilities, in order to achieve more and live enhanced lives. The knowledge gained from targeting and solving the problems of those with special needs, he says, can only drive technological innovation that benefits everyone across society.

A dozen or so years ago, Saqib joined Microsoft and quickly proved his prowess as an engineer by helping to create products, services, and apps that many use every day, like Bing and Cortana. His quest now is to create greater accessibility and inclusion - to level the playing field for everyone. As the driving force behind Microsoft's Seeing AI project, he is exploring how AI can enable people, who are blind or with low vision to achieve more with freedom and confidence.

The Seeing AI app, launched in 2017, provides to those who cannot see a new way to understand the world through the cameras on their smartphones. Since 2017, the app has helped people who use it, with more than 10 million tasks. Seeing AI is a perfect paradigm of how Artificial Intelligence technologies can drive inclusion, enable people to realize their potential and improve the lives of everyone - and not just those with disabilities. After all, as Saqib says "There are a lot of problems. But for every problem, there is a solution".

Source: https://www.microsoft.com/en-us/seeing-ai, https://news.microsoft.com/apac/features/saqib-shaikh-on-technology-and-inclusion-creating-an-ai-future-with-possibilities-for-all/



AI ADOPTION DOESN'T COME RISK-FREE

The vast number of opportunities that AI offers do not come risk-free. As highlighted by the survey, Greeks, whilst acknowledge AI benefits, appear cautious about threats that AI could impose on human life, as we know it. Presented with a list of potential risks associated with AI, 60 percent cited the loss of control over their lives as a major concern. Societal issues that could be raised due to an increased role of AI, such as the decrease of opportunities for humans and the feeling of being less useful were also highlighted by more than half of the Greeks questioned (57 percent). The impact that AI could have on jobs and on personal relationships between people is top-of-mind risk, as stated by almost one out of two Greeks (49 percent). However, only one third of the respondents (36 percent) seem to embrace the dark scenario, where machines become independent and able to think for themselves (see Figure 3.5).

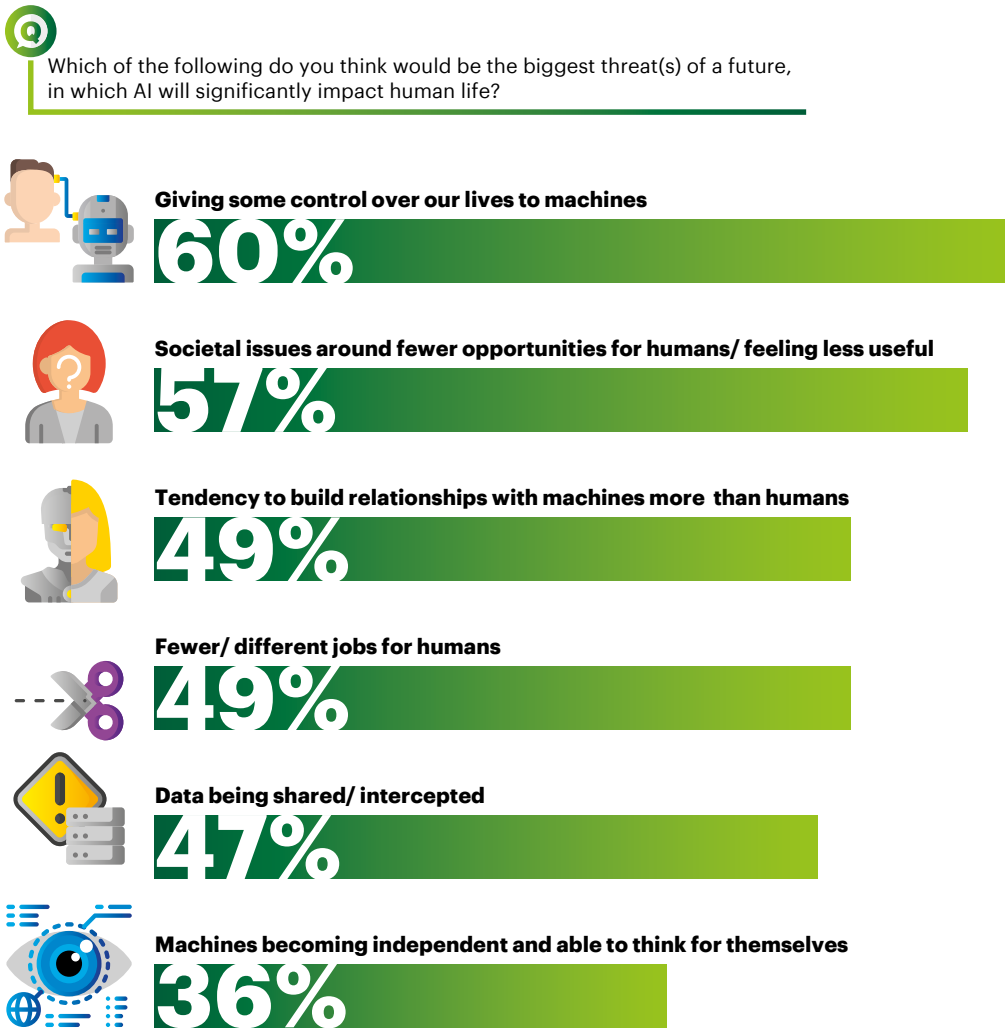


Figure 3.5. The perception of the Greek public on the biggest potential threats of AI, (%), (multiple answers)

3.4 AI TRUST FOR SELECTED TASKS

Greeks have started to trust AI technologies and appear willing to cede activities to machines, whilst at a variable degree. In fact, the level of trust that Greeks demonstrate with regards to delegating activities to applications of AI is directly influenced by the degree of technology penetration in the same activities.

More than 80 percent trust AI to monitor home energy consumption and home security. AI is also trusted by approximately 70 percent of the respondents to monitor their health and provide health advice. What do these activities have in common? They are already performed largely by machines and carry the potential to be further automated.

However, there are tasks that our sample still appears reluctant to hand over to AI-driven applications. Approximately 60 percent has cited that they would hesitate to trust AI to independently shop for them or to drive their car. Even more so, to manage their finances or to monitor their children's safety. For these, most Greeks prefer a real person instead of a machine (see Figure 3.6).

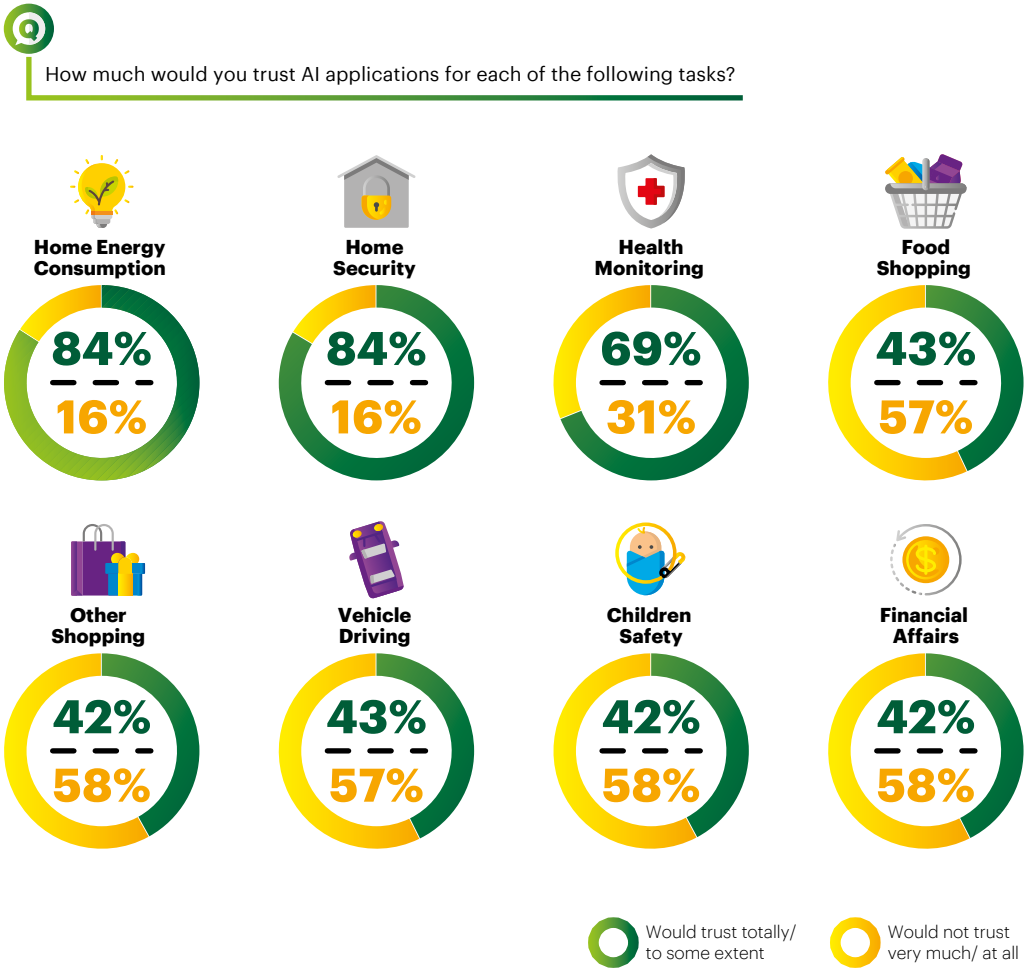


Figure 3.6. Level of trust demonstrated by the Greek public with regards to different AI applications, (%)

Survey outcomes suggest that human validation can be the key factor to increase Greeks' comfort with AI. More than 60 percent of our sample indicated that they would trust more the advice and/ or direction of AI applications on complex issues, if human involvement was also present (see Figure 3.7).

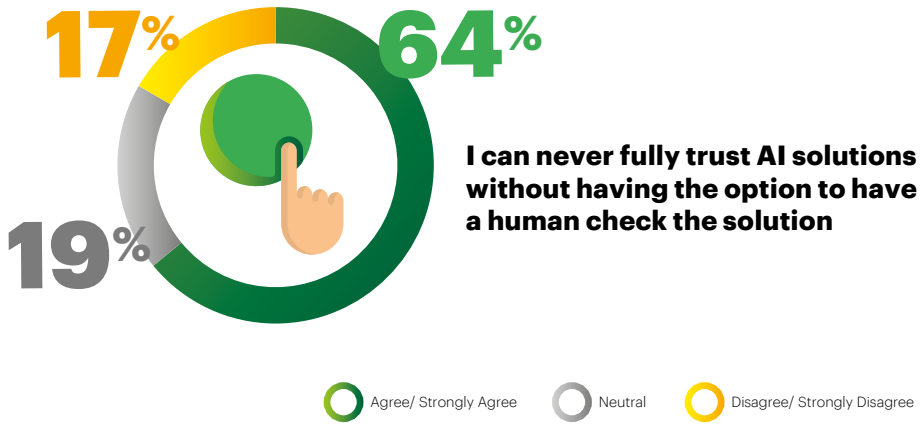


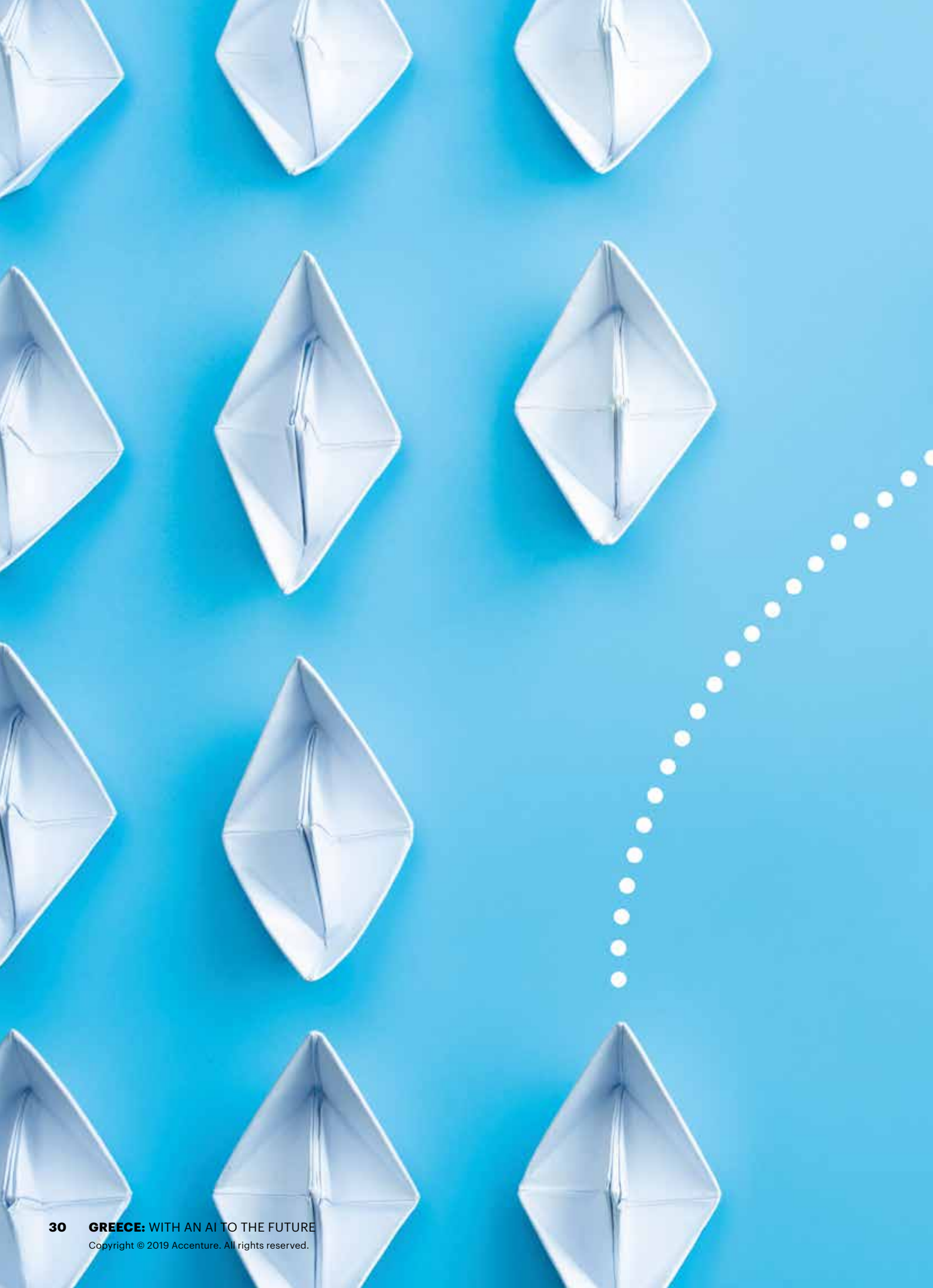
Figure 3.7. Level of agreement of the Greek public on whether they would trust AI solutions without having the option to have a human check the solution, (%)

3.5 CONCLUSION

Optimistic but cautious. Positive but confused. Mixed emotions seem to overwhelm Greeks when they think about AI. The results of the survey do not come as a big surprise. As in many parts of the world, Greeks do not know what to feel towards AI. While they seem to recognize the likelihood of a societal shift, the prospect of such change is met with mixed emotions. This is to be expected as rapid change has always been a catalyst for uncertainty.

This uncertainty is offset by people's views on the positive impact that AI can have on their lives. From personal assistants to medical preliminary diagnosis, Greeks see many ways in which AI can improve lives and make them safer. At the same time, due to the rapid rise of AI and its boundless opportunities, many questions and concerns remain open. What will an AI-led future look? How will it affect us? Could we form relationships with machines in the same way we currently do with people?

AI is here, and it is here to stay. Despite concerns, people around the world appear hopeful that AI's benefits will outweigh potential risks and that society will progress as a result. After all, the augmentation of humans' intelligence by AI suggests that the possibilities ahead are endless.



4. GREEK ORGANIZATIONS' AI READINESS

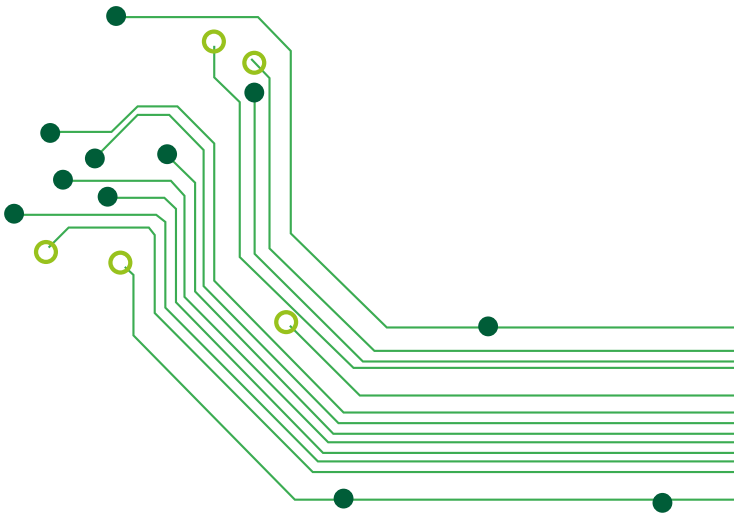
4.1 INTRODUCTION

Pepper and Rachel, 2 human-like robots, are star performers in retail sales. Pepper single-handedly boosted revenue by 300 percent at The Ave, a fashionable LA clothing boutique - in just three days[10]. When Amazon acquired Kiva Robots in 2012, it signaled that the mobile bots zipping around Amazon's warehouses were a key to their fulfillment advantage. Not only do the robots help lift and stack plastic bins filled with different products, but they also do the legwork of autonomously transporting items around the facility to human "pickers", who then select the right products to fulfill different orders. Thanks to such increased efficiencies, the company has been able to offer same-day shipping to customers[11]. At Goldman Sachs, AI applications study up to a million different analyst reports to identify top factors affecting share prices[12], while Las Vegas Sands Corp. uses AI to model different layouts of gaming stations throughout its casino to optimize financial performance[13].

These are just a few examples of global companies that have already embraced AI to digitally transform and build value.

While AI is growing its presence across organizations globally, where do their Greek counterparts stand? Have they already started their AI journey? If not, what holds them back? Are they ready, willing and able for an AI-led future?

The AI Questionnaire for Greek Organizations[14] combined with insights derived from conversations we had with Greek captains of industry, reveals an awareness on the potential benefits. But also exposes the complexity and the challenges associated with it. Greek executives realize that fulfilling this potential requires the courage to reimagine their business and calls for a new approach to management and decision making.



10. Softbank, Pepper Case Study (undated)
11. Nick Wingfield, "As Amazon pushes forward with robots, workers find new roles", New York Times, September 2017, https://www.nytimes.com/2017/09/10/technology/amazon-robots-workers.html
12. Nathaniel Popper, "The Robots are coming for Wall Street", New York Times, February 25, 2016, https://www.nytimes.com/2016/02/28/magazine/the-robots-are-coming-for-wall-street.html
13. Ed Burns, "Analytical Technologies are game changer for casino company", SearchBusinessAnalytics, October 2014, https://searchbusinessanalytics.techtarget.com/feature/Analytical-technologies-are-game-changer-for-casino-company
14. The analysis is based on data recorded through the AI Questionnaire for the Greek organizations, launched on January 23, 2019 and remained open until March 03, 2019.

4.2
AI AS AN "AGENT FOR CHANGE"

Business leaders in Greece do recognize the strategic importance of AI and acknowledge it as a critical centerpiece for moving forward. In the words of a seasoned executive, "AI is what keeps me awake at night". According to the survey, 85 percent of the surveyed executives expect AI to provide disruptive opportunities for new products, services, business models and/ or markets.

At the same time, 7 out of 10 (73 percent) anticipate that AI will disrupt their industry in the next three years and will fundamentally change their competitive landscape. The same percentage (71 percent) fears that if their organizations do not proactively harness AI capabilities, they risk being left behind by their competitors (see Figure 4.1).

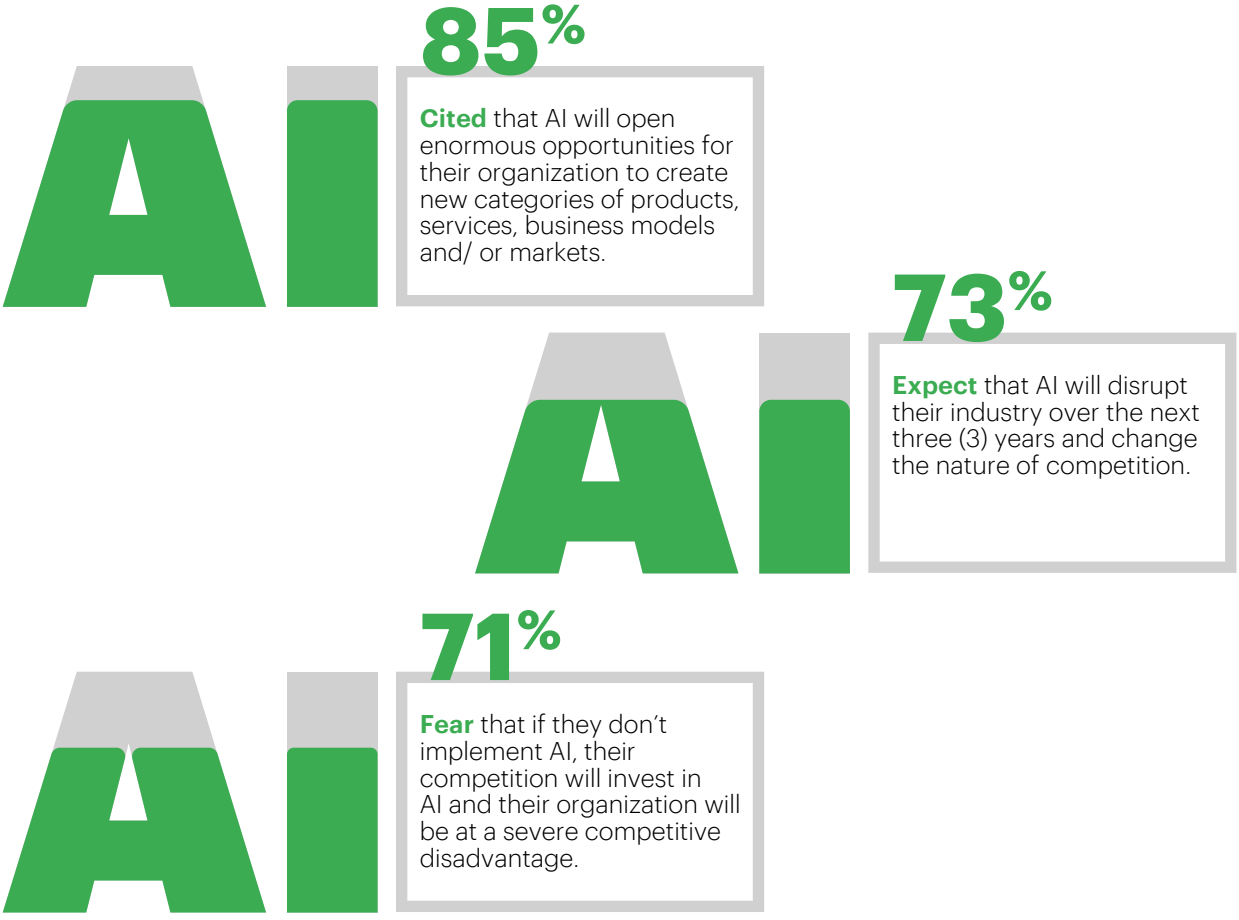


Figure 4.1. Greek executives' level of agreement regarding the opportunities that AI will open for their organizations, the disruption of their industry due to AI and the potential competitive disadvantage due to lack of investment in AI, (%)

Business leaders direct their AI attention in areas where they expect to see wider benefits. The optimization of operations is cited by 73 percent as the greatest benefit harnessed by organizations that currently experiment with AI. The transformation of organizations' product and service portfolio, as well as the improved customer experience also score high on the list of top benefits of AI deployment.

The stated ambitions are high. Over the next years, Greek executives expect their organizations to benefit more from AI. Approximately 1 out of 2 Greek executives also see that AI will significantly empower their organizations' workforce (see Figure 4.2).

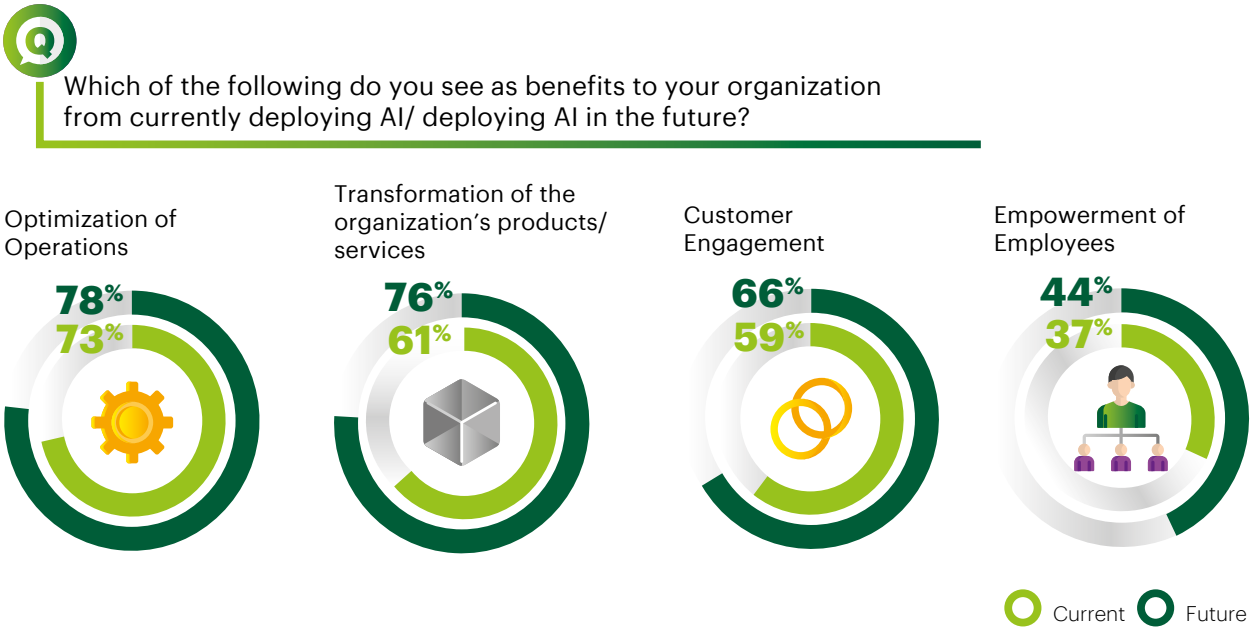


Figure 4.2. Organizations' top benefits from deploying AI currently and in the future, (%), (multiple answers)

Case in Point: European transportation leader achieves record-breaking performance with AI

Budapest-headquartered Waberer's International Nyrt. specializes in "full truckload transportation"- the successful delivery of large consignments of goods and supplies on a long-haul basis in Europe.

The company had worked hard on its internal capabilities to get above the European full truckload "standard" of 87 percent loaded ratio - a very important performance metric. However, the scheduling process at the heart of its operations was, until recently, still being done with a manual, spreadsheet approach, says CEO, Ferenc Lajkó. "Trucks driving around with no cargo, drivers sitting around waiting for assignments and poor resource utilization are our main enemies as a business", he says.

To address this, Waberer's International deployed a customized Azure-based AI system to cope with this level of complexity. The new AI-powered assistant, Waberer's Intelligent Planning Engine (WIPE), enabled the company to automate its truck scheduling function, using complex mathematical models and algorithms to seamlessly allocate driver team, load and journey schedules in the most efficient way. Apart from fully automating a critical business process, large savings emerged due to improved resource allocation and less fuel used. In addition, thanks to this new AI assistan, Waberer's International Nyrt. has automated its truck scheduling function - and is now achieving a better than industry-average loaded ratio of 92 percent.

Source: *http://customers.microsoft.com/en-us/story/waberers-professional-service-azure-hungary*

To achieve these benefits, the majority of respondents selectively deploy AI, primarily within their IT, Marketing & Sales and Operations divisions.

Over the next years, respondents aim to increase their AI efforts within their HR departments, while at the same time, continue to vest AI attention across their Operations, IT and Marketing & Sales divisions (see Figure 4.3).

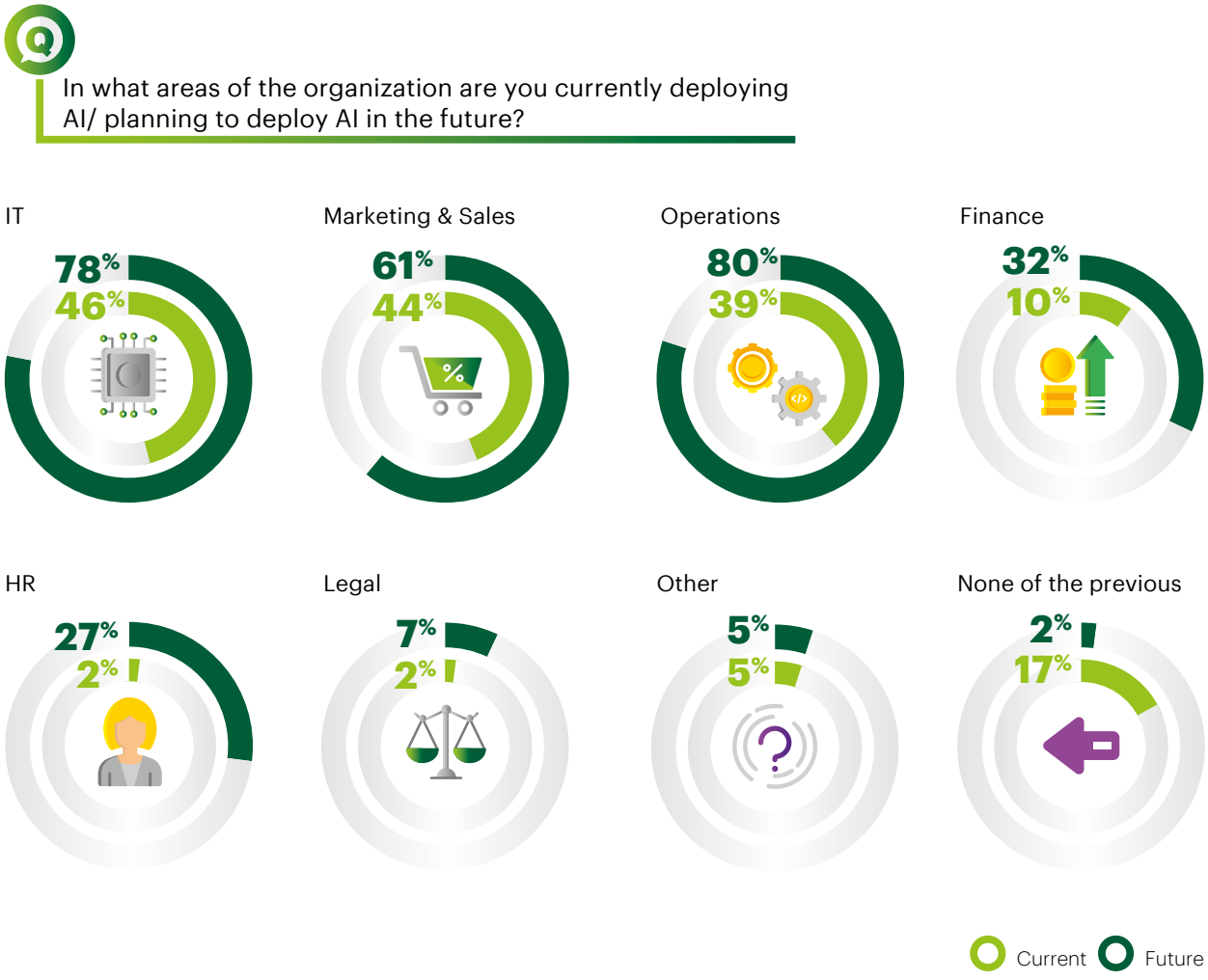


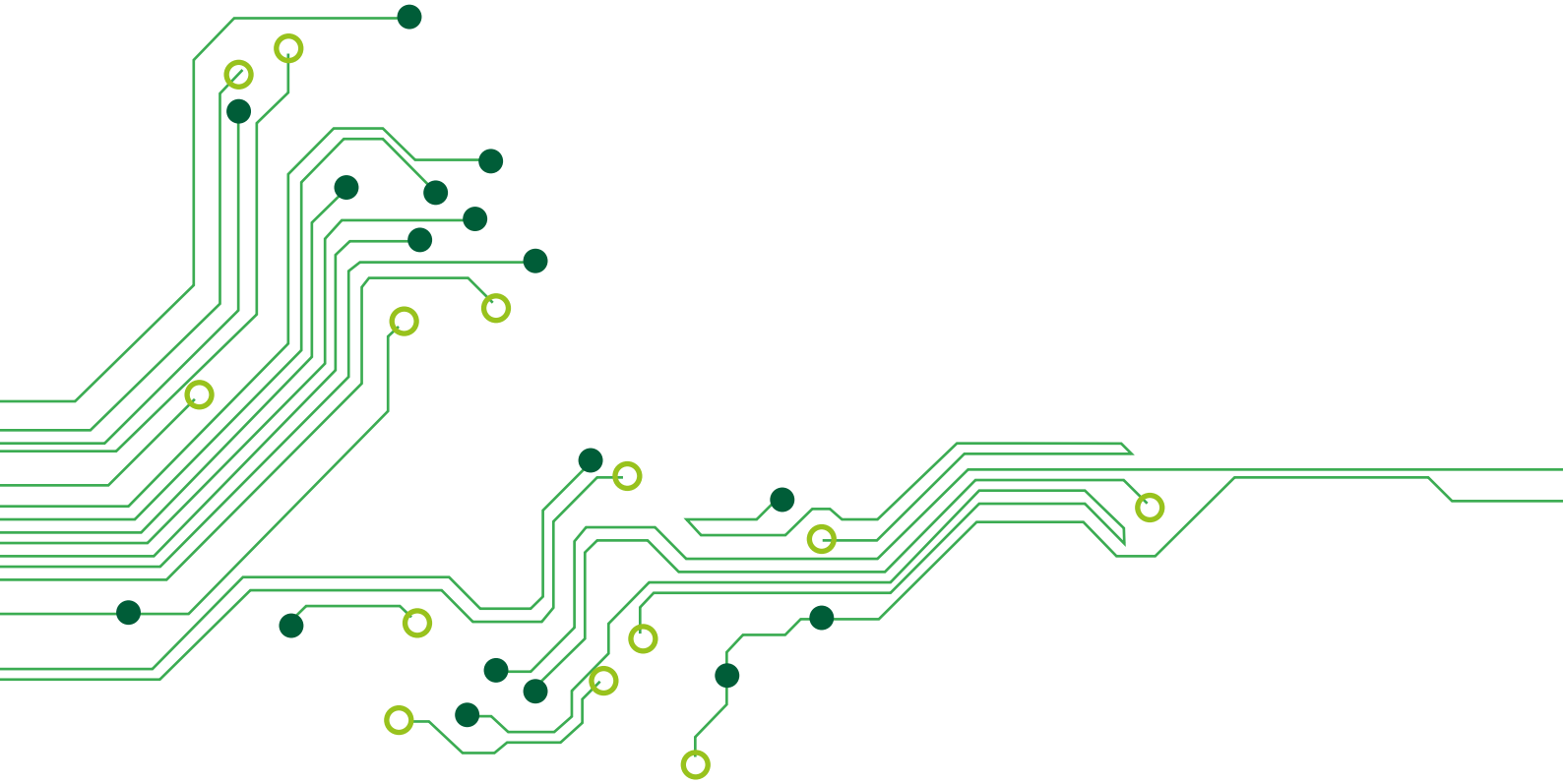
Figure 4.3. Organizational areas where AI is currently being deployed/ will be deployed in the future, (%), (multiple answers)

Case in Point: Marriott International's AI-powered Chatbot simplifies travel for guests throughout their journey

Marriott International, a hospitality industry leader, is expanding upon the heart of its hospitality, by creating additional points of engagement for guests, powered by AI.

Aloft Hotels, part of the hospitality industry's leader Marriot International, launched in 2017 ChatBotlr, a new chatbot powered by AI, that is available via text message and offers guests an additional way to make service requests through their smartphones. With ChatBotlr, the guest can text to request services, information about the hotel, listen to AloftLive playlist and connect with the front desk team during their stay, even when the guest is not on-property. All these with a five-second response time. Leveraging machine learning and natural language processing, ChatBotlr simplifies the travel experience and powers up better services for Aloft's guests, by being a communication channel that guests increasingly prefer and feel comfortable using.

Source: https://news.marriott.com/2017/09/marriott-internationals-ai-powered-chatbots-facebook-messenger-slack-alofts-chatbotlr-simplify-travel-guests-throughout-journey/



4.3 GREEK ORGANIZATIONS' AI INERTIA

If AI technologies are recognized by our sample to be truly disruptive, and are expected to change the very nature of business, then their systematic application should be visible. However, our analysis suggests that this is not the case. In fact, 54 percent of surveyed Greek executives feel that it is too early to invest in AI. They consider this to be at its early stages and prefer to wait for AI to mature (see Figure 4.4). To make up for the lost time, they believe that they can simply shift resources and accelerate adoption at a later date.

This view is also confirmed by the majority of the interviewed executives. As the CTO of a Greek major utilities company stated, "we aim to exploit AI and see areas where we can apply this to instigate growth, however this is not one of our top priorities right now".

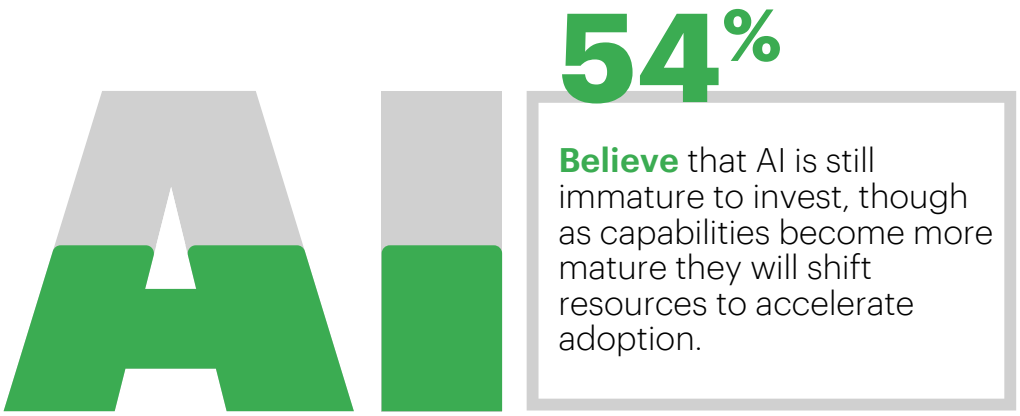


Figure 4.4. Greek executives' level of agreement regarding the maturity of AI capabilities and their willingness to invest in them, (%)

Greek executives' reluctance to actively invest in AI is evident from their organizations' experimentation on AI applications. Currently, almost none of the surveyed Greek executives (3 percent) has deployed sustainable AI programs within their organizations. Contrary to their global counterparts, where 1 out of 2 (45 percent) state that they already run cross-organizational AI programs[15].

At the same time, 1 out of 4 Greek business leaders stated that their organizations are at early stages of AI program investments (contrary to almost half of their global peers), while 1 out of 3 claim to implement AI on a trial mode, running pilot initiatives.

The survey also revealed that 1 out of 4 Greek executives has yet to start deploying any AI initiative but plans to do so in the following years. At the same time, 11 percent admits AI is simply not a strategic priority for their organizations (see Figure 4.5).

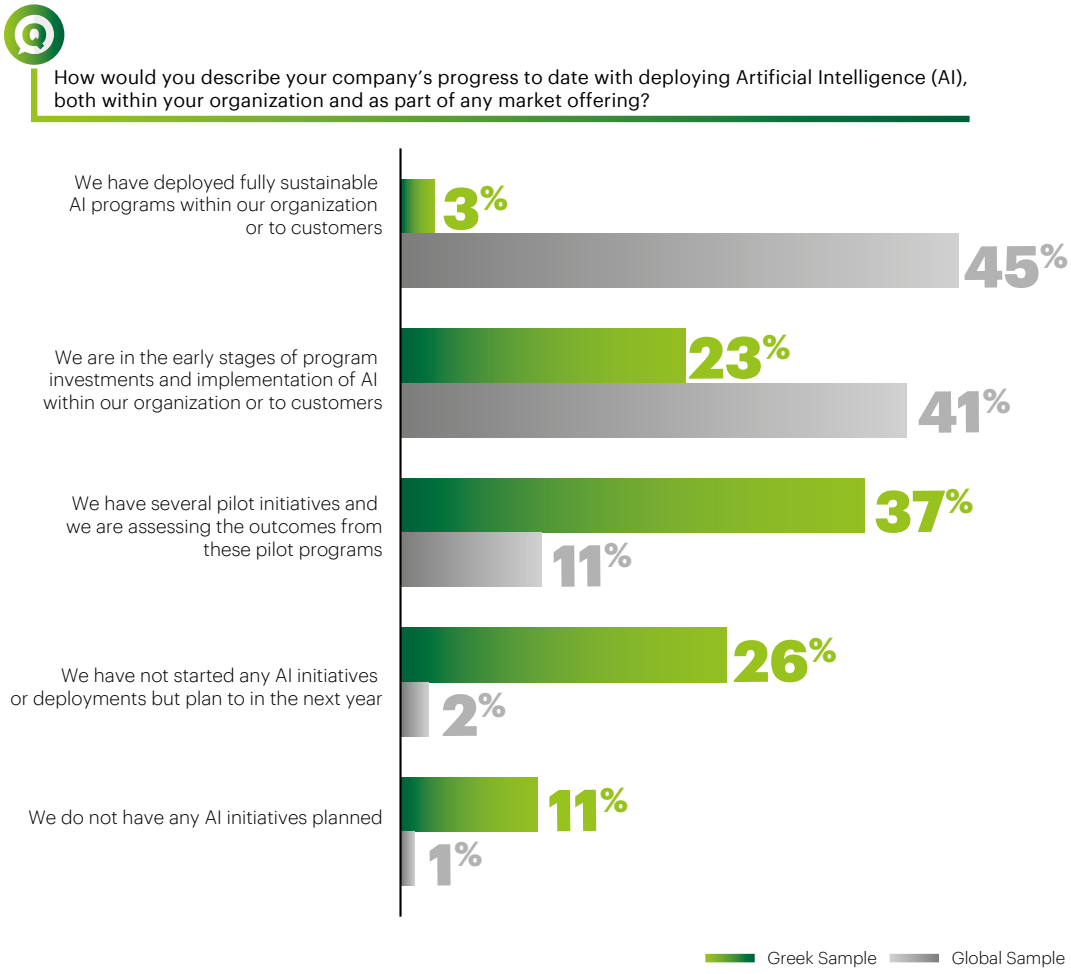


Figure 4.5. Greek organizations' progress to date with deploying AI, (%)

15. Accenture, AI The Momentum mindset, https://www.accenture.com/_acnmedia/PDF-73/Accenture-Strategy-AI-Momentum-mind-set-Exec-Summary-POV.pdf

Greek organizations have the ambition to make the most of AI, but the nuts and bolts of extracting value remain a challenge for many. What is stopping them? Our survey results suggest that Greek executives confront a number of challenges for the deployment of AI. Limited skills for implementing and using AI, IT infrastructure and low data quality are being identified as the three top-of-mind challenges (see Figure 4.6).

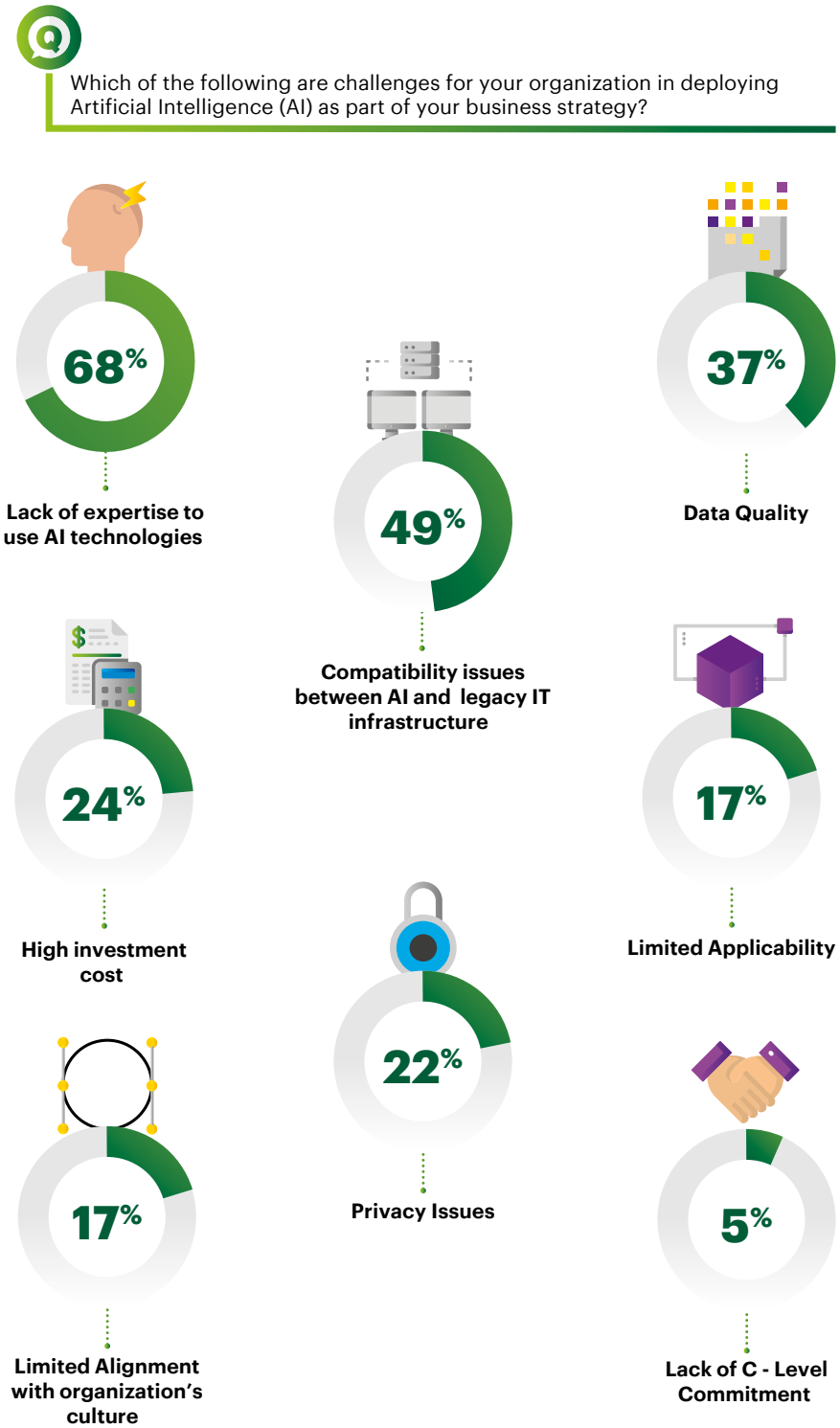
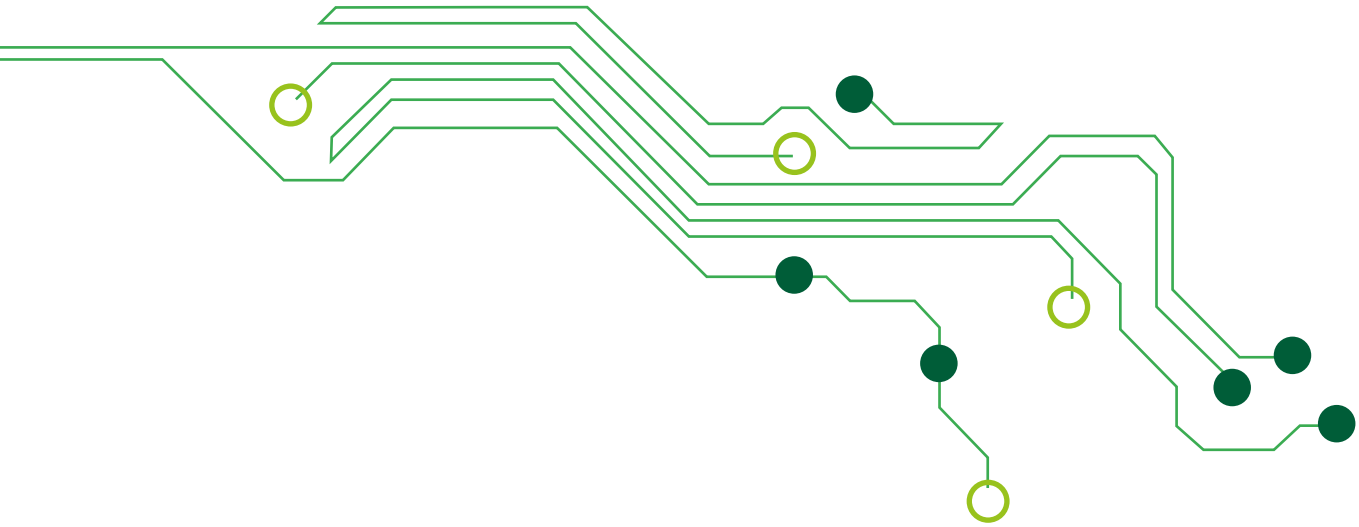


Figure 4.6. Greek organizations' biggest challenges regarding AI adoption, (%), (multiple answers)

In more detail, 2 out of 3 (68 percent) Greek executives mentioned that their organizations lack the required skills to design, implement and use AI technologies. At the same time, 1 out of 2 (49 percent) of Greek executives believe that their organizations suffer due to legacy IT infrastructure and its perceived incompatibility with new AI-led architectures. 37 percent state low data quality as a key challenge for designing and implementing an AI strategy. The limited data availability, the high data fragmentation and the wide dispersion, significantly lowers the ability of organizations to translate data into actionable insights and have been quoted as fundamental disablers. As stated by the CDO of a leading Greek bank "We are drowning in data, while still thirsting for insights".

Another key reason for not deploying AI has been stated to be the perceived high investment cost, combined with often unclear business cases. "With the current economic situation in Greece, our leadership does not have the luxury to invest on long-term AI initiatives, where growth or efficiencies will not be realized from day one", stated the CTO of a large Greek retail organization.

Interestingly though, only 5 percent of the surveyed business leaders cited the lack of C-Level commitment as a major concern. This indicates that Greek executives claim to be ready, yet have still to show tangible evidence of their commitment.



4.4 RESPONSIBLE AI - WITH GREAT POWER COMES GREAT RESPONSIBILITY

AI can be understood to be a profoundly human science. The technologies are built by people and, even though AI systems can train themselves, they will still require oversight and molding by a human hand, as Dr Athina Kanioura, Chief Analytics Officer and Global Lead for Accenture Applied Intelligence states[16]. AI needs to be built in a way that earns trust, protects against bias, and respects privacy as a fundamental human right. Greek executives appear to agree with this statement. In fact, 1 out 2 business leaders consider the setup of an AI ethics framework within their organizations as a necessity in the near future. This framework will focus on ensuring the ethical, transparent and accountable use of AI technologies in a manner consistent with user expectations, organizational values and societal laws and norms (see Figure 4.7).

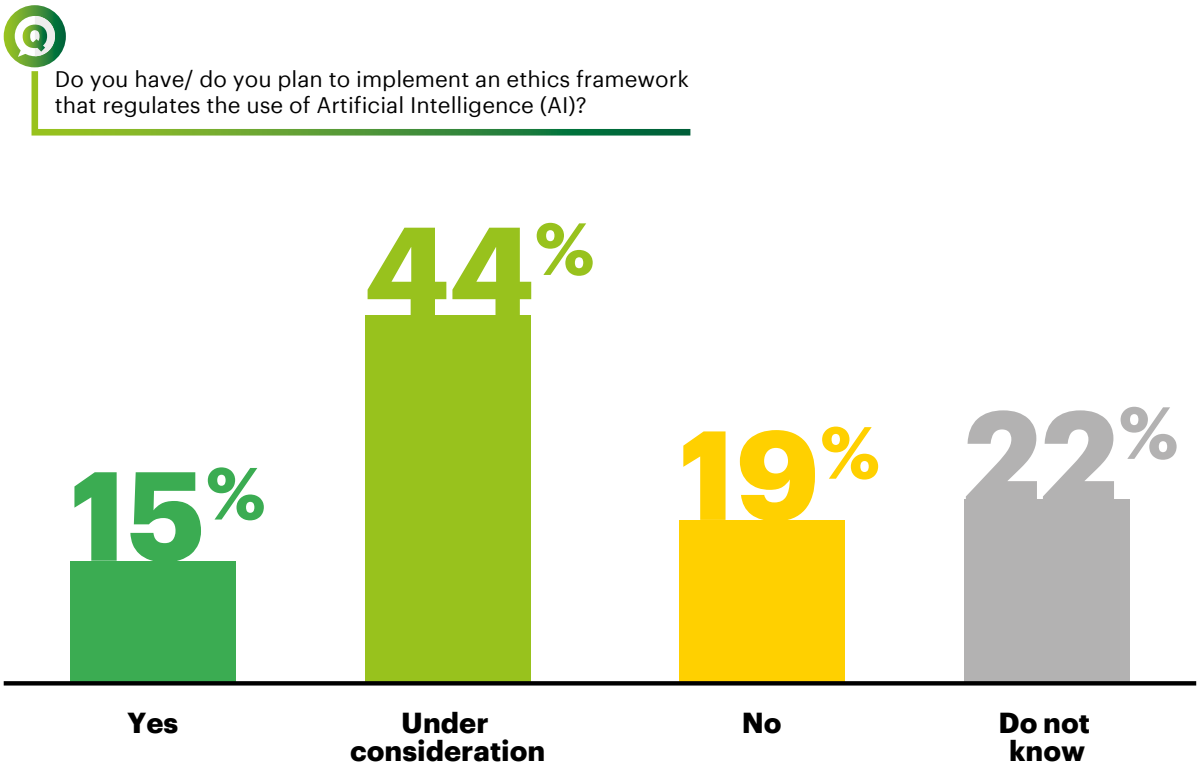
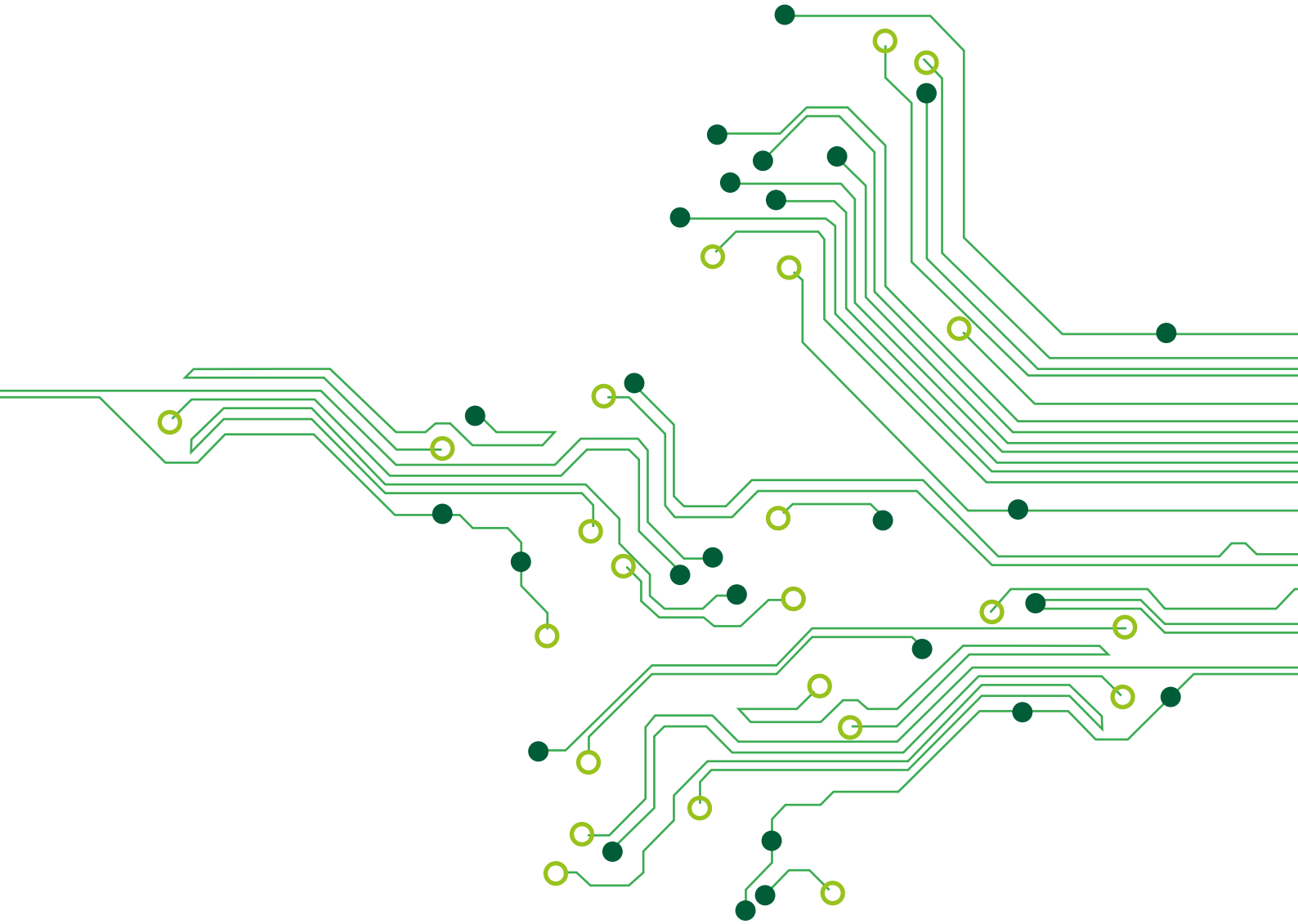


Figure 4.7. Greek executives' consideration about implementing an AI ethics framework, (%)

16. Forbes Insights in association with Accenture, Avanade, Microsoft (2019), "Human AI Is Here", https://www.accenture.com/_acnmedia/PDF-94/Forbes-Accenture-Avanade-Microsoft-AI-Research%E2%80%93Full-Report.pdf

Such a framework will be key to address major AI risks and concerns stated by executives.

In more detail, nearly 70 percent of Greek executives are fearful of potentially wrong AI-driven recommendations. 32 percent fear that their customer attrition rate may increase due to AI failures. The lack of trust in AI seems to affect both customers and businesses. In addition, 1 out of 2 Greek executives link AI to rising cyber vulnerability. This can be translated in two ways. The first is that criminals, rogue state actors, unscrupulous competitors or inside threats can potentially manipulate organizations' fledgling AI programs; for example, a shady competitor could attack another company's AI pricing algorithm. The second is that attackers can potentially use AI in a variety of ways to exploit vulnerabilities in their victims' defenses; a cyber-thief targets a financial institution's AI-controlled customer recognition software (see Figure 4.8).



Which would you consider to be the top Artificial Intelligence (AI)-related risks that concern your organization?

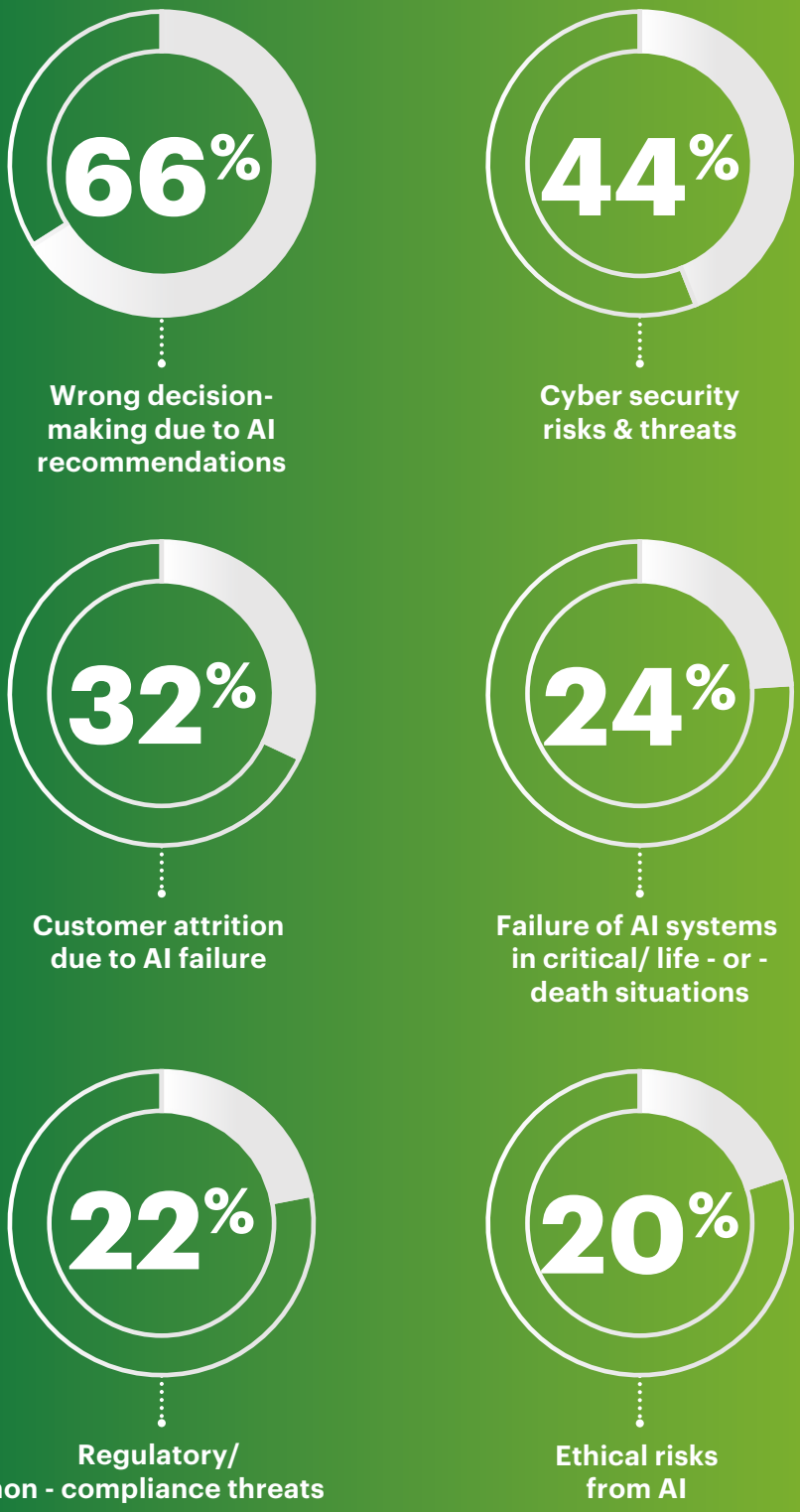
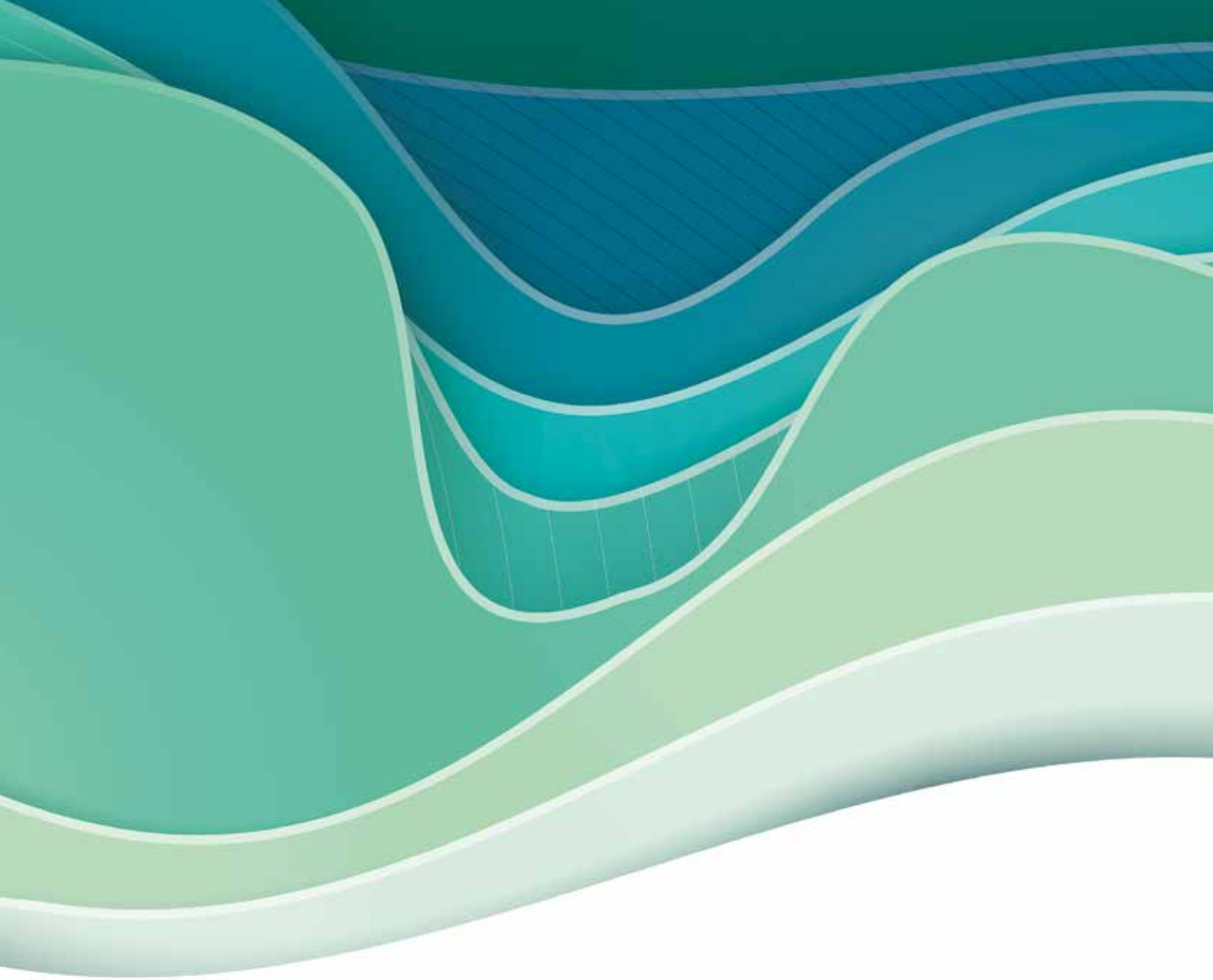
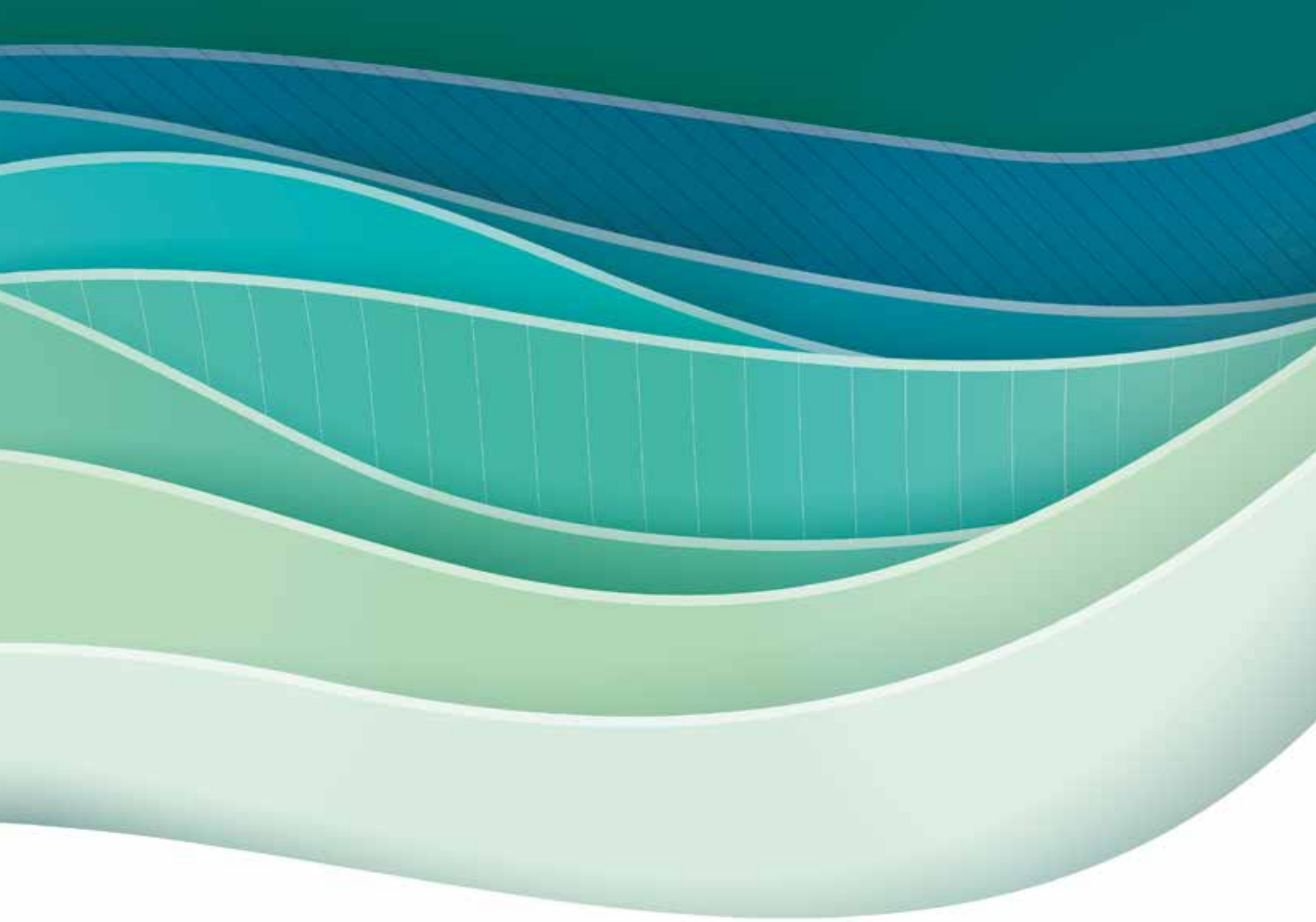


Figure 4.8. Greek organizations' top AI-related risks, (%), (multiple answers)





4.5 CONCLUSION

Greek captains of industry recognize the strategic importance of AI. However, they hesitate to invest in it. They have identified several issues that slow them down, such as, the lack of technical expertise, the low quality of data and the fear of error.

Organizations' hesitance can potentially place them at an immediate disadvantage. Followers, albeit fast, can lose critical intelligence in building experience. This can be hard to make up.

5. AI AS A DRIVER FOR GREECE'S GROWTH

5.1 INTRODUCTION

Traditionally, capital and labor are the "factors of production" that drive growth in an economy. Growth occurs when the stock of capital or labor increase, or when they are used more efficiently. The growth that comes from innovations and technological change in an economy is captured by the Total Factor Productivity measure (TFP). Economists have always seen new technologies to drive growth through their ability to enhance this measure. This made sense for the technologies that we have seen until now. These may have dramatically boosted productivity but we had limited evidence to suggest that they radically transformed and "augmented" the existing workforce.

Today, we are witnessing the takeoff of AI. Many see AI as similar to past technological inventions.

But what if AI has the potential to be not just another driver of TFP, but an entirely new factor of growth? How can this be?

The key is to see AI as a capital-labor hybrid. AI carries the potential to augment human activities, replicate them at much greater scale and speed, and to even perform some tasks beyond the capabilities of humans. Not to mention that in some areas it has the ability to learn faster than humans, if not yet as deeply. This creates a symbiotic relationship between labor and machines and empowers humans with new capabilities. Similarly, AI can take the form of physical capital[17], such as robots and intelligent machines. Unlike conventional capital, it can actually improve over time, thanks to its self-learning capabilities.

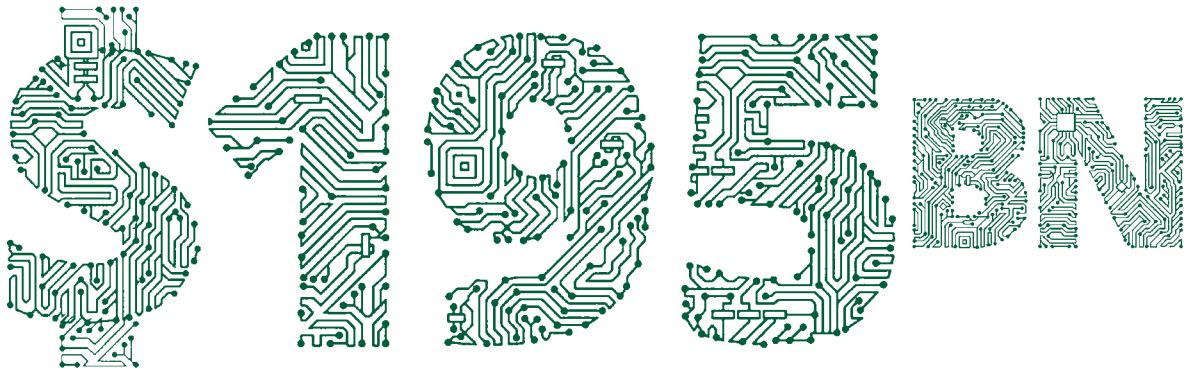
To understand the value of AI as a new factor of growth for Greece, Accenture, in association with Frontier Economics, applied the AI Growth Model. This model enables us to capture the projected economic growth that AI can infuse into the Greek economy. A point of caution: the impact of such a technology is not instantaneous though. Whilst immediately visible, its economic impact and long-term consequences on economies do take time to realize. For this reason, our modelling extends to assess a 15-year period, from 2020 to 2035.

17. In economic theory, physical capital is one of the three factors of production. It consists of tangible, man-made goods that assist in the process of creating a product or service. The machinery, buildings, office or warehouse supplies, vehicles, and computers that a company owns are all considered part of its physical capital. Physical capital items, such as manufacturing equipment, also fall into the category of fixed capital, meaning they are reusable, and not consumed during the production process.

5.2 FACTORING IN AI TO BOOST THE NATIONAL ECONOMIC GROWTH

To estimate the economic potential of AI we compared two scenarios for Greece. The first is the "baseline" scenario, which shows the expected annual economic growth rate under current assumptions over a 15-year period (in 2035)[18]. The second is the "AI scenario", which shows the expected economic growth including the impact of AI.

Our results reveal increased capacity for value creation. We find that AI has the potential to lead to a cumulative $195 billion GDP uplift over a 15-year period (from 2020 to 2035) - a powerful remedy to the limited growth experienced in the recent years (see Figure 5.1).



cumulative GDP uplift
over the next 15 years

Source: Accenture Analysis, Frontier Economics

Figure 5.1. Projected cumulative GDP uplift in Greece, 2020 - 2035, (US$ Bn., constant 2010 prices)

18. The "baseline" scenario has been estimated based on IMF data and applying Oxford Economics' and IMF's forecasted growth rates.

5.3 DISSECTING THE ADDITIONAL GDP GROWTH

THE THREE CHANNELS OF AI-LED GROWTH

To further investigate the channels through which AI can contribute to Greece's GDP growth over the next 15 years, the AI Growth Model provides additional layers of analysis.

As a new factor of growth, AI can increase a country's economic performance through three "channels": the "intelligent automation", the "labor and capital augmentation" and the "innovation diffusion" (see Figure 5.2).

INTELLIGENT AUTOMATION

The new AI-powered virtual workforce that automates tasks, solves miscellaneous problems and has the ability to learn by itself.

LABOR & CAPITAL AUGMENTATION

The enhancement of the existing workforce by complementing human capabilities and the reinforcement of current capital stock

INNOVATION DIFFUSION

The stimulation of innovation and the domino-effect it entails as Artificial Intelligence diffuses through the economy.

Figure 5.2. The three "channels" of AI-led growth

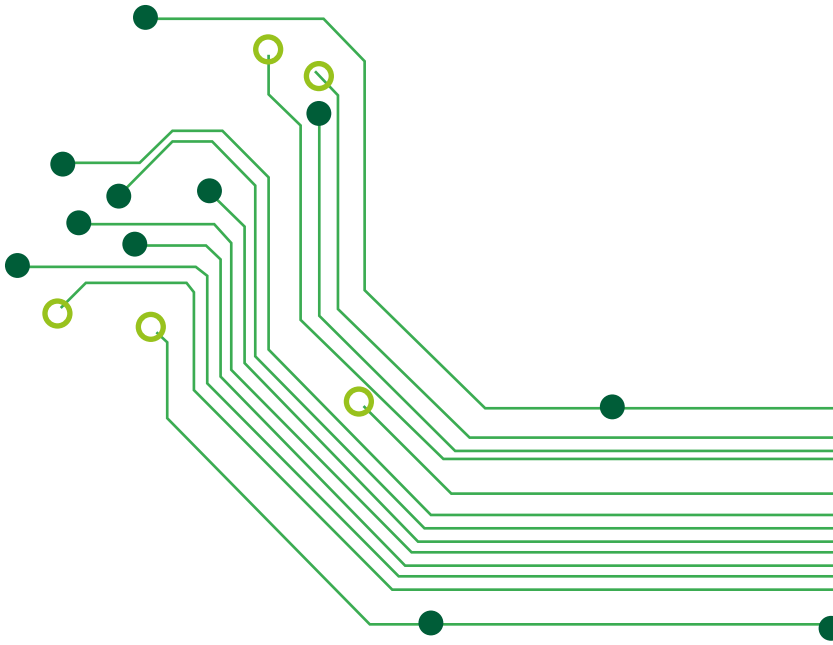
INTELLIGENT AUTOMATION

The first feature is its ability to automate complex physical world tasks that require agility and adaptability. Consider the work of retrieving items in a warehouse where companies have relied on people's ability to maneuver in crowded spaces and avoid moving obstacles. Now, robots from California-based Fetch Robotics use lasers and 3D depth-sensors to navigate safely and work alongside warehouse workers[19]. Used in tandem with people, the robots can handle the vast majority of items in a typical warehouse.

Whereas traditional automation technology is task specific, the second distinct feature of AI-powered intelligent automation is its ability to solve problems across industries and job titles. For instance, Amelia - an AI platform with natural language processing capabilities developed by the US firm IPsoft - can support maintenance engineers in remote locations. Having read all the manuals, Amelia can diagnose a problem and suggest a solution[20].

The third and most powerful feature of intelligent automation is self-learning, enabled by repetition at scale. The wide adoption of "chatbots" - a computer program that conducts a conversation via auditory or textual methods - is a good example. Like a conscientious employee, these chatbots recognize the gaps in their own knowledge and take steps to close them. If chatbots are presented with a question that they cannot answer, they escalate it to a human colleague; then they observe how the person solves the problem.

The self-learning aspect of AI represents a fundamental change in the way work is done. Whereas traditional automation capital degrades over time, intelligent automation assets constantly improve.



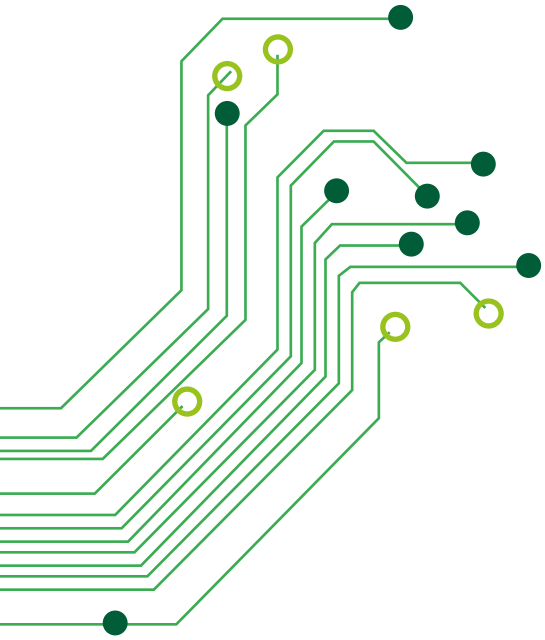
19. Robotics Business Review, "Fetch robotics," 2015.
20. Finders, K., "IPsoft gives automation platform a face", September 30, 2014.

LABOR AND CAPITAL AUGMENTATION

A significant part of the economic growth from AI will come not from replacing the existing labor and capital, but from enabling them to be used much more effectively.

AI can augment labor by complementing human capabilities, offering employees new tools to enhance their natural intelligence. Praedicat, an American company providing risk modeling services to property and casualty insurers, is using AI technologies to improve underwriters' risk-pricing abilities. Its AI platform reads more than 22 million peer-reviewed scientific papers to identify serious emerging risks. As a result, underwriters can not only price risk more accurately, but also create new insurance products[21].

AI can also improve capital efficiency - a crucial factor in industries, where it represents a large sunk cost. For instance, in manufacturing, Japanese industrial robotics company Fanuc has teamed up with Cisco and other firms to create a platform to reduce factory downtime - estimated at one automotive manufacturer to cost $20.000 per minute[22]. The Fanuc Intelligent Edge Link and Drive (FIELD) system, an analytics platform powered by advanced machine learning, captures and analyzes data from disparate parts of the manufacturing process to improve manufacturing production. The platform has been deployed in an 18-month "zero downtime" trial at one manufacturer, where it realized significant cost savings[23].



21. https://www.praedicat.com
22. Tantzen, B., "Connected machines: Reducing unplanned downtime and improving service", October 6, 2015.
23. FANUC, "Manufacturing automation leaders collaborate: Optimizing industrial production through analytics", April 18, 2016.

INNOVATION DIFFUSION

One of the least-discussed benefits of AI is its ability to stimulate innovation as it diffuses through the economy. Take driverless vehicles for example. A combination of lasers, global positioning systems, radars, cameras, computer vision and machine learning algorithms can enable a driverless vehicle to sense its surroundings and act accordingly. Not only are Silicon Valley technology companies entering the market, but traditional companies are also building new partnerships to stay relevant. For instance, Ford is working with Massachusetts Institute of Technology and Stanford University on this area[24].

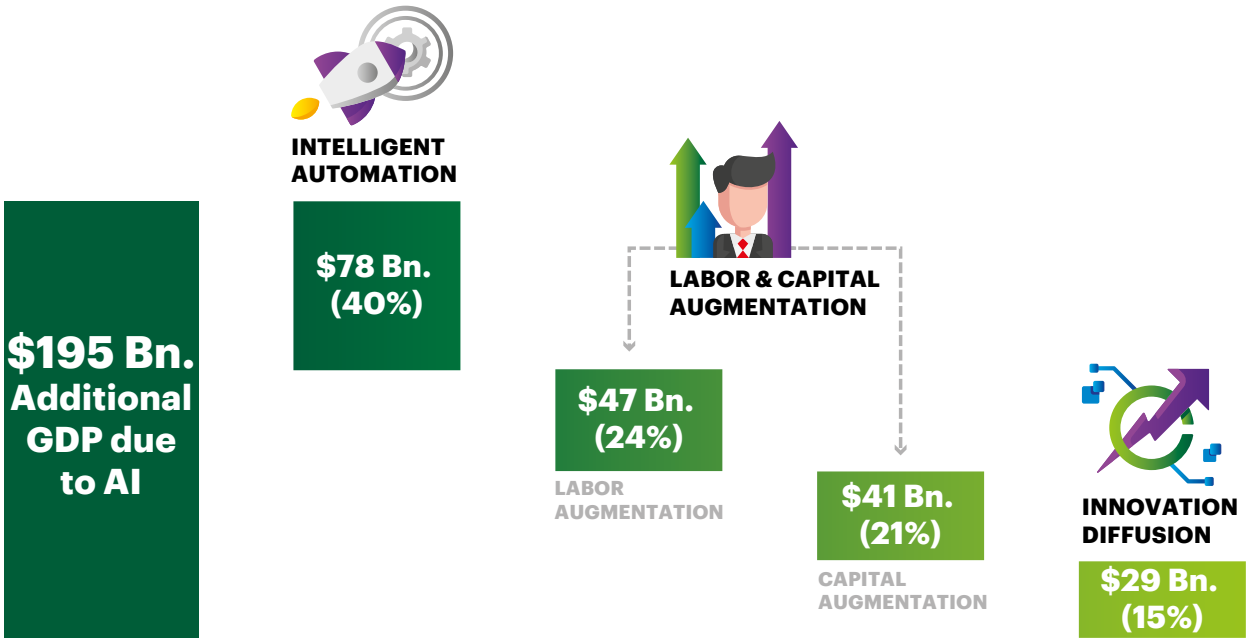
As innovation begets innovation, the potential impact of driverless vehicles on economies could eventually extend well beyond the automotive industry. Mobile service providers could see even more demand from subscribers as drivers, now free to enjoy leisure activities while traveling, spend more time on the Internet, which, in turn, could create new advertising opportunities for the service providers and selling opportunities for their retailer partners. The insurance industry could create new revenue streams from the masses of data that self-driving vehicles generate. By combining vehicle data with other streams such as smart phones and public transport systems, they could not only build up a more complete picture of their customers, but they could also create new policies that insure total customer mobility, not just driving.

There could even be significant social benefits. Driverless vehicles are expected to dramatically reduce the number of road accidents and traffic fatalities, making the technology potentially one of the most transformative public health initiatives in human history. They could also give back independence to people who cannot drive due to disability, enabling them to take up jobs from which they were previously excluded. And, even among those who can drive, driverless cars will make traveling far more convenient, freeing up time that people can dedicate to work or leisure.

24. Ford, "Ford teams up with MIT and Stanford to advance automated driving research," January 22, 2014.

ANALYZING THE AI-LED ADDITIONAL GDP GROWTH

Our analysis indicates that "intelligent automation" and "labor and capital augmentation" channels are expected to drive the majority of benefits for Greece. In more detail, the Greek economy will be boosted by additional $78 billion due to the introduction of AI's intelligent automation capabilities into its economic and social fabric. At the same time, AI is expected to enable the Greek human resources and capital to become more productive, leading to an additional $88 billion GDP increase. Finally, the innovation, expected to be stimulated due to AI technologies, is estimated to contribute an additional $29 billion boost to the Greek economy over the next 15 years (see Figure 5.3).



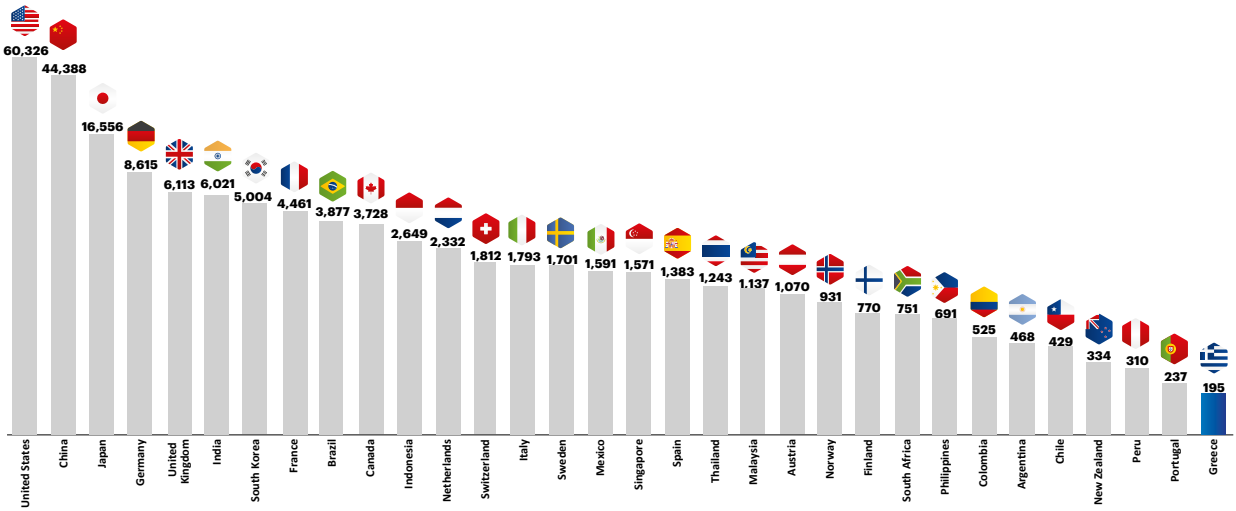
Source: Accenture Analysis, Frontier Economics

Figure 5.3. Greece's cumulative GDP Uplift, 2020 - 2035, breakdown per "channel" of AI Growth (US$ Bn., constant 2010 prices, %)

5.4 SEIZING AI'S FULL POTENTIAL - THE NATIONAL ABSORPTIVE CAPACITY INDEX

Although the first impression of a likely AI-driven GDP uplift of $195 billion to the Greek economy appears promising, this picture is challenged when we juxtapose this to that of its global counterparts.

According to the AI Growth Model, Greece is positioned at the lower end of the cumulative AI-driven GDP uplift curve. In fact, a more granular view on the cumulative GDP uplifts of different countries, indicates that the rift between top performers and countries scoring near the bottom appears notably wide. By 2035, large economies like the United States, China, Japan and Germany are forecasted to add more than $8 trillion to their economies (see Figure 5.4).



Source: Accenture Analysis, Frontier Economics

Figure 5.4. Cumulative GDP uplift for 32 countries due to AI Impact, 2020 - 2035, (US$ Bn., constant 2010 prices), logarithmic scale

At the other side of the spectrum, several countries including Argentina, Chile, Peru, Portugal and Greece still appear behind with regards to exploiting the full potential of AI and using this set of technologies as a means to build national competitiveness and stimulate economic growth.

But why is this divergence observed? And what is the key reason that prevents countries like Greece from unlocking the full potential of AI? The answer lies in the countries' "National Absorptive Capacity" - their ability and speed to weave innovation into their economic and social fabric and to capitalize on the economic potential of new technologies.

ASSESSING GREECE'S PERFORMANCE ON THE NAC INDEX

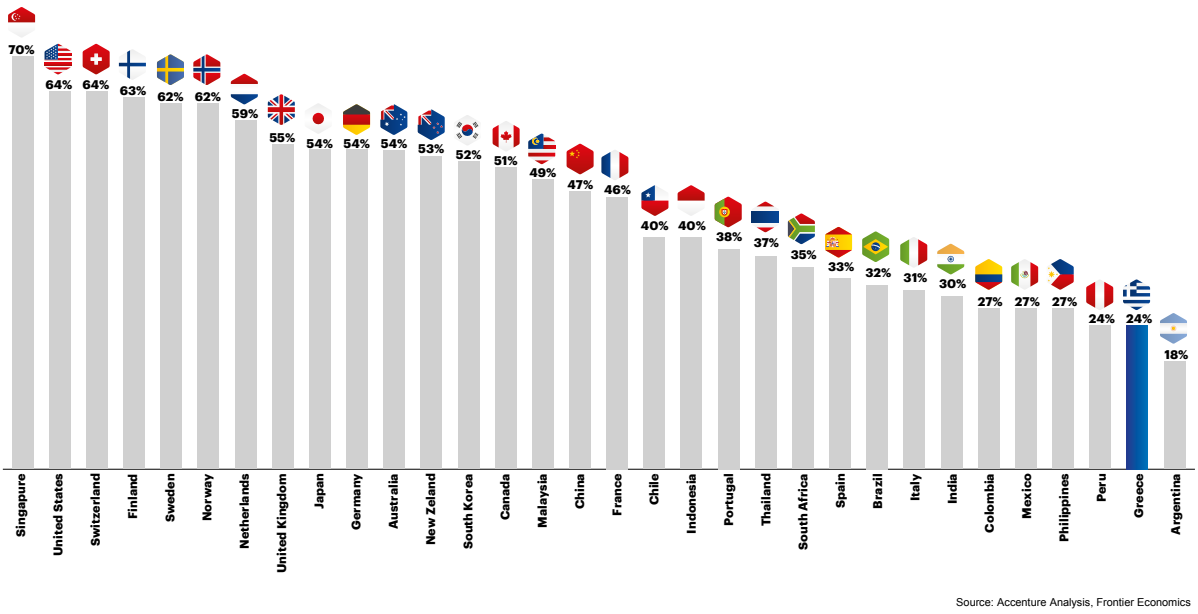
Historically, a number of countries outperformed others when it came to capitalizing on the economic potential of new technologies. The introduction of electric power in the industrialized world at the turn of the twentieth century offers a clear example of this dynamic in action. While many countries stood at about the same starting line, the United States became the world leader in electrification. Why? Because, it more rapidly embedded the new technology in the wider economy and altered production and organizational structures to take advantage of it.

We see an equally revolutionary potential with AI. AI has the potential to disrupt industries and societies alike and to boost growth in economies worldwide. But to do so, countries need to have in place the right enabling conditions.

To evaluate Greece's national absorptive capacity, that is its ability to infuse innovation into its economy and society and capitalize on the economic potential of new AI technologies, the study applied the "National Absorptive Capacity" Index (NAC)[25].

According to the NAC Index, Greece scores at the lower end of the curve. In fact, the overall score of 24 percent confirms Greece's relatively weak position against its global peers (see Figure 5.5).

A picture consistent with the results of the Digital Economic Opportunity Index (DEOI) for Greece, as this was presented in Accenture's study "Digital Greece: The path to Growth" in 2017[26].



Source: Accenture Analysis, Frontier Economics

Figure 5.5. National Absorptive Capacity (NAC) Index for 32 countries, 2019, (%)

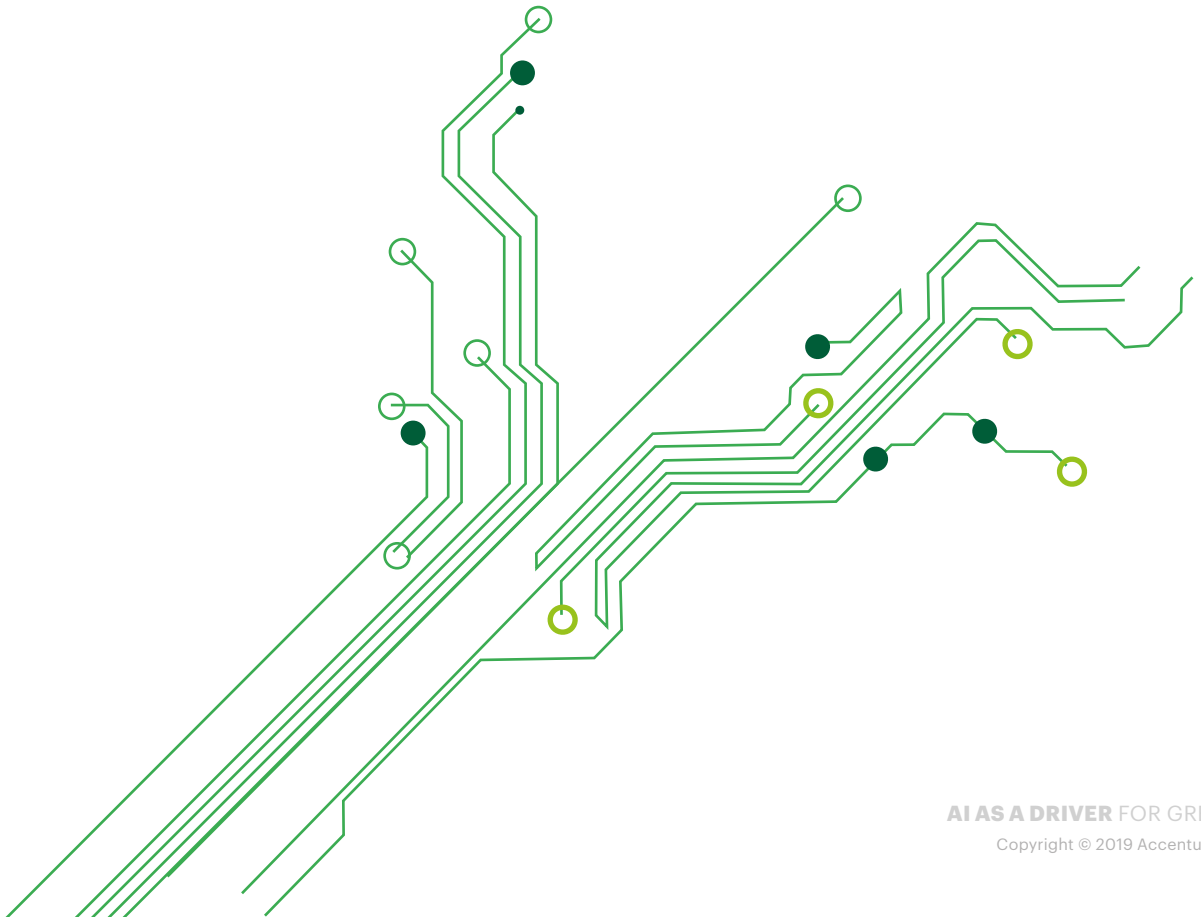
25. Absorptive capacity is defined in economics and business administration as "the ability to recognize the value of new information, assimilate it, and apply it to commercial ends". It is studied on individual, group, firm, and national levels. The structure of the NAC is based on the OECD's Guidelines for collecting and interpreting innovation data (the 'Oslo manual'), and specifically on its third edition: https://www.oecd-ilibrary.org/science-and-technology/oslo-manual_9789264013100-en. Additional bibliography is referenced in the Study Notes section.

26. Accenture Greece, "Digital Greece: The path to Growth" https://www.slideshare.net/accenture/digital-greece-the-path-to-growth

HOW DOES GREECE'S NAC INDEX AFFECT THE COUNTRY'S ECONOMIC POTENTIAL OF AI?

Greece scores low on the NAC Index. But how does this affect the country's economic potential of AI? To investigate this further, we compared the results of two different scenarios generated by the AI Growth Model:

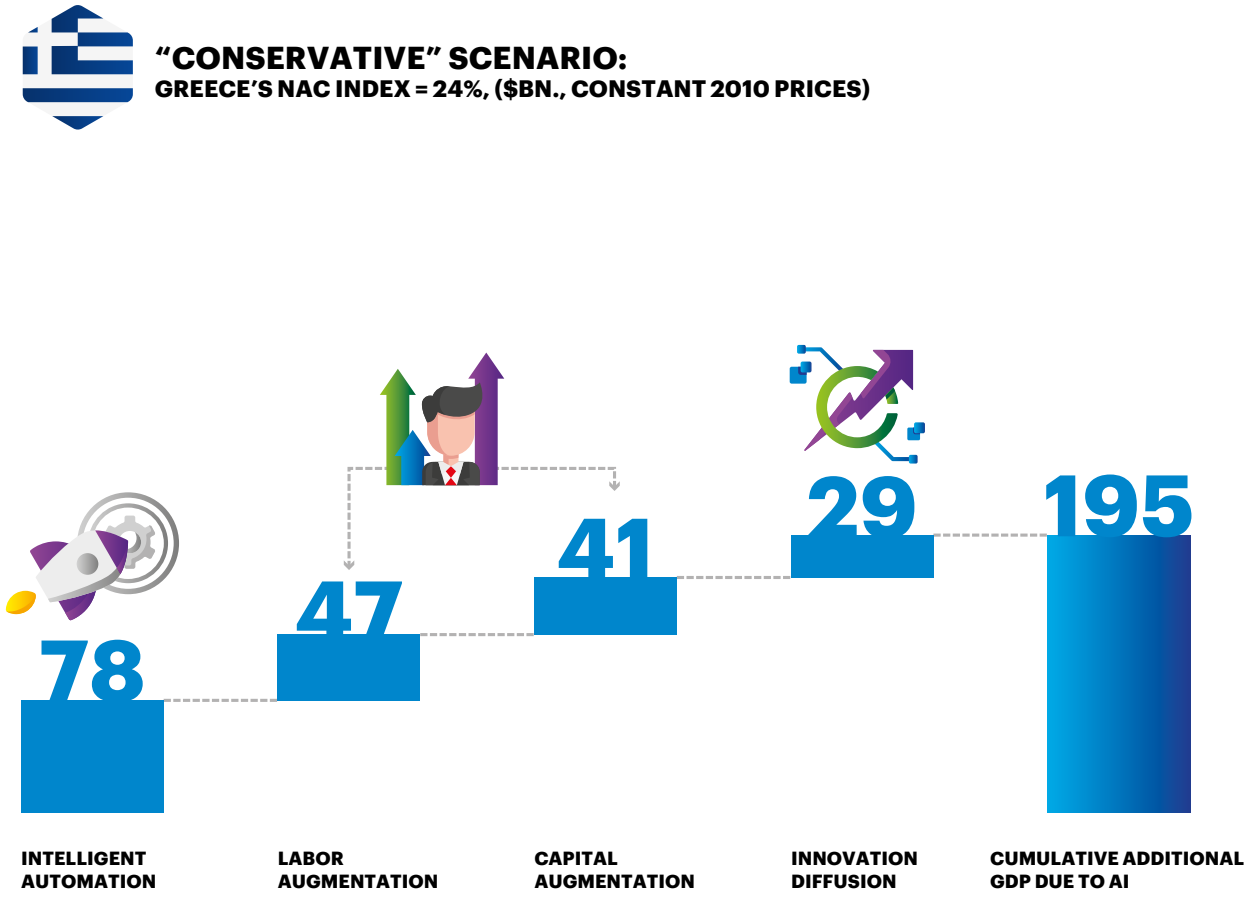
- **"Conservative" Scenario:** The economic impact of AI on the Greek GDP, if today's investments and policy trend continue to progress on their planned path (as presented in paragraph 5.2).
- **"All hands on deck" Scenario:** The economic impact of AI if Greece undertakes additional measures, in order to improve technology adoption and economic diffusion. In fact, we examined the scenario where Greece improves its NAC index by 14 percentage points and reaches Portugal's state (38 percentage points).



"Conservative" Scenario:

The economic impact of AI on the Greek GDP, if today's investments and policy trend continue to progress on their planned path

Greece's current position on the NAC Index and the projected cumulative GDP uplift due to AI implementation represents the first scenario. As indicated before, our results show that under these conditions, AI would add $195 billion to cumulative Greek GDP by 2035 (see Figure 5.6).



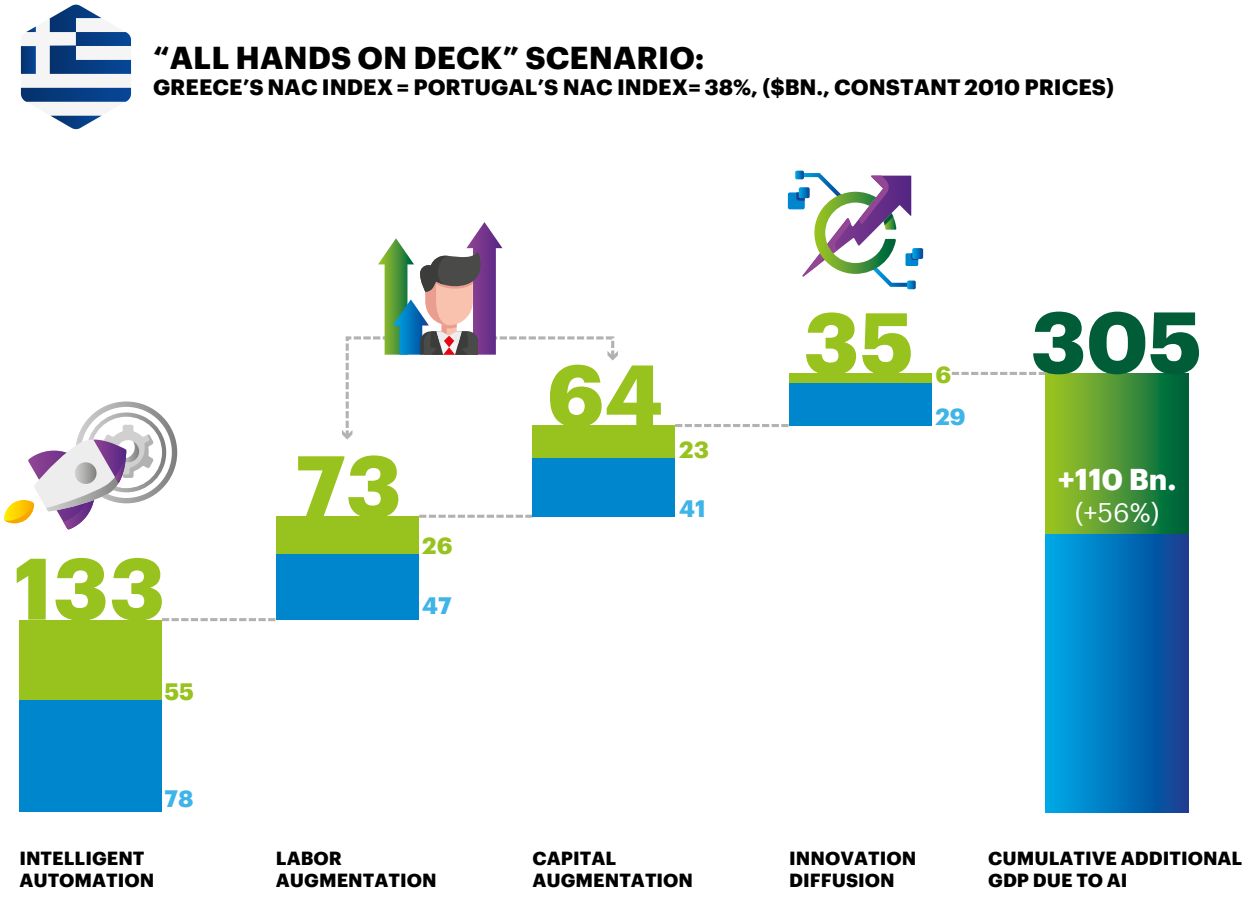
Source: Accenture Analysis, Frontier Economics

Figure 5.6. "Conservative" Scenario - Greece's cumulative GDP Uplift due to AI impact, 2020 - 2035, breakdown per "channel" of AI Growth (US$ Bn., constant 2010 prices)

"All hands on deck" Scenario:

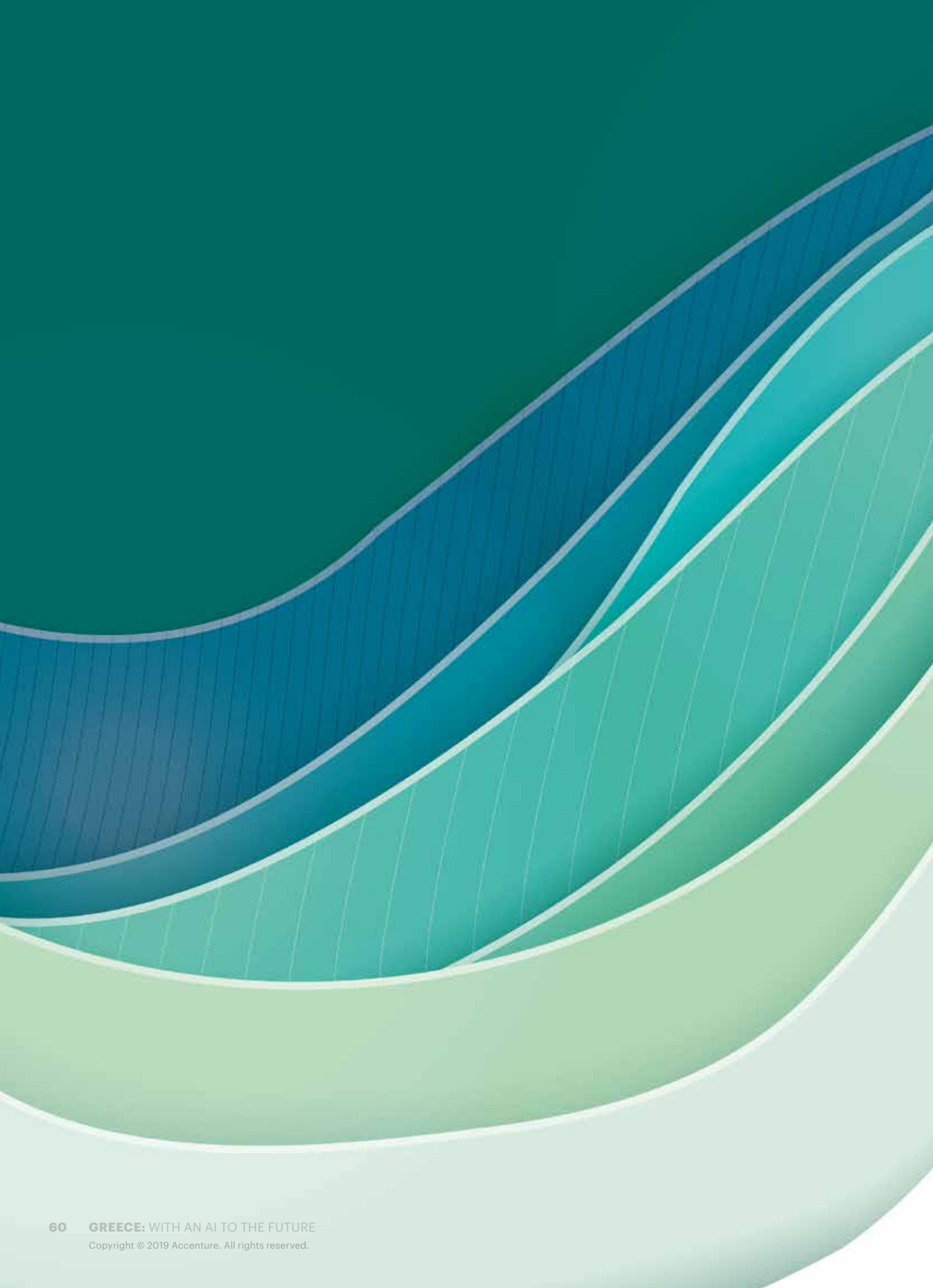
The economic impact of AI if Greece undertakes additional measures, in order to improve technology adoption and economic diffusion and reaches Portugal's NAC Index (38 percentage points).

In the latter scenario, we assigned Greece a higher score on the NAC Index, in order to match Portugal's Index. Here we found that the cumulative value would jump to $305 billion during the same 15-year period. This translates in an approximate 56 percent increase ($110 billion in absolute values) on the outcome of the "Conservative" Scenario (see Figure 5.7).



Source: Accenture Analysis, Frontier Economics

Figure 5.7. "All hands on deck" Scenario - Greece's Cumulative GDP Uplift due to AI impact, 2020 - 2035, breakdown per "channel" of AI Growth, (US$ Bn., constant 2010 prices)



5.5 CONCLUSION

Greece's weak position on the NAC Index creates a burning platform for the country. Greece needs to quickly create the right conditions to accelerate the economic diffusion of new technologies in its social and economic fabric. Should the country continue to move at current speed, the gap between frontrunners and Greece is expected to widen and the country will risk to be left behind.

To avoid such an "inevitable future", Greek policy makers and captains of industry need to define an AI vision and architect an actionable plan to infuse AI into the Greek economy and society. AI has the potential to have a profound effect on the growth of the Greek economy, yet the earlier we get on the race, the faster the learning, the greater the impact.

6. NEXT STEPS FOR POLICY MAKERS AND BUSINESS LEADERS

6.1 INTRODUCTION

We are amid a major digital revolution and AI is set to compound this. Nevertheless, Greece appears to have taken nascent steps to grasp the opportunities that it can offer.

A pressing question is born: what can Greece do to accelerate the economic diffusion of new technologies in its social and economic fabric and to fully seize the AI opportunity?

The time to act is now. In order not to lose momentum, Greek policy makers and captains of industry need to work in tandem to harness the benefits of AI.

Policy makers must be prepared to address the challenges that go along with it. Namely, organizational, technological, political, ethical and social. To achieve this, policy makers shall gear their efforts and act towards the accomplishment of four goals:

- Accelerate Greece's digital rotation
- Prepare the next generation for an AI future
- Advocate a code of ethics for AI
- Address the redistribution effects and ensure inclusion

At the same time, business leaders shall integrate AI into their strategies and create the new AI playbook that will empower people to do what they do best - imagine, innovate and create. For this, they shall:

- Step beyond automation towards innovation and true growth
- Organizationally experiment and learn
- Take data "off the bench" and "into the game"
- Reimagine work and move from workforce planning to work planning
- "New-Skill" to collaborate with intelligent machines

6.2 FOR POLICY MAKERS: CLEARING THE PATH TO AN AI FUTURE

ACCELERATE GREECE'S DIGITAL ROTATION

Greece's policy makers carry the responsibility to enact a dual role to ensure that Greece is digitally transformed. They must urgently act as "digital enablers" for the Greek society and economy and holistically adopt digital for the Public Administration.

To start with, policy makers need to ensure that a set of foundational initiatives are in place. These act as the transformation enablers and instigate the mass adoption of digital across the nation. In more detail, policy makers shall:

- **Ensure Connectivity and set the conditions for accelerating the deployment of nation-wide Next Generation Access (NGA) networks:** Policy makers shall ensure that a favorable legislative and regulatory environment is in place for private investments in NGA networks. In addition, public resources shall focus on the expansion of next generation broadband infrastructure in areas, which, in terms of NGA infrastructure, will remain "white NGA areas".

- **Exploit Open Data:** The introduction of a clear and actionable Open Data strategy and governance model shall ensure that Open Data is efficiently collected, managed and exploited for the development of new products and services for the common good. Key levers for enforcing data openness and interoperability across the Public Administration, will be the development of open standards and interoperability policies that will enable free data sharing and the interconnection of basic Public Administration registries.

Policy makers shall also focus internally to digitalize the Public Administration and to transform it from a being a passive fulfillment service provider to an active, user-centric value creator. Public Administration's digital transformation requires policy makers to:

- **Redesign customer-centric, omnichannel public services:** Policy makers shall redesign public services that will span across the online and offline worlds and will demonstrate higher levels of personalization for citizens and businesses alike.

- **Adopt a multi-speed IT architecture:** Policy makers shall move away from on-premise solutions and toward the implementation of digital, cloud and as-a-Service solutions, assets and offerings, to support greater flexibility, scalability and cost efficiency. In addition, the design and implementation of a multi-speed IT architecture is also suggested. This will enable the Public Administration to manage the large, complex legacy operational systems that are slow to change but currently maintain the rhythm of business operations, while at the same time create a more nimble, agile "new IT" that supports the digital services.

- **Reshape the Sourcing and Partnering Mechanism:** Prerequisite for the digitalization of the Public Administration, consists the updating of its sourcing and partnering mechanism, in order to become leaner and more efficient. In this context, policy makers shall extend the use of the existing central public procurement portal to significantly reduce costs and accelerate the procure-to-pay process. Sourcing strategies shall also move away from the traditional procurement processes. "Waterfall" approaches are long and complex. Exhaustive RFPs shall be replaced. "Pharaonic", detailed designs and budgets often become obsolete or irrelevant by the time the actual project is about to be implemented. The new sourcing policies shall provide the missing flexibility to support agile software development.

PREPARE THE NEXT GENERATION FOR AN AI FUTURE

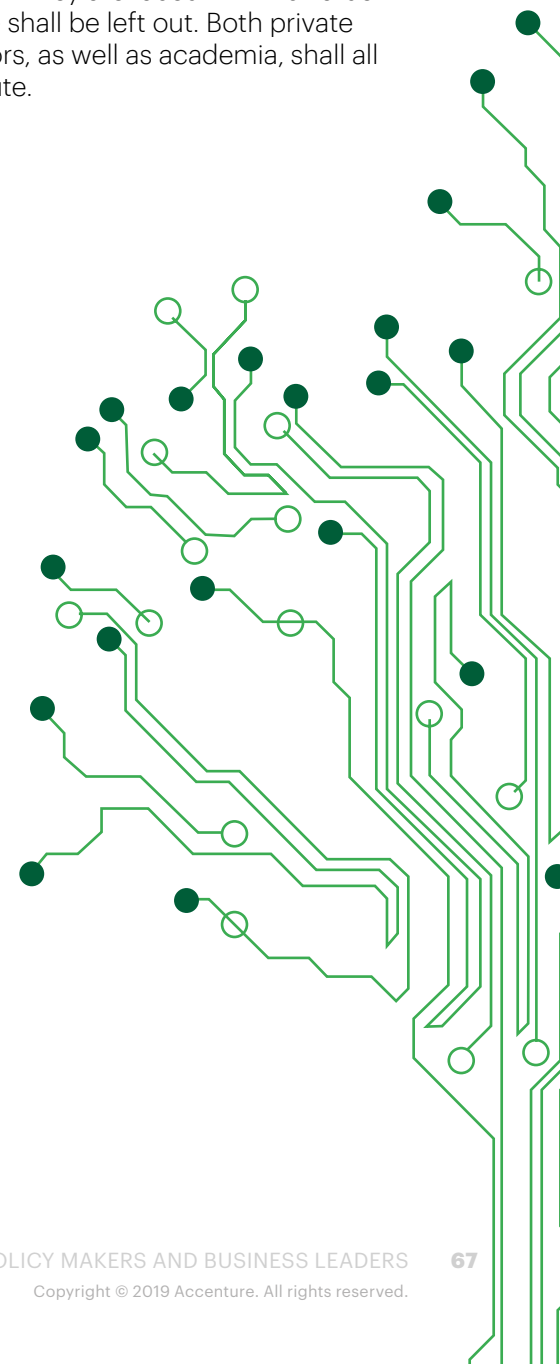
The seamless integration of human intelligence with machine intelligence will become more critical than ever. Currently, people are learning how to use machines. Increasingly, this will change as machines will learn from humans and humans will learn from machines. For example, customer service representatives of the future will need to act as "role models" to their digital colleagues and potentially vice versa. As the division of labor between man and machine changes, policy makers need to reevaluate the type of knowledge and skills imparted to the future workforce.

A broad set of digital skills will be required to design, implement and collaborate with new, advanced AI systems, drawing on the expertise of many specialties, including analytics, robotics, vision, audio and pattern recognition, to name but a few.

At the same time, interpersonal skills, like creativity and emotional intelligence will also become even more important than they are today.

The case for Greece is clear: Policy leaders must take action and build the future workforce. This will require them to ask tough questions, such as: how do we: Develop the new talent? Scale and accelerate at the pace of change? Make sure the people do not get left behind?

Leaders must proactively work to address the complex equation they are faced with. Towards this goal, no one shall be left out. Both private and public sectors, as well as academia, shall all actively contribute.



Policy makers shall prepare the future workforce:

- **Strengthen the talent pipeline from its source:** Policy makers shall work with the wider education sector and Greek academia to modernize the educational system and design new curricula that develop relevant digital and AI skills at the start of the talent supply chain. To achieve this, primary and secondary education shall equip all students with basic digital skills as well as with literacy, numeracy and problem-solving capabilities that will enable them to collaborate and interact with "intelligent" machines. At the same time, higher education shall enhance the existing programs to develop advanced digital and AI skills, stimulate and extend the Greek STEM (Science, Technology, Engineering, Mathematics) skillset and create new programs and courses on AI, i.e. Law-AI joint degrees, AI Masters and Ph.D. degrees, etc.

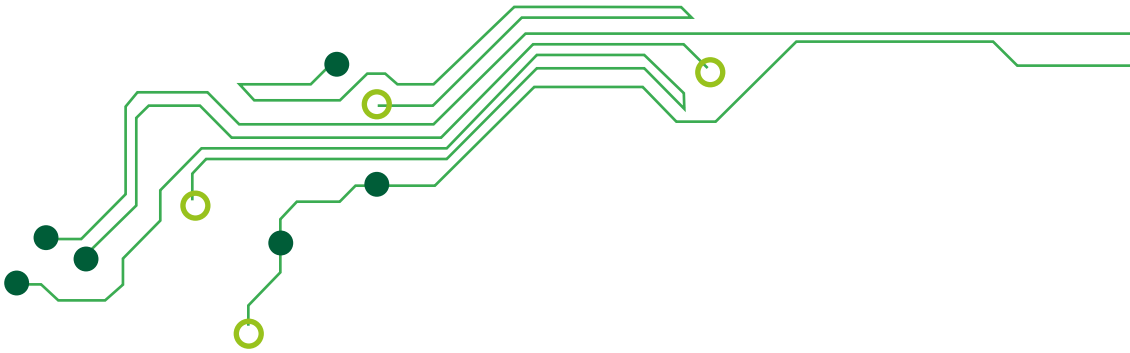
- **Accelerate reskilling people:** Citizens shall be equipped with digital skills and knowledge to improve their quality of life and increase awareness on the opportunities and challenges of AI. To achieve this, policy makers shall provide incentivization to improve digital literacy across the Greek society. The launching of e-learning and open online courses (i.e. MOOCs) on AI and new technologies, financial incentivization for disadvantaged groups, as well as fostering digital literacy programs and AI awareness campaigns can all contribute towards the digital upskilling of the Greek society.

- **"New-skill" the Public Administration workforce:** Policy makers need to build in the Public Administration workforce trust in the "intelligent" machines that employees will increasingly rely upon. They can do so by teaching them how to interact, train and augment these systems. Over the long-term, active upskilling may also be required for many Public Administration roles.

ADVOCATE A CODE OF ETHICS FOR AI

AI is maturing rapidly as an incredibly powerful technology with seemingly limitless applications. Intelligent machines move into social environments that were once occupied only by humans. This opens up ethical and societal issues and concerns, such as workforce displacement, loss of privacy, potential biases in decision-making and lack of control over automated systems and robots. Policy makers will soon need to answer to critical questions that range from how to respond to racially biased algorithms to whether autonomous cars should give preference to their driver's life over those of others in an imaginery case of an accident. Acknowledging this need, the European Union launched the Communication on Building Trust in Human-Centric Artificial Intelligence that shall be applied by developers, suppliers and users of AI in the European market, establishing an ethical level playing field across all Member States[27].

Given how prevalent intelligent systems will become in the future, policy makers, in collaboration with the scientific community, captains of industry and civil society organizations, need to ensure the development of a code of ethics for the AI ecosystem. The code shall focus on ensuring the ethical, transparent and accountable use of AI technologies in a manner consistent with user expectations, organizational values and societal laws and norms. It shall also guard against the use of biased data or algorithms, ensure that automated decisions are justified and explainable and help maintain user trust and individual privacy. By providing clear rules of engagement, the code of ethics will allow organizations to innovate and realize the transformative potential of AI that is both compelling and accountable.



27. Communication: Building Trust in Human Centric Artificial Intelligence, https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence

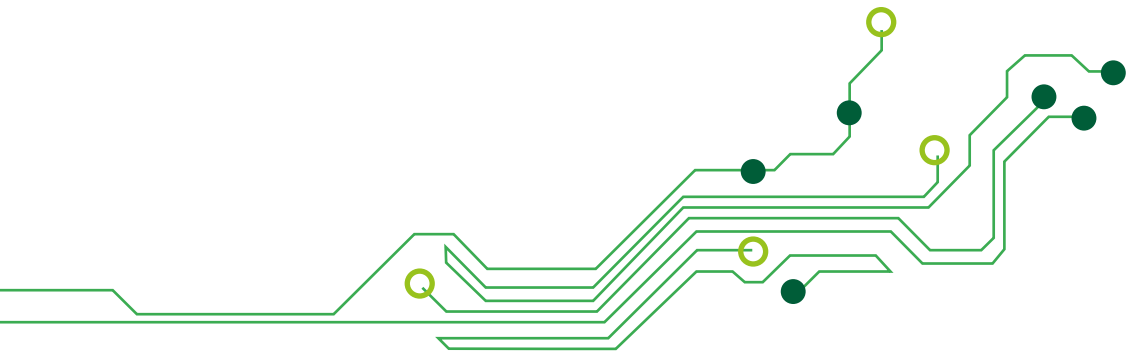
The code of ethics shall be underpinned by a set of principles that will enable the evaluation, deployment and monitoring of AI to create new opportunities for the Greek economy and society alike.

- **The "GOVERN" principle:** Policy makers shall create a governance framework to enable AI to flourish. Standards bodies such as IEEE are providing guidance for global organizations to ensure every stakeholder involved in the design and development of autonomous and intelligent systems is educated, trained and empowered to prioritize ethical considerations[28].

- **The "DESIGN" principle:** Any new solution shall be architected and deployed with trust built into the design. This means that requirements for privacy, transparency and security shall have equal weight with new product features. The resulting systems should address the need to include AI solutions that can explain their rationale for decision making. Capital One is researching ways to make AI more explainable, hoping to use it to review credit card applications since banking regulations require that financial companies furnish an explanation to customers when their applications are denied[29].

- **The "MONITOR" principle:** AI needs close supervision using ongoing human monitoring and auditing of the performance of algorithms against key value-driven metrics such as accountability, bias, and cybersecurity. Automakers Volvo[30] and Audi[31] are addressing accountability with announcements that they will assume liability for any accidents that happen when automated driving technology is in use.

- **The "TRAIN" principle:** Policy makers shall collaborate with the private sector, in order to prepare and equip the workforce to take full advantage of AI and the new workstyles that it fosters. This requires training in the near-term to better understand how AI systems operate and potential upskilling in the long-term.



28. https://standards.ieee.org/industry-connections/ec/autonomous-systems.html
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MICROSOFT CEO SATYA NADELLA HAS 10 COMMANDMENTS FOR HOW AI AND HUMANS SHOULD ACT IN OUR SHARED FUTURE:

TECHNOLOGY

1 AI must be designed to assist humanity - As we build more autonomous machines, we need to respect human autonomy

2 AI must be transparent - We should be aware of how technology works and what its rules are

3 AI must maximize efficiencies without destroying the dignity of people - It should preserve cultural commitments, empowering diversity

4 AI must be designed for intelligent privacy - It should incorporate sophisticated protections that secure personal and group information, in ways that earn trust

5 AI must have algorithmic accountability so that humans can undo unintended harm - We must design these technologies for the expected and the unexpected

6 AI must guard against bias - AI must ensure proper, and representative research so that the wrong heuristics cannot be used to discriminate

HUMAN

7 Start with Empathy - Empathy, which is so difficult to replicate in machines, will be valuable in the human-AI world

8 Invest in Education - To create and manage innovations we cannot fathom today, we will need increased investment in education to attain higher level thinking and more equitable education outcomes

9 Go forth Creatively - One of the most coveted human skills is creativity and this won't change. Machines will continue to enrich and augment our creativity

10 Reserve the right of Judgment and maintain Accountability - We may be willing to accept a computer-generated diagnosis or legal decision, but we will still expect a human to be ultimately accountable for the outcomes

Source: https://qz.com/720424/microsoft-ceo-satya-nadella-has-10-commandments-for-how-ai-and-humans-should-act/

ADDRESS THE REDISTRIBUTION EFFECTS AND ENSURE INCLUSION

Artificial Intelligence is often perceived as a double-edged sword, sparking opportunity for some, but often introducing painful change for others. Many commentators are concerned that AI will change the notion of jobs, eliminate a high number of them, worsen inequality, affect the wealth distribution and erode incomes.

Policy makers must recognize these apprehensions and introduce a policy of inclusion to ensure that the development and implementation of AI does not contribute to an increase in social and economic inequality. As Cedric Villani quoted in the AI Strategy for France "In a world marked by inequality, artificial intelligence should not end up reinforcing the problems of exclusion and the concentration of wealth and resources"[32].

The policy of inclusion should fulfill a twofold objective: ensure that the Greek society understands the tangible benefits of AI for the Public Good and introduce a "no one left behind" policy for the Greek society.

- **AI for the Public Good:** Policy makers should emphasize the tangible benefits of AI for societies. AI is not a "silver bullet", but it could help alleviate some of the world's greatest societal problems. Think of physical danger and crisis response challenges. AI can be combined with data from IoT devices to create solutions that help firefighters determine safe paths through burning buildings. Or, think of equality and inclusion challenges. Affectiva, which was spun out of the MIT Media Lab and Autism Glass, a Stanford research project, involves using AI to automate the recognition of emotions and to provide social cues to help individuals along the autism spectrum interact in social environments[33]. Benefits like these should be clearly articulated to encourage a more positive outlook on AI's potential. In order to boost AI-led social innovation, policy makers could also launch programs specifically designed to assist AI innovation in the social sphere and equip social actors with tools that would enable them to benefit from AI-related developments.

- **"No-one left behind" Policy:** Policy makers shall actively address and preempt the downsides of AI and adopt a "No-one left behind" policy. In an increasingly AI-driven world, privileged segments of people will be able to use digital means and AI applications to access specific benefits including remote access to health and education information, financial inclusion and digital pathways to economic and political empowerment. On the other hand, other groups may be disproportionately affected in employment and income by AI; these may have less access, agency and ability to reap the AI benefits and will potentially be left further behind. To prevent a backlash, policy makers should identify these groups at high risk of displacement and create strategies that aim to "new-skill", financially support and reintegrate them into the new economy.

32. CÉDRIC VILLANI Mathematician and Member of the French Parliament, "FOR A MEANINGFUL ARTIFICIAL INTELLIGENCE: TOWARDS A FRENCH AND EUROPEAN STRATEGY", https://www.gouvernement.fr/en/artificial-intelligence-making-france-a-leader
33. https://tonic.vice.com/en_us/article/9kz49d/this-emotionally-intelligent-device-is-helping-kids-with-autism-form-bonds

6.3 FOR BUSINESS LEADERS: CREATING A NEW PLAYBOOK FOR AN AI WORLD

Similarly to policy makers, business leaders should move from simply discussing to actively addressing the opportunities that arise from the systematic application of AI technologies across the functions of their organization. To reap the benefits of AI deployment, business leaders must begin to invest now, in order to enable this set of technologies to mature and evolve in sync with the accelerated pace of change.

STEP BEYOND AUTOMATION TOWARDS INNOVATION AND TRUE GROWTH

Until now, robots, big data analytics and other technologies have been used within organizations for a single purpose: improve efficiencies. Now, as companies invest in AI systems that can sense, communicate, interpret and learn, all that changes. AI can help businesses move beyond automation to elevate human capabilities that unlock new value. Leveraging AI, organizations can now take the next step and harness the intelligence of dynamic, self-learning and self-governing machines, which will be able to generate new business opportunities for them. Business leaders should seek more AI-powered innovations in operations, products and business models, changing their mindset from "doing things differently" to "doing different things".

In this context, an AI roadmap will also be essential. This should be a plan to grow the business, incorporating AI as a critical enabler. As such, it is incumbent on leaders to have a sufficient grasp of AI to effectively transform their organizations.

ORGANIZATIONALLY EXPERIMENT AND LEARN

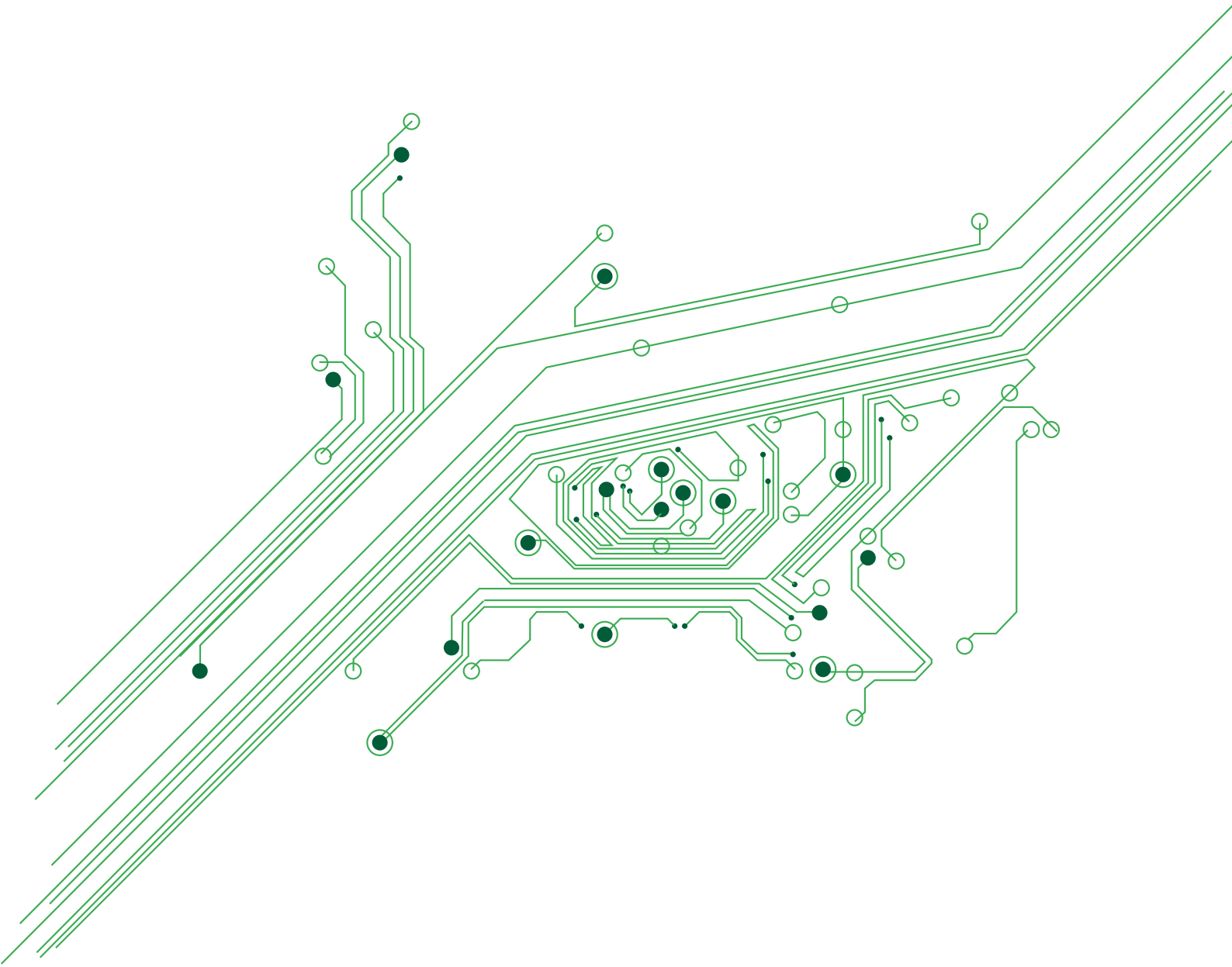
In too many organizations and industries, the impetus and interest for AI still comes from the bottom or from the middle of the organization - from digital enthusiasts that have seen these technologies and are excited by their promise. But attaining the value from AI, our analysis suggests, that will demand recognition and action from the very top of the organization.

An essential first step is to make the benefits of AI tangible to the C-suite. That means experimenting, learning and developing rapid proof of concepts that will yield business value to the organization. To achieve this, business leaders need to spend time with real AI machines and applications, interact with them, question and test them. There is no substitute for visiting AI laboratories or innovation centers where experts can be probed, ideas can be tested and prototypes can be developed.

Active experimentation will enable business leaders to target tangible results, help them built an understanding of their organization's data quality, ecosystem access, AI capabilities and talent. Business leaders should not get stuck in the trap of targeting and assessing without doing.

TAKE DATA "OFF THE BENCH" AND "INTO THE GAME"

Data is often being compared to oil for good reason - it is a a precious and immensely valuable resource. It is an essential driver of the new economy. But its importance runs even deeper; data is the DNA behind AI applications that help modern organizations to identify new products, determine how to better serve customers and achieve operational efficiencies. When datasets are inaccurate or corrupt, for example, the associated applications inevitably fail to deliver the expected insights. That is why a strong focus around the production, acquisition, structuring and ultimetaly use of data is crucial for the successful deployment of AI.



To build this focus and unlock trapped value, business leaders shall improve their organizations' capability, to collect, aggregate and make interoperable the high volumes of data that is generated on a daily basis. To put it simply, it is time for business leaders to take the data "off the bench" and "into the game".

- **Access data:** For AI to be effective, access to accurate data is vital - but it is not a given. Data has the potential to polarize the market, with many companies struggling to compete with the large platform and technology companies who often assume ownership over the high volumes of created and used data. For instance, Intel's investments in autonomous driving included the US$15 billion acquisition of Mobileye which the CEO described as "our strategy to make Intel the driving force of the data revolution across every technology and every industry"[34].

- **Converge data:** Another challenge is that much data is either "dark" (unstructured, not readily usable) or disparate (hard to combine). Organizations will need to invest to open up legacy systems to expose or access key data. They will need to be able to consolidate, integrate and structure data from disparate sources such as Internet of Things (IoT) sensors and social networks. The greater the data density and variety, the greater are the chances to identify"unknown unknowns" - relationships that were not known to exist or were not looked for at all. For example, Verizon is offering its big data and AI platform to partner carriers. Part of its Exponent offering, this solution helps carriers monetize data by using machine learning and deep analytics to create value from a range of their data, including unstructured customer data[35].

- **Share data:** Sharing data in a trusted environment is vital. For example, a consortium of German automakers acquired HERE, a provider of mapping data and related services, crucial elements of self-driving technology[36]. The car makers share the data generated by each vehicle to create value for the wider market. Security must be given the utmost attention to give such consortia the confidence to exchange such data on a continued basis. The lesson is important: companies must build on what they do best while also understand where shared value can be mined.

34. Amazon website. https://www.amazon.com/b?node=16008589011
35. "Verizon launches Exponent, a new technology and business venture designed to accelerate growth for global carriers," Verizon website, February 2017. http://www.verizon.com/about/news/verizon-launchesexponent-new-technology-and-business-venturedesigned-accelerate-growth-global
36. "The autonomous car's reality check," The Economist, April 2016. http://www.economist.com/news/scienceand-technology/21696925-building-highly-detailedmaps-robotic-vehicles-autonomous-cars-reality

REIMAGINE WORK - FROM WORKFORCE PLANNING TO WORK PLANNING

Forecasts of AI's impact on jobs vary. In January 2018, the World Economic Forum, in collaboration with Accenture, released an analysis that reveals a smaller net loss of jobs than some other studies have predicted. The study estimates that 16 percent of jobs are at risk of displacement in five production industries after accounting for potential job gains that would arise from the same trends. Even as automation continues, demand for labor will increase in parts of the value chain and in some locations[37].

But focus only on job gains and losses misses a crucial point: The most significant impact of AI won't be on the number of jobs per se, but rather on job content, on the augmentation of human capabilities and on the elevation of employees.

THE EVOLUTION OF WORK AND THE ELEVATION OF WORKERS

A **drilling technician** drills multiple test holes, manually preparing, calculating and entering correct pressure and speed for the drill	>	AI tells the drilling technician which oil deposits to target and **intelligent drills** calculate speed, pressure and depth
A **pharmacovigilance scientist** combs through vast volumes of documents in order to assess safety issues related to drugs	>	AI, using **Natural Language Processing and Machine Learning**, helps free scientists to work on higher risk cases and cater to growth in adverse event cases
A **software developer** spends time each week identifying new spam flags and manually writing rules for spam detection	>	**Machine intelligence identifies new spam keywords and updates detection** rules, freeing the employee from work unrelated to new software development
An **aerospace engineer** designs a new plane component making manual calculations to produce strong and light designs	>	**Generative Design** mimics nature's evolutionary approach to consider millions of possible designs and tests for strength and lightness
A **long-haul driver** controls the vehicle on the road, in charge of the speed, braking and steering	>	The driver becomes an **"in-cab systems manager",** performing high-level technical work, such as monitoring diagnostics systems and optimizing routing tasks as automation controls braking and speed

Source: Accenture Future Workforce Ethnographic Study 2017

37. The New Production Workforce: Responding to Shifting Labour Demands, 2018. World Economic Forum. Available at: https://www.weforum.org/whitepapers/the-new-production-workforce-respondingto-shifting-labour-demands

Business leaders must now address almost "existential" questions, such as:

- Do we have a clear understanding of how work in our organization will be reconfigured by intelligent machines, starting in 2019?
- Which of our core activities will be automated, which will seek human-machine collaboration, and which will remain the preserve of human workers only? What will this mean for our operating models?
- Are we prepared for the disruptive changes ahead as the nature of work is reimagined, starting from now?

To convincingly address them, business leaders shall move the spotlight from jobs to the nature of the work itself and take three steps:

- **Assess tasks and skills, not jobs:** First, business leaders need to identify the new kinds of tasks that must be performed. Assessing the range of technologies and teams at their disposal, they can then allocate those tasks to people or machines. Dynamic Group, a US manufacturer, for instance, faced skills shortages in its injection molding production business. By using light robots that can work collaboratively side by side with workers, the company reallocated tasks accordingly. The investment quadrupled the efficiency of the process, reduced wastage from errors and saved existing workers repetitive and strenuous work[38].
- **Break with tradition and create new roles:** Organizations need to create new roles within a broader contextual shift as AI enables people to take on higher value work. Operational jobs will become more insight-driven and strategic, while mono-skilled roles will become multi-skilled. At the same time, jobs will also become more specialized as greater volumes of precise data allow for more insights to be explored. For example, consumer brands will become increasingly dependent on AI chatbots to represent them in the mass market. Personality trainers will be required to develop the appropriate tone, humor and level of empathy needed for different situations. A health care AI agent must appreciate the sensitivity of patients in a different way than a supermarket AI agent would need to appreciate the mood and mindset of a grocery's customer. Microsoft uses a team including a poet, a novelist and a playwright to develop Cortana's personality, without which this manifestation of the brand would be no different from any other[39].
- **Assess and map skills to new roles:** Once the organization has a full list of required tasks, skills and newly defined roles, it can map that list against the skills currently present in the workforce. Where there are gaps in skills, business leaders must decide whether they can quickly train current employees or look for new sources of talent. Some companies are addressing skills gaps with contract workers in the short term. Others have allready managed to align the skills of their existing workforce to the new requirements.

38. Tingley, K. (2017). Learning to love our robot co-workers. New York Times [online]. Available at: https://www.nytimes.com/2017/02/23/magazine/learning-to-love-our-robot-co-workers.html
39. Wilson, H. J., Daugherty, P. R., and Morini-Bianzino, N. (2017). When AI becomes the new face of your brand. Harvard Business Review [online]. Available at: https://hbr.org/2017/06/when-aibecomes-the-new-face-of-your-brand

"NEW-SKILL" TO COLLABORATE WITH INTELLIGENT MACHINES

To fill the new and reconfigured roles, organizations will need to make radical changes to their training strategies. "New Skilling" programs must be rapid, flexible, tailored and large-scale to maximize the value humans and machines can create together. "New-Skill" shall also foster a culture of lifelong learning, much of it enabled by technology. Three steps are proposed to expand the reach of the "new-skill" training programs:

- **Prioritize skills for development:** Creative skills, as well as resource management, leadership, communication, complex problem-solving and judgment/ decision-making are considered among the most valuable human skills required to collaborate with AI.

- **Go digital to create innovative learning experiences:** Digital learning methods, such as virtual reality and augmented reality technologies, can provide realistic simulations to help employees master new manual tasks so they can work with smart machinery. The same technologies can help reinforce correct procedures on the shop floor - monitoring how employees execute tasks and coaching them to do it the best way. Thyssenkrupp is overcoming skill mismatches through AI. The elevator technicians of this industrial services giant consult subject matter experts through Microsoft HoloLens, a mixed reality headset[40].

- **"New-Skill" at the top of the house:** Preparing the workforce for AI doesn't exclude the higher echelons of the organizations. Today's leaders need to become "digital architects", equipped with a new set of capabilities that enables them to succeed in disrupted environments.

40. Ridder, M. (2016). Thyssenkrupp unveils latest technology to transform the global elevator service industry: Microsoft HoloLens, for enhancing interventions. Thyssenkrupp [online]. Available at: https://www.thyssenkrupp.com/en/newsroom/press-releases/press-release-114208.html

6.4 CONCLUSION

To harness AI's full potential, policy makers and business leaders alike must work towards improving their "AIQ" and reimagine an AI future for Greece. AI is simply not another technology buzzword; rather, it must be understood as a game-changer that will transform their thinking about how growth is created both at an organizational and national level.

As economies compete on AI, Greece needs to "reinvent" itself to differentiate and stay in, if not ahead of, the game. Reinvention, by nature, means to get into the game early. All else, is called following.

APPENDIX: STUDY NOTES

1. THE AI GROWTH MODEL

The AI Growth Model, developed by Accenture in collaboration with Frontier Economics, estimates the potential GDP impact due to AI implementation across a country's economy and society by the year 2035.

The econometric model was based on a modified growth model[41] developed by Robin Hanson, professor of economics at George Mason University, Virginia, United States.

In our model, we defined labor as a continuum of tasks that can either be performed by a human or AI - not work solely done by humans.

The intent was to introduce intelligent systems as an additional workforce capable of handling activities that require an advanced level of cognitive agility.

To estimate the shares of workers' tasks that could be performed by intelligent machines (AI absorption rates), we drew on research by Frey and Osborne[42] who take a task-based approach to identifying roles and occupations that are affected by AI. The estimates are aggregated at country-level, taking into account the different mix of occupations and industries within each country.

1.1 MODEL ASSUMPTIONS

- The impact of AI is not considered instantaneous. Whilst immediately visible, its economic impact and long-term consequences on economies do take time to realize. For this reason, our modelling assesses a 15-year period, from 2020 to 2035.
- A key driver of the impact of AI on growth is how well each country is positioned to benefit from the emergence of new technologies and how ready it is to integrate them into its economy - measured by what we refer to as a country's "National Absorptive Capacity" (NAC) (for further details on the National Absorptive Capacity, please refer to paragraph 2).

1.2 MODEL SOURCES

Data from various 3rd party sources has been used as input to the AI Growth Model.

- Absolute GDP values and GDP growth rates were sourced from Eurostat, IMF and Oxford Economics.
- Estimated share of tasks performed by AI per country was provided by Frontier Economics.

41. Hanson, R., (2001), "Economic Growth given machine intelligence", Technical Report, University of California, Berkeley.
42. Frey, C. and Osborne, M., (2013), "The future of Employment: How susceptible are jobs to computerization?", Technological forecasting and Social Change.

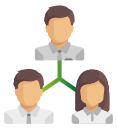
2. THE NATIONAL ABSORPTIVE CAPACITY (NAC) INDEX

2.1 METHODOLOGY AND SOURCES

The NAC measures the ability of a country to weave innovations and new technologies in its economic and social fabric and hence the degree in which a country can incorporate and absorb AI in its structures.

The term "absorptive capacity" was first coined at a firm level in an academic study by Cohen and Levinthal in 1990 and later refined by additional research in the decades that followed[43]. NAC, the National Absorptive Capacity, is based on OECD's and Eurostat's guidelines for collecting and interpreting innovation data[44].

The National Absorptive Capacity Index consists of four mutually exclusive and equally weighted pillars: Business Commons, Take-off Factors, Transfer Factors and Innovation Dynamo.



Business Commons

Business Commons describe the business climate and pool of resources on which companies can draw to carry out their operations. Key elements of a healthy business commons include an educated workforce, a reliable financial system and a robust network of local suppliers and distributors.

Take-off Factors

Take-off Factors help to transform a technological advance into usable applications, products and services beyond niche markets and players. With the technological foundation established, entrepreneurs, large businesses and the general public start taking advantage of the new technology, in turn driving increased innovation and scaling.

Transfer Factors

Transfer Factors enable a technology to become far more deeply ingrained in an economy - inducing wider changes in the behavior of businesses, consumers and society. At this point, change is less about the technology itself and more about the organizational and social transformations that it enables to take place.

Innovation Dynamo

The Innovation Dynamo is when a technology produces self-sustaining innovation and development. When this happens, innovators combine technological advances in other areas with the core technology's newfound ubiquity, producing a "multiplier effect" by building once unimaginable complementary goods.

43. Cohen, W. and Levinthal, D., (1990), "Absorptive Capacity: A New Perspective on Learning and Innovation", Administrative Science Quarterly, Vol. 35, pp. 128-152.
44. "Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data", OECD 3rd edition. https://www.oecd-ilibrary.org/docserver/9789264013100-en.pdf?expires=1555577768&id=id&accname=guest&checksum=5F1687AD880506956A9E928552A39047

The NAC index is normalized on a 0 to 100% scale. The higher the score, the greater the benefit from the emergence of new technologies and the broader their integration into a country's economy. A country achieving top score on every pillar would attain a score of 100% overall.

Each pillar is further decomposed to a set of dimensions and indicators that have been collected from 3rd party sources (see below).

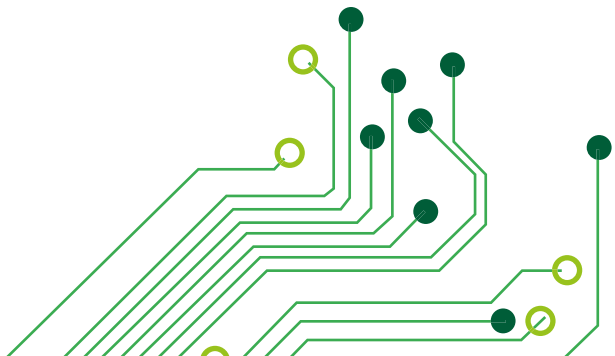
PILLAR	DIMENSION	SOURCE
 **Business Commons**	Quality of Governance and Institutions	Global Competitiveness Report - World Economic Forum, World Bank
	Economic Openness	World Bank, Human Freedom Index - Fraser Institute
	Access to Capital	Global Competitiveness Report - World Economic Forum
	Communications Infrastructure	Global Competitiveness Report - World Economic Forum
	Human Capital	Global Competitiveness Report - World Economic Forum
 **Take-off Factors**	Demand Side	International Monetary Fund Reports
	Supply Side	Global Competitiveness Report - World Economic Forum
 **Transfer Factors**	Informal Knowledge	Global Competitiveness Report - World Economic Forum, World Bank
	Formal Knowledge	Global Competitiveness Report - World Economic Forum, World Bank
	Social Norms and Security	World Bank
 **Innovation Dynamo**	Entrepreneurial Culture	World Bank
	Research Ecosystem	Global Competitiveness Report - World Economic Forum
	Market Strategy	Global Competitiveness Report - World Economic Forum

The National Absorptive Capacity (NAC) Index - Pillars, Dimensions, Sources

3.
THE AI QUESTIONNAIRE FOR THE GREEK PUBLIC

3.1
QUESTIONNAIRE METHODOLOGY

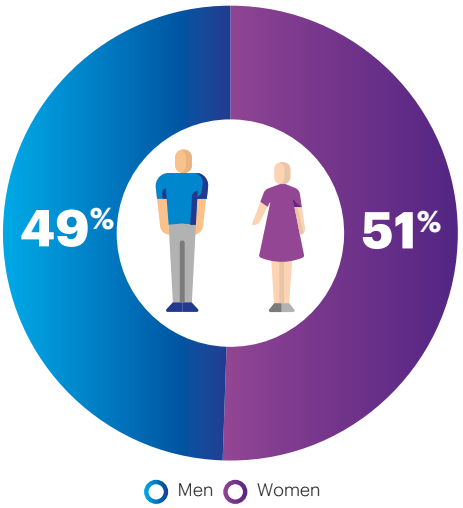
- The analysis is based on data recorded through the AI Questionnaire for the Greek Public, executed by Focus Bari Market Research SA from January 16, 2019 to February 1, 2019.
- The participating sample consisted of 600 people across Greece (Attica, Thessaloniki and Rest of Greece).
- The survey consisted of 17 questions that aimed to surface Greeks' perception on AI and its applications.
- Questionnaire results have been weighted based on the gender, age group, region of residence and educational level demographic ratios of the overall Greek population.
- Gender, age group, region of residence and educational level was requested by the Questionnaire.



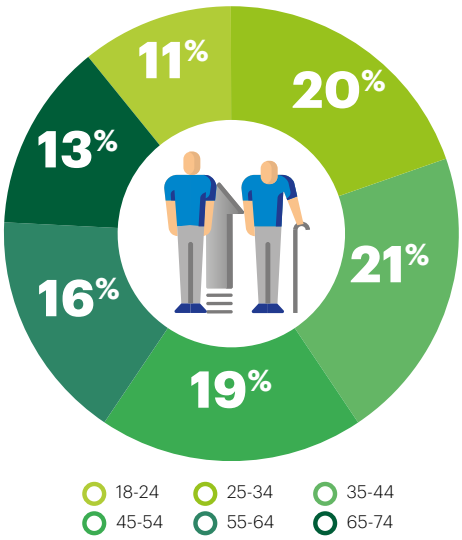
3.2 QUESTIONNAIRE SAMPLE DEMOGRAPHICS

The participative sample consists of 600 Greeks, with the following distributions across their key characteristics:

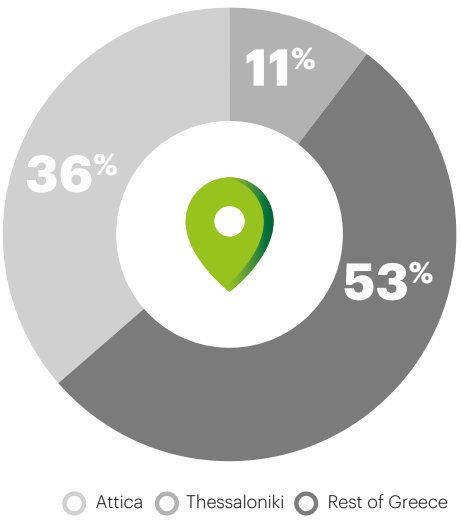
DISTRIBUTION OF QUESTIONNAIRE'S SAMPLE BY GENDER (%)



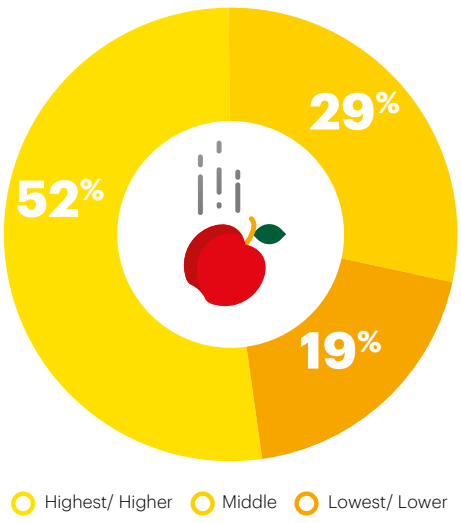
DISTRIBUTION OF QUESTIONNAIRE'S SAMPLE BY AGE (%)



DISTRIBUTION OF QUESTIONNAIRE'S SAMPLE BY REGION (%)



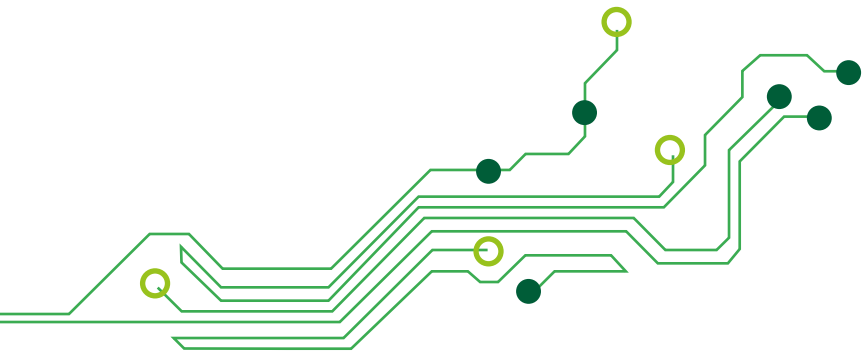
DISTRIBUTION OF QUESTIONNAIRE'S SAMPLE BY EDUCATIONAL LEVEL (%)



4.
THE AI QUESTIONNAIRE FOR THE GREEK ORGANIZATIONS

4.1
QUESTIONNAIRE METHODOLOGY

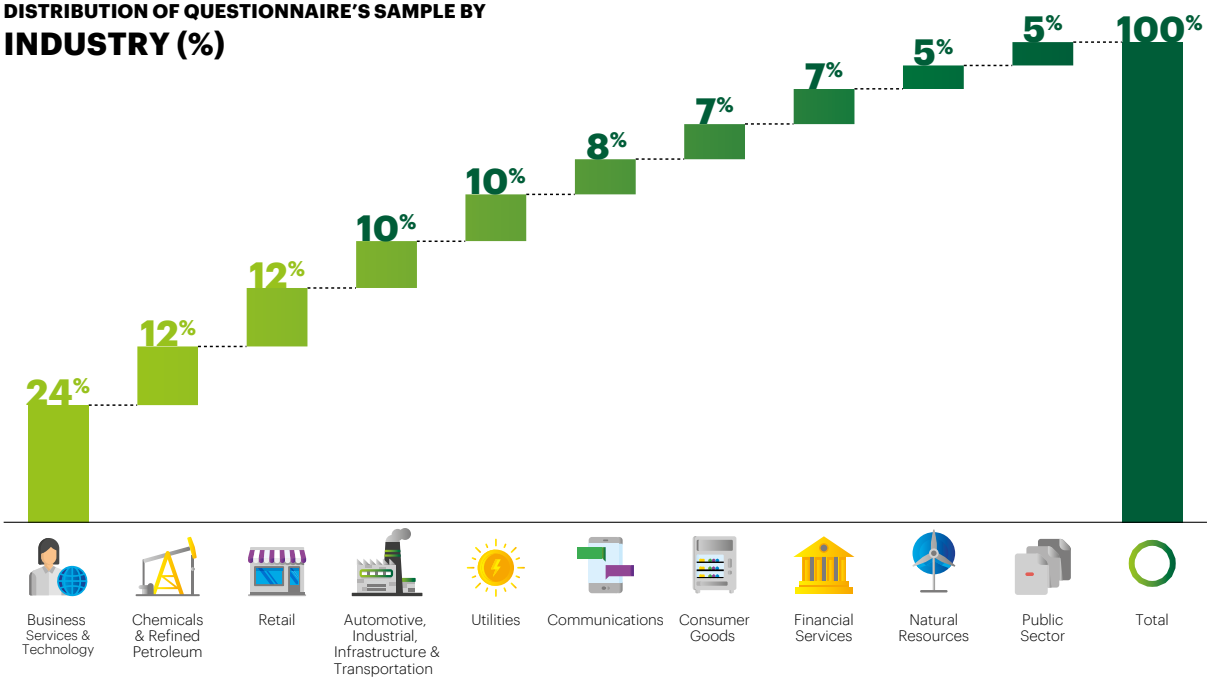
- The analysis is based on data recorded through the AI Questionnaire for the Greek organizations, launched on January 23, 2019 and remained open until March 03, 2019.
- The participating sample covered the top 100 Greek organizations based on 2017 revenues (ICAP data). 41 organizations responded to the Questionnaire.
- The Questionnaire was sent to C-level/ senior management of Greek organizations.
- The survey consisted of 17 questions that aimed to capture organizations' understanding of AI and respective degree of readiness to deploy the associated technologies and applications.



4.2 QUESTIONNAIRE SAMPLE DEMOGRAPHICS

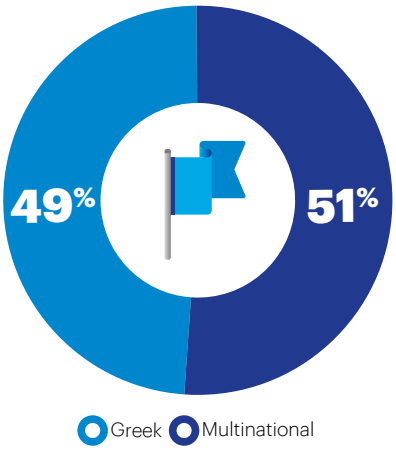
The participative sample consists of 41 organizations, with the following distribution across Greece's key industries:

DISTRIBUTION OF QUESTIONNAIRE'S SAMPLE BY
INDUSTRY (%)



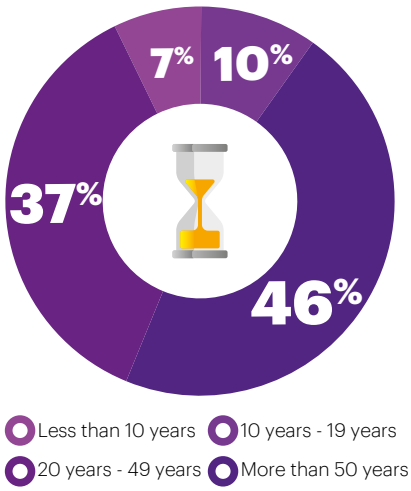
Natural Resources industry includes the following sectors: Crop & animal production, forestry, fishing, mining & quarring, manufacture of basic metals, manufacture of other non-metallic mineral products.

DISTRIBUTION OF QUESTIONNAIRE'S SAMPLE BY
ORIGIN (%)



- *Greek: the organization operates exclusively in Greece*
- *Multinational: the organization operates in several countries*

DISTRIBUTION OF QUESTIONNAIRE'S SAMPLE BY
YEARS IN OPERATION (%)



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