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Ethics and Responsibility in Artificial Intelligence: A Global Perspective and Portugal's AI Governance

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Ethics and Responsibility in Artificial Intelligence: A Global Perspective and Portugal's AI Governance

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Abstract

This paper explores the relation of Artificial Intelligence (AI), ethics, and responsibility in the contemporary era. It investigates global AI regulatory frameworks, particularly focusing on Portugal's approach, and considers the urgent need for ethical considerations in AI development. The paper aims to answer the three key research questions: 1 - How do global AI regulatory frameworks influence ethical considerations and responsibilities in AI development, and how does Portugal's approach compare?; 2 - What is the role of Chief Ethical Officers (CEOs) in promoting ethical AI practices within organizations, contributing to risk mitigation and user trust?; 3 - Where does the responsibility lie in ensuring the ethical development and use of AI, and how can a distributed responsibility model be established among AI stakeholders and organizations?. It also emphasizes the importance of AI regulation and its implications for both organizations and consumers. It seeks to provide insights into Portugal's regulatory approach, considering economic factors and the broader global context, and highlights the opportunities and challenges presented by AI regulation. Ultimately, the paper aims to contribute on AI governance, making a comparison between innovation and responsibility, with a focus on ethics. In order to support these findings, it was conducted a small case study to Portuguese AI users, working in a portuguese organization.

JEL Classification: M10, O320

Keywords: Artificial Intelligence, Ethics, Responsibility, Regulation

Note: ***This article is sole responsibility of the authors and do not necessarily reflect the positions of GEE or the Portuguese Ministry of Economy*.**

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1. Introduction

We think of AI as the mainstream dilemma of this century. The prevailing violence in today's world is often linked to a lack of ethical values, a condition comparable to ethical nihilism. This term, characterized by a lack of purpose and answers to fundamental questions, underscores the need for strong ethical foundations, as emphasized by Nietzsche. The violence in society is seen as a consequence of this nihilistic worldview, where economic power takes precedence above all else. In such a culture of violence, the future is either non-existent or perceived as a looming threat, leading to a sense of despair when there's no clear vision for the future (Marsden, 2022). This prompts us to ask whether the field of AI might also experience what Hannah Arendt referred to as "the banality of evil". (Arendt, 1963).

These apprehensions about this new technology have been discussed by some industry leaders, such as Elon Musk, who has repeatedly warned that "AI is the most serious threat to the survival of the human race", urging a cautious and regulated approach to its development (Gibs, 2014). Also, Geoffrey Hinton, often referred to as the "Godfather of AI"[2], recently left his position at Google to openly discuss the AI risks associated with. Stuart Russel, in his influential work "Human Compatible", asserts the importance of responsibility in AI technology in order to benefit humanity and avoid involuntary consequences (Russel, 2019; Henshall, 2023).

Considering this context of concerns, UNESCO has disseminated a worldwide call for governments to adopt a Global Ethical Framework, addressing the numerous ethical issues modelled by AI, from discrimination and stereotyping to the fight against disinformation and the protection of personal data, human, and environmental rights (UNESCO, 2023).

With these developments we point out the three research questions of this paper:

1- How AI regulatory frameworks impact ethical considerations and responsibility in AI development, and how does Portugal's regulatory approach compare to these frameworks?

2- What is the role and effectiveness of Chief Ethical Officers (CEOs) in promoting ethical AI practices within organizations, and how do their efforts contribute to mitigating risks and fostering trust among AI users?

3- Where does the responsibility lie in the ethical development and use of AI, and how can a distributed responsibility model can be established to ensure ethical oversight across AI stakeholders and organizations?

[2] On November 13th, 2023, The New Yorker launch an article explaining the history of this name, and how the Hinton's decision to leave Google was influenced by the growing realization of the profound understanding displayed by ChatGPT, which raised questions about the implications of this level of AI capability (Rothman, 2023).

In the first research question, our goal is to analyze the impact of global AI regulatory frameworks on ethical practices and the responsibility of AI developers, and how Portugal's regulatory approach aligns with (or diverges from) these, highlighting the similarities and differences. Also, it aims to elucidate the extent to which global regulations shape ethical norms and developer responsibilities in the AI landscape, examining potential divergences, overlaps, and emerging trends. It also aims to identify the regulatory gaps that Portugal addresses, providing insights into the country's position within the evolving global AI governance framework.

In the second research question, we aim to understand the role of CEO´s within organizations and their impact on promoting ethical AI practices. We explore the leadership and the decision-making processes of CEOs in relation to AI integration. Furthermore, we investigate the effectiveness of the strategies employed to ensure ethical AI, including to set clear ethical guidelines and fostering transparency. Additionally, we address the challenges faced in promoting ethical AI, such as conflicting priorities, resource constraints, and cultural resistance.

Finally, in the third research question, we aim to understand the role of responsibility in AI development and use. By exploring the multifaceted dimensions of responsibility, including ethical, legal, and societal aspects, we explain the roles and the obligations of the numerous stakeholders throughout the AI lifecycle. Our inquiry delves into the ethical considerations involved in designing and deploying AI systems, the legal frameworks governing AI usage, and the broader societal implications of AI technologies. Furthermore, we explore the mechanisms for ensuring accountability and transparency in AI development, as well as the challenges and opportunities associated with navigating ethical dilemmas and the risks. Through this research, we aim to contribute to the discussion on responsible AI development and usage, offering insights and recommendations for fostering ethical, trustworthy, and social beneficial AI.

Having recognized the necessity of regulation, this paper aims to understand the implications of such measures for organizations and, for their users. It also aims to provide an understanding of Portugal's approach, taking into account the economic framework and the global context, highlighting the challenges and the opportunities presented by the regulation of AI, while seeks to contribute on the field of AI governance, the balance between innovation and responsibility, and, as a central topic, ethics.

2. Global Framework of AI Regulation

In this chapter, we aimed to demonstrate the main international guidelines and ethical frameworks of AI regulation, such as USA, China, the EU, and Portugal, with the objective of highlighting the implications for organizations within these jurisdictions. We also explored who should govern and regulate AI, and who does it now.

Figure 1 - Global AI Ethics initiatives

Source: Deloitte Insights: 'Government Trends 2020'

In the previous figure, we can see a global framework of the initiatives of AI Ethics around the world, in the year 2020, like the Centre of Data Ethics and innovation in the United Kingdom, the General Data Protection Law approved in Brazil in August, 2018, and the ethical

accountability framework for businesses operations, published in October, 2018, Hong Kong, in order to protect the privacy of citizens.

We can see that most of these initiatives reflects ethics and responsibilities of AI in a very different way. For example, while Canada, Netherlands and New York ensure through an automated system the ethics of the automated systems, UK, Singapore and Dubai established centres for data and ethical appliance

Even Elon Musk, a notorious person in technology, has expressed some concerns about the increasing of generative AI. He states that the technology is powerful and needs regulation to ensure it's operating within "the public interest." (Reuteurs, 2023). He also agrees that there should be 'some sort of regulatory oversight' of AI (FoxBusiness, 2023), and that "there is a real danger for digital superintelligence having negative consequences" (Reuteurs, 2023).

But what are the countries doing on this matter until now, and what are the implications of the regulations for the organizations?

Below, we present a benchmark framework between USA, China, EU, Portugal and the UNESCO´s role and vision, regarding the IA regulations.

Table 1 - Global framework of AI regulation

Location	Main insights	Documents
China	China has historically regulated deepfake technologies and is set to introduce provisional regulations on generative AI on August 15. These regulations mandate that AI service providers adhere to core socialist values and prohibit the generation of "false and harmful information" (TechCrunch, 2023). This approach reflects China's broader strategy of maintaining strict control over technological outputs and societal norms.	-China Regulation on Generative AI (CAC, 2023).
European Union (EU):	In contrast to the USA and China, the EU has adopted a risk-based approach. The AI Act from 2021 categorizes AI applications according to the level of risk they pose. This legislation, dubbed the "world's first comprehensive AI law"	- A definition of AI: Main capabilities and disciplines (European Commission, 2019); -Ethics guidelines for trustworthy AI (European Commission, 2018);

	(EU, 2023), outlines regulations for various categories of AI, ranging from a total prohibition of high-risk applications to transparency obligations for certain AI systems.	-AI Act: Council calls for promoting safe AI that respects fundamental rights (European Council, 2022); -Regulation of the European parliament and of the council. Laying down harmonised rules on AI (AI act) and amending certain union legislative acts (European Commission, 2021); -How the EU Can Achieve Legally Trustworthy AI: A Response to the European Commission's Proposal for an AI Act (Smuha, 2021); -European framework on ethical aspects of AI, robotics and related technologies (European Parliament, 2020); -Assessment List for Trustworthy AI (ALTAI) for self-assessment (European Commission, 2020).
G7	The G7 Code of Conduct refers to a set of ethical guidelines and principles established by the Group of Seven (G7) nations for organizations involved in the development of AI systems (G7, 2023). This document aims to promote responsible and transparent AI practices, emphasizing ethical considerations, human rights, privacy protection, and accountability in AI development and deployment. Additionally, the "G7 Leaders Statement on the Hiroshima Process" reaffirms the commitment	-Hiroshima Process International Code of Conduct for Organizations Developing Advanced AI Systems (G7, 2023); -Hiroshima Process International Guiding Principles for Organizations Developing Advanced AI System (G7, 2023); -G7 Leaders' Statement on the Hiroshima AI Process (G7, 2023).

	of G7 nations to promote the responsible development and governance of AI technologies and the importance of collaboration and international cooperation in AI challenges (G7, 2023).	
ISO	In order to provide a responsible AI (ISO, 2020, 2022, 2023) The standards and technical reports of ISO provide a comprehensive framework for guiding the development and governance of AI systems. Also, they aimed to ensure the ethical and legal compliance while minimizing risks and maximizing benefits. Some of this standards offers valuable insights into managing risks associated with AI systems throughout their lifecycle, ensuring they operate safely and effectively (ISO, 2023), while others tried to address the crucial issue of bias in AI systems and decision-making processes, striving for fairness and equity (ISO, 2021). Furthermore, we can also see some methodologies for assessing the robustness of neural networks (ISO 2021, 2023) emphasizing the importance of trustable AI models. The Ethical considerations are also a thoughtful examination of AI's broader implications (ISO, 2022), and the need for responsible practices of AI seems urgent to input in organizations, taking into account the governance implications (ISO, 2022).	-IT AI. Overview of trustworthiness in AI (ISO, 2020); -AI. Assessment of the robustness of neural networks (ISO, 2021); - IT AI Bias in AI systems and AI aided decision making (ISO, 2021); -IT AI. Overview of ethical and societal concerns (ISO, 2022); -IT AI. Process management framework for big data analytics (ISO, 2022); -IT. Governance of IT. Governance implications of the use of AI by organizations (ISO, 2022); - IT AI. Guidance on risk management (ISO, 2023); -Software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE). Quality model for AI systems (ISO, 2023); -IT AI. Management system (ISO, 2023).
Portugal	While aligning with EU regulations, Portugal has also initiated targeted efforts to address AI ethics and governance. Under Measure #38 of the iSimplex	-Portuguese National Initiative on digital skills. An innovation and growth strategy to foster AI

	Program, the "GuIA for AI" was established, offering guidelines for the ethical, transparent, and responsible use of AI by the public sector (ama, 2022). Furthermore, the AI.Ethics program, launched by APEE and UNA Portugal, seeks to integrate ethics into AI systems, enhancing transparency and fostering trust (ideiasenegócios, 2023).	in Portugal in the European context (InCode, 2019); -GuIA for AI (ama, 2022); -Forging AI Pathways: Portugal's Journey within the EU Digital Landscape (Barros, 2023); -A IA na Transição Climática - Desafios e Potencialidades na União Europeia (Barros, 2023).
UNESCO's Role and Vision:	Audrey Azoulay, UNESCO's Director-General, emphasizes the urgency of establishing robust ethical rules for AI. She notes that the member states have endorsed UNESCO's Recommendation on the Ethics of AI, underscoring the imperative to implement national strategies and regulations that reflect these global standards (UNESCO, 2023).	-Recommendation on the Ethics of AI (UNESCO, 2022); -AI: UNESCO calls on all Governments to implement Global Ethical Framework without delay (UNESCO, 2023); - The Responsible AI Certification Program – White Paper (RAII, 2022); -Ethical Impact Assessment. A Tool of the Recommendation on the Ethics of AI (UNESCO, 2023); -Governing AI for Humanity (UN, 2023); -Principles for the Ethical Use of AI in the UN System (UN, 2022); -K-12 AI curricula: a mapping of government-endorsed AI curricula (UNESCO, 2022).
United States of America (USA)	In October 2022, the White House released the Blueprint for an AI Bill of Rights (The White House, 2022), which follows the five main principles: 1-Safe and Effective Systems	-AI Accountability Policy Request for Comment (GPO, 2023); -Blueprint for an AI Bill Of Rights (The White House, 2022);

	2-Algorithmic Discrimination Protections 3-Data Privacy 4-Notice and Explanation 5-Human Alternatives, Consideration, and Fallback. The "AI Accountability Policy Request for Comment" issued by the GPO in 2023, solicits feedback from stakeholders on proposed policies aimed at establishing accountability measures within the field of AI. Additionally, the AI Risk Management Framework (NST, 2023) describes a framework for managing risks associated with AI, and offers guidelines for identifying and mitigating AI-related risks.	-FACT SHEET: President Biden Issues Executive Order on Safe, Secure, and Trustworthy AI (The White House, 2023); -AI Risk Management Framework (NST, 2023).

Source: elaboration of the author, 2024

In this table we can see a combined effort across some countries and international organizations to shape the ethical and responsible development of AI. With initiatives from the International Organization for Standardization (ISO), for example, we could see comprehensive frameworks and standards for trustworthy AI systems. Meanwhile, we also can see countries like the United States, China, and members of the European Union are implementing regulations and guidelines to address AI bias, ensure transparency, and manage risks associated with AI deployment. Portugal, aligning with EU regulations, is spearheading targeted efforts to integrate ethics into AI systems. UNESCO's global recommendations underscore the necessity of establishing ethical rules for AI, encouraging nations to implement strategies reflecting these standards. Together, these initiatives demonstrate a mutual commitment promoting responsible AI development and governance worldwide.

Also, as we could see on this global framework, most of the AI Regulation are made by the government of each country. But is this ethical? In which country laws lay out the best regulation for this global technology? Can we trust them?

In a Statista survey in 2022 across 17 countries, more than 17,193 adults affirmed that the National Universities and the security/defense forces (both with 47%, followed by the international research organisations – 45% and the international orgs like UN – 42%) are the most trusted institutions to govern/regulate AI, in contrast, governments (even with 34% of high or complete confidence), are the most voted as having no or low confidence to govern/regulate AI (33%, followed by the Tech companies – 31% and the existing regulatory/governmental agencies -25%), (Statista, 2022).

3. Ethics and AI - A Necessary Match in Organizations

According to a 2018 Deloitte survey, 32% of 1,400 U.S. business executives familiar with AI identified ethical concerns as one of the top three priorities in AI development. These executives emphasize the need for "companies to improve risk and change management" or reducing cybersecurity vulnerabilities and "managing ethical risks".

Additionally, the Electronic Frontier Foundation (EFF) has been at the forefront in advocating for ethical AI practices and promoting transparency in algorithmic decision-making (Eckersley, 2017). We also can see the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems has significantly influenced ethical principles and standards for AI. This also includes involvement in the AIS Standards Working Groups under the IEEE P7000 series and the participation on Ethics Certification Program for Autonomous and Intelligent Systems (ECPAIS), which we saw that has the goal to create specifications for certification and marking processes that advance transparency, accountability, and reduction in algorithmic bias in autonomous and intelligent systems (IEEE, 2019).

From our research, we support that some of the most important organizations like Microsoft have made significant strides in implementing ethical AI principles by prioritizing transparency, accountability, and fairness in their AI systems (Smith, 2023), or Intel, through its AI for Social Good program, which demonstrates a commitment to using AI technologies for ethical purposes, such as addressing environmental and social issues (Intel, 2023).

We could also agree that companies, who are increasingly recognize the intersection of AI and ethics, the role of the CEO is gaining prominence. This position seems important in the promotion of responsible AI practices, fostering trust, and mitigating risks associated with AI technologies. It highlights the growing acknowledgment of AI's ethical dimensions and the necessity for dedicated leadership to ensure its responsible development and deployment.

We asked ChatGPT what is this role and how it´s important for an organization, and it seems that the system also agrees with us:

"A Chief Ethical Officer (CEO) is a high-level executive of a company or organization who is responsible for ensuring that the company or organization operates in accordance with ethical and social responsibility standards. The CEO is responsible for developing, implementing, and monitoring ethical and social responsibility policies and practices throughout the company or organization.

The primary responsibilities of the CEO include:

- Developing and implementing ethical policies and procedures for the company or organization;
- Monitoring compliance with these policies and procedures throughout the company or organization;
- Ensuring that the company or organization complies with applicable ethical laws and regulations;
- Advising the leadership team of the company or organization on ethical issues;

- Conducting ethics training and awareness programs;
- Communicating the company or organization's ethical and social responsibility practices to the general public.

In summary, the CEO is responsible for leading the ethical and social responsibility culture of a company or organization, promoting a fair and respectful work environment for all employees, customers, and stakeholders, which is why "Protecting individual rights and freedoms in AI is pivotal" (The White House, 2022).

Also, we agree that its importance lies in ensuring that the company or organization operates ethically and responsibly, and the three main contributions could be described as follows:

1- Firstly, the CEO can help prevent violations of ethical laws and regulations, which can lead to significant financial and legal sanctions. This can also prevent damage to the reputation of the company or organization, which can negatively affect its ability to attract customers, investors, and talent. We can say that "Ensuring accountability mechanisms in AI development and usage is imperative" (GPO, 2023);

2- Secondly, a strong ethical CEO can increase the trust of employees, customers, and stakeholders in the company or organization. This can lead to a healthier and more collaborative workplace culture, improving employee satisfaction and productivity;

3- Additionally, an effective ethical CEO can help promote the company's or organization's social and environmental responsibility, helping to reduce its negative impact on the environment and contribute to the well-being of the community at large.

In summary, the CEO plays a crucial role in ensuring that the company or organization operates with integrity and responsibility, which can lead to greater trust and long-term success (Open AI, 2023). This revision aims to provide a clearer, more engaging, and well-structured narrative, enhancing the reader's understanding of the ethical landscape in AI and the critical role of a CEO, while it demonstrates the importance of "Responsibility".

4. The Role of Responsibility

We can have the conclusion that all leads to a single question: where does the responsibility lie?

We believe that this question demonstrates the emergent recognition that AI, with its complex and often opaque decision-making processes, poses unique ethical challenges. We saw an apprehension surrounding AI, which is amplified by a perceived reluctance among stakeholders to fully embrace accountability for outcomes that are uncertain or not fully understood.

So, the responsibility for AI's ethical implications is complex and cannot be ascribed to a single person. Maybe, it may initially that belongs to the user who directly interacts with the technology, but this perspective seems overly simplistic. The creators who design and build the AI tools also exhibit a significant portion of this responsibility, tasked with foreseeing and mitigating potential ethical issues at the developmental stage. Furthermore, the entities that make these tools accessible to users and those who authorize their use must also be considered responsible. These entities may act as gatekeepers, and maybe with the power to influence how, where, and by whom these technologies are deployed.

So, we can say that it depends. It might lie in the person who used the tool. But it also lies in the hands of the person who made the tool, the person who made the tool available to the user, and the person who allowed the use of the tool by the user (Kohler, 2023).

Considering this, we acknowledge the role of regulatory bodies and governments. They are tasked with creating and enforcing guidelines that dictate the ethical development and use of AI. Their involvement is crucial in setting standards and expectations that guide the behaviour of all other parties.

Moreover, the academic and research communities play a pivotal role. We believe that they are the heralds of deeper understanding and critical analysis, and they continually measuring AI's ethical implications and tried to propose frameworks to guide the development of the ethics on AI. Also, their work informs policies, shapes public opinion, and ultimately influences how society crosses the ethical obstacle from AI.

In essence, the responsibility is distributed across a network of stakeholders and organizations, each with their role to play in ensuring the ethical deployment and use of AI. This distributed responsibility model reflects the complexity nature of modern AI systems and the societies in which they operate. It underscores the need for a collective approach to governance and ethical oversight, one that is as adaptive as the technology aims to regulate.

We also confirm that, as AI continues to evolve, the discussion about responsibility, and, essentially, ethics should also increase. It's not just about assigning blame or anticipating every possible outcome, but probably about fostering an environment where there is:

- Continuous learning;
- Ethical reflection;

- Proactive governance.

With collaborative efforts, we can hope to provide ethical norms to AI, ensuring that these technologies serve humanity's best interests without compromising moral integrity.

5. The Case Study

In this technology, the ethical considerations regarding its development have earned significant attention. As AI is become increasingly integrated into various sectors, like healthcare to finance and beyond, understanding and addressing ethical concerns are paramount to ensuring the responsible use of AI. Considering this, the purpose of this research paper is to understand the implications of the measures on organizations and their users, while recognizing the necessity of regulation.

In this line of thinking, we draft a small questionnaire for AI users, with ages between 20- and 42-years, with Portuguese nationality, living in Lisbon, and that are working in an organization,

This small questionnaire aimed to understand the critical issues of AI, such as the impact of regulations on ethical considerations, the efficacy of Chief Ethical Officers (CEOs) in promoting ethical AI practices, and the distribution of responsibility in ensuring the ethical development and use of AI.

Through the analysis of data collected, this research attempts to provide valuable insights into the challenges and opportunities inherent in AI governance and in ethics.

We distribute the survey via email, to 42 persons that were correspondent to the sample that we needed. The questionnaire is divided into three sections:

1 – Section 1: AI Regulatory Frameworks and Ethical Considerations;
2 – Section 2: Role and Effectiveness of Chief Ethical Officers (CEOs);
3 - Section 3: Responsibility in Ethical AI Development and Use.

It was made by the software QuestionPro, and it was distributed from January 5th, 2024, until February 27th, 2024. The average time to complete the questionnaire was 2 minutes. From the 42 persons send, we obtained 37 responses, but only 23 were complete and contained valid data for analysis.

In the following table we present the survey:

Table 2 – Questionnaire used by the case study

Introduction
This survey aims to understand the impact of AI regulations on ethical considerations, the role of Chief Ethical Officers (CEOs) in promoting ethical AI practices, and the distribution of responsibility in ensuring the ethical development and use of AI. Your participation in this questionnaire is invaluable and will contribute to a deeper understanding of the complex challenges and opportunities in AI governance and ethics. Thank you for taking the time to share your insights and perspectives.

Contact Information	-Name; -Address; -Age; -E-mail; -Phone number; -Organization.
Section 1: AI Regulatory Frameworks and Ethical Considerations	
Question (1, 2, 3)	Possible answers
Please rate of how familiar are you with AI regulatory frameworks?	-Familiar; -Neutral; -Very Familiar.
In your opinion, how do AI regulatory frameworks impact ethical considerations in AI development?	-Positive impact; -Neutral; -Negative Impact.
How familiar are you with Portugal's regulatory approach to AI?	-Familiar; -Neutral; -Very Familiar.
Section 2: Role and Effectiveness of Chief Ethical Officers (CEOs)	
Question (1, 2, 3)	Possible answers
How effective does the Chief Ethical Officer (CEO) of your organization is dedicated to ethical AI practices?	-Very Dedicated; -Neutral; -Very Dedicated.
How would you rate the effectiveness of CEOs in promoting ethical AI practices within organizations?	-Very effective; -Neutral; -Ineffective.
Do you believe CEOs' efforts contribute to fostering trust among AI users?	-Significantly; -Neutral; -Not at all.
Section 3: Responsibility in Ethical AI Development and Use	
Question (1, 2, 3)	Possible answers
Where do you believe the primary responsibility lies in the ethical development and use of AI?	-AI developers; -AI users, -Government regulators; -Other (Please Explain).
How important do you think it is to establish a distributed responsibility model for ethical oversight across AI stakeholders and organizations?	-Very important; -Neutral; -Not important.

Who do you think that should be in charge to establish a distributed responsibility model for ethical oversight in AI development and use?	-AI Researchers and Academics; -Policy and Regulatory Professionals; -AI Industry Stakeholders; -Other (Please explain).

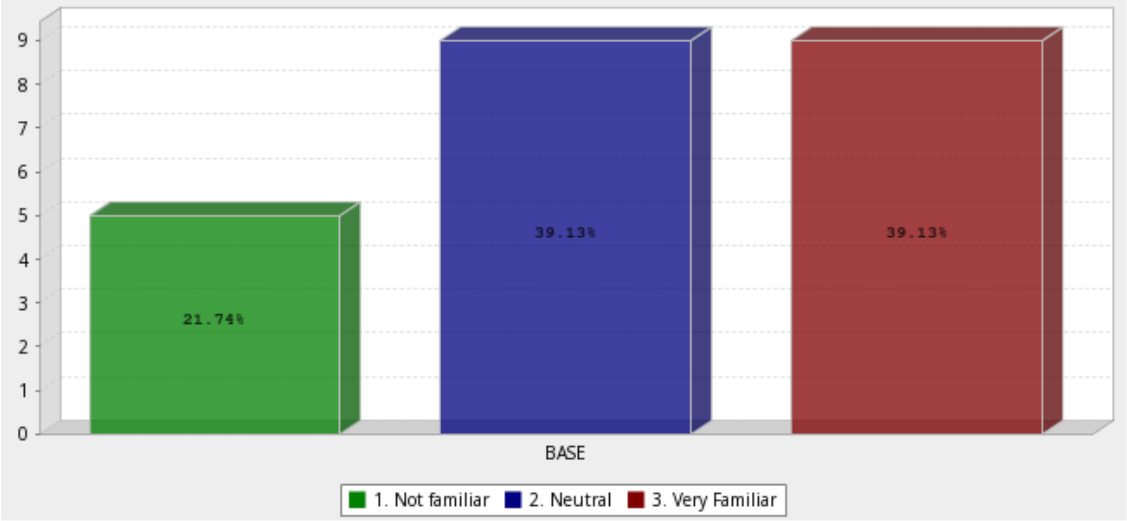
Source: elaboration of the author, 2024

With the data that we collected from this questionnaire we did a quantitative analysis to extract meaningful insights and patterns regarding participants' responses. We will provide an extensive analysis for each question, showing the total of the answers, the mean, the confidence interval, the standard deviation, the standard error and the percentage.

Below, we present the responses:

Question 1: Please rate of how familiar are you with AI regulatory frameworks?

Figure 2 – Results for the first question



	Answer	Count	Percent
1.	Not familiar	5	21.74%
2.	Neutral	9	39.13%
3.	Very Familiar	9	39.13%
	Total	23	100%

Mean: **2.174**	Confidence Interval @ 95% : **[1.856 - 2.492]**	Standard Deviation : **0.778**	Standard Error : **0.162**

Source: Elaboration of the author, 2024

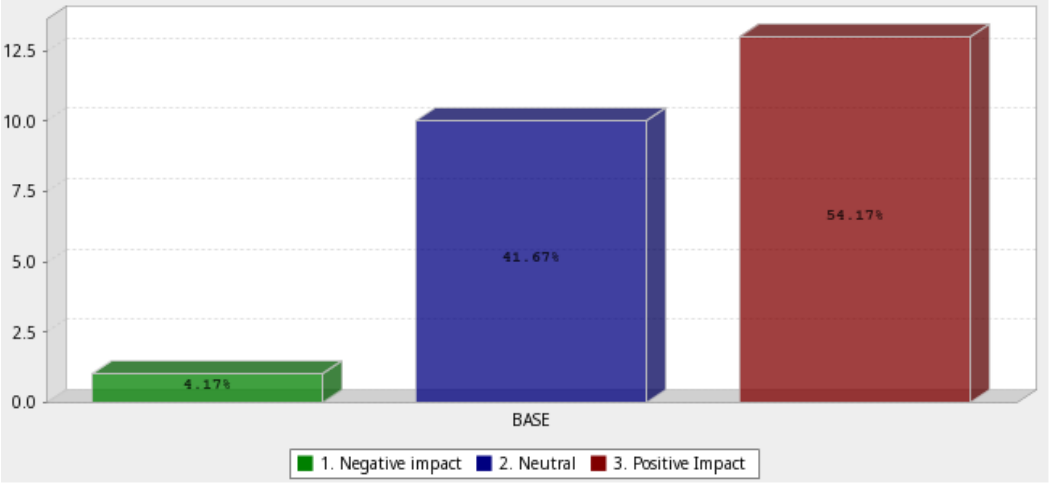
The results for this question indicate that participants' familiarity with AI regulatory frameworks varied. The majority of respondents (39.13%) reported being "Neutral" in terms of familiarity, while an equal proportion (39.13%) indicated being "Very Familiar" with AI

regulatory frameworks. A smaller proportion (21.74%) reported being "Not familiar" with these frameworks.

The mean familiarity score, calculated based on the responses, was 2.174 out of a possible scale ranging from 1 to 5. This indicates a moderate level of familiarity among participants on average. The confidence interval at a 95% confidence level provides an estimate of the range within which the true population mean of familiarity with AI regulatory frameworks is likely to fall. In this case, the confidence interval ranges from 1.856 to 2.492, suggesting that the true mean familiarity score for the population is likely to be within this range. The standard deviation of 0.778 indicates the extent of variability or dispersion in participants' responses around the mean familiarity score. A higher standard deviation suggests greater variability in familiarity levels among respondents. The standard error of 0.162 reflects the precision of the estimate of the population mean based on the sample data. A lower standard error indicates a more precise estimate of the population mean. Overall, these results suggest a mixed level of familiarity among participants with AI regulatory frameworks, with a significant proportion indicating either neutrality or high familiarity. The variability in responses underscores the need for further exploration and understanding of the factors influencing participants' familiarity with AI regulatory frameworks.

Question 2: In your opinion, how do AI regulatory frameworks impact ethical considerations in AI development?

Figure 3 – Results for the second question



	Answer	Count	Percent
1.	Negative impact	1	4.17%
2.	Neutral	10	41.67%
3.	Positive Impact	13	54.17%
	Total	24	100%
Mean : **2.500**	Confidence Interval @ 95% : **[2.264 - 2.736]**	Standard Deviation : **0.590**	Standard Error : **0.120**

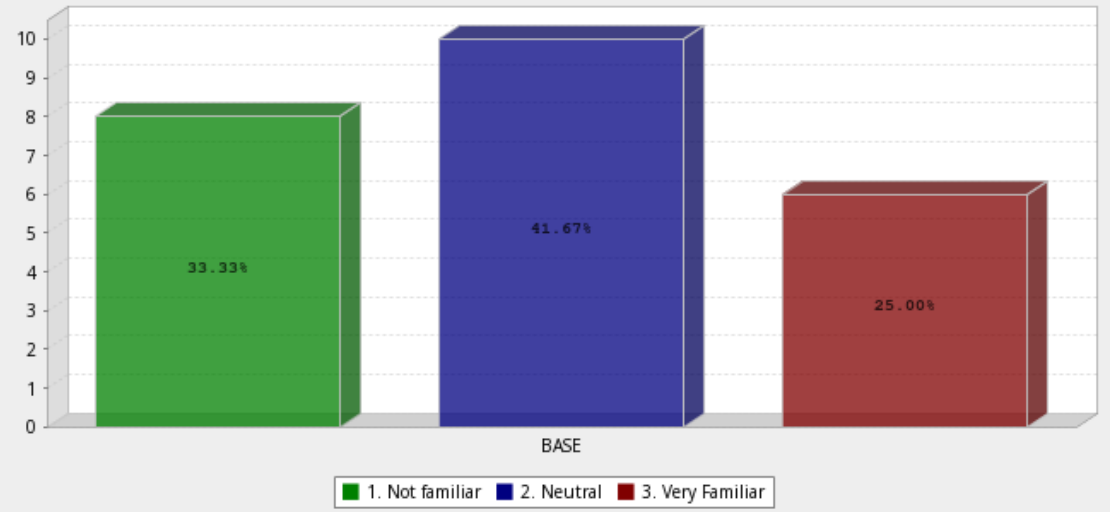
Source: Elaboration of the author, 2024

Here, participants were asked to rate their level of agreement with the statement: "Ethical considerations should be prioritized over technological advancement in AI development" on a scale of 1 to 5. The results indicate that opinions were fairly evenly distributed across the response options. The largest proportion of respondents (26.09%) indicated a "Neutral" stance, followed by an equal proportion (17.39%) who either "Strongly Disagree" or "Strongly Agree" with the statement. Additionally, 26.09% of participants expressed "Agree" with the statement, while 17.39% "Disagree." The mean agreement score, calculated based on the responses, was 3.261 out of a possible scale ranging from 1 to 5. This suggests a moderate level of agreement with the prioritization of ethical considerations over technological advancement in AI development among participants, on average. The confidence interval at a 95% confidence level provides an estimate of the range within which the true population mean of agreement with the statement is likely to fall. In this case, the confidence interval ranges from 2.895 to 3.627, indicating the range of uncertainty around the estimated mean agreement score. The standard deviation of 1.021 indicates the extent of variability or dispersion in participants' responses around the mean agreement score. A higher standard deviation suggests greater variability in agreement levels among respondents. The standard error of 0.213 reflects the precision of the estimate of the population mean based on the sample data. A lower standard error indicates a more precise estimate of the population mean.

Overall, these results suggest a diversity of opinions among participants regarding the prioritization of ethical considerations in AI development, with a significant proportion expressing neutrality. The variability in responses underscores the complexity of balancing ethical concerns with technological advancement in the field of AI.

Question 3: How familiar are you with Portugal's regulatory approach to AI?

Figure 4 – Results for the third question



	Answer	Count	Percent
1.	Not familiar	8	33.33%
2.	Neutral	10	41.67%
3.	Very Familiar	6	25.00%
	Total	24	100%

Mean : **1.917**	Confidence Interval @ 95% : **[1.606 - 2.227]**	Standard Deviation : **0.776**	Standard Error : **0.158**

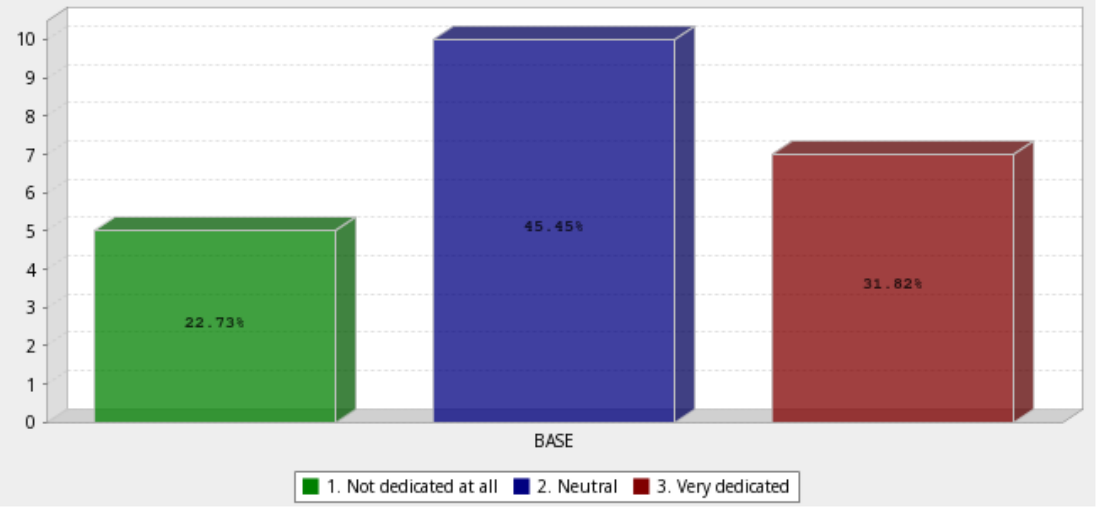
Source: Elaboration of the author, 2024

These results indicate that familiarity levels among participants varied. The largest proportion of respondents (41.67%) reported being "Neutral" in terms of familiarity with AI regulatory frameworks, while 33.33% indicated being "Not familiar" with these frameworks. Additionally, 25.00% of participants reported being "Very Familiar" with AI regulatory frameworks. The mean familiarity score, calculated based on the responses, was 1.917 out of a possible scale ranging from 1 to 3. This indicates a moderate level of familiarity among participants on average. The confidence interval at a 95% confidence level provides an estimate of the range within which the true population mean of familiarity with AI regulatory frameworks is likely to fall. In this case, the confidence interval ranges from 1.606 to 2.227, suggesting that the true mean familiarity score for the population is likely to be within this range. The standard deviation of 0.776 indicates the extent of variability or dispersion in participants' responses around the mean familiarity score. A higher standard deviation suggests greater variability in familiarity levels among respondents. The standard error of 0.158 reflects the precision of the estimate of the population mean based on the sample data. A lower standard error indicates a more precise estimate of the population mean.

Overall, these results suggest a mixed level of familiarity among participants with AI regulatory frameworks, with a significant proportion indicating either neutrality or low familiarity. The variability in responses underscores the need for further exploration and understanding of the factors influencing participants' familiarity with AI regulatory frameworks.

Question 4: How effective does the Chief Ethical Officer (CEO) of your organization is dedicated to ethical AI practices?

Figure 5 – Results for the fourth question



	Answer	Count	Percent
1.	Not dedicated at all	5	22.73%
2.	Neutral	10	45.45%
3.	Very dedicated	7	31.82%
	Total	22	100%

Mean : **2.091**	Confidence Interval @ 95% : **[1.777 - 2.404]**	Standard Deviation : **0.750**	Standard Error : **0.160**

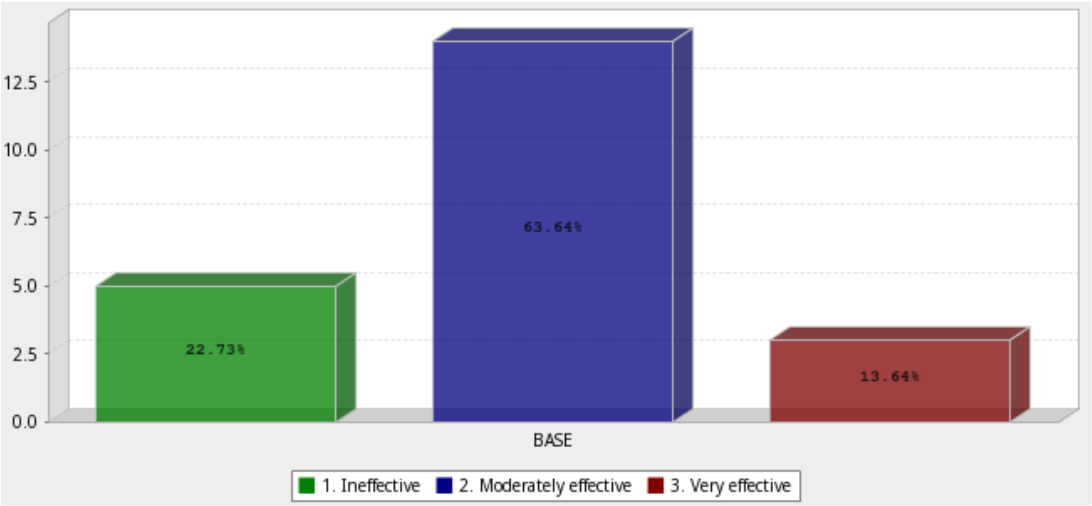
Source: Elaboration of the author, 2024

The majority of participants (45.45%) chose "Neutral," indicating a middle ground in their perception of the CEO's dedication to ethical AI practices. Meanwhile, 31.82% of participants viewed the CEO as "Very dedicated," suggesting a positive perception of their commitment to ethical AI practices. Additionally, 22.73% of respondents indicated that the CEO was "Not dedicated at all," signalling a negative perception of their dedication. The mean dedication score, calculated based on the responses, was 2.091 out of a possible scale ranging from 1 to 3. This suggests a moderate level of perceived dedication among participants on average. The confidence interval at a 95% confidence level provides an estimate of the range within which the true population mean of dedication to ethical AI practices by the CEO is likely to fall. In this case, the confidence interval ranges from 1.777 to 2.404, indicating the level of uncertainty surrounding the estimated mean dedication score. The standard deviation of 0.750

reflects the variability or dispersion in participants' perceptions of the CEO's dedication to ethical AI practices. A higher standard deviation suggests greater variability in perceptions among respondents. Overall, these results offer insights into participants' perceptions of the CEO's effectiveness in promoting ethical AI practices within their organizations, highlighting areas where improvement may be needed and areas of strength.

Question 5: How would you rate the effectiveness of CEOs in promoting ethical AI practices within organizations?

Figure 6 – Results for the fifth question



	Answer	Count	Percent
1.	Ineffective	5	22.73%
2.	Moderately effective	14	63.64%
3.	Very effective	3	13.64%
	Total	22	100%

Mean : **1.909**	Confidence Interval @ 95% : **[1.654 - 2.164]**	Standard Deviation : **0.610**	Standard Error : **0.130**

Source: Elaboration of the author, 2024

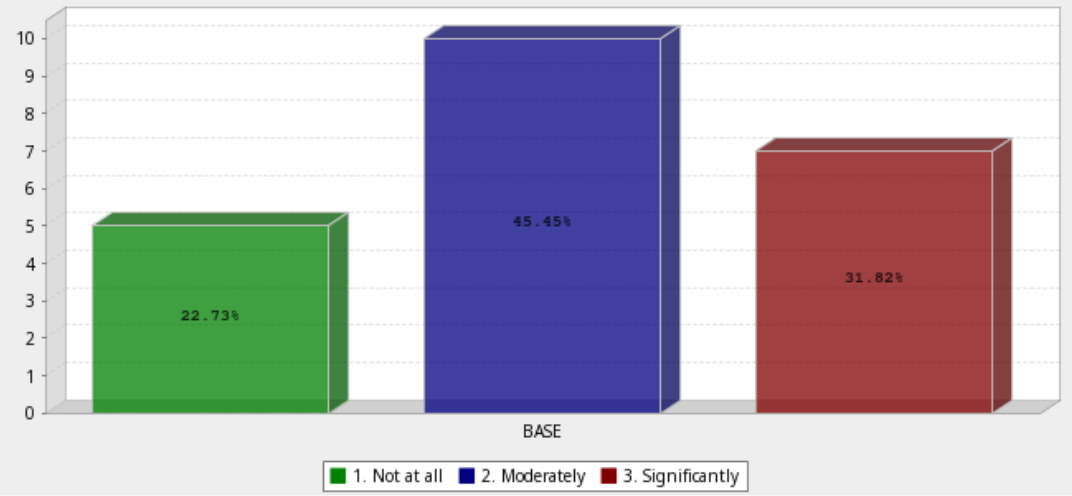
The majority of participants (63.64%) rated the CEO as "Moderately effective," suggesting a perceived moderate level of effectiveness in promoting ethical AI practices. Meanwhile, 22.73% of participants deemed the CEO as "Ineffective," indicating a negative perception of their effectiveness. Additionally, 13.64% of respondents viewed the CEO as "Very effective," suggesting a positive perception of their effectiveness. The mean effectiveness score, calculated based on the responses, was 1.909 out of a possible scale ranging from 1 to 3. This suggests a moderate level of perceived effectiveness among participants on average. The confidence interval at a 95% confidence level provides an estimate of the range within which the true population mean of effectiveness is likely to fall. In this case, the confidence interval ranges from 1.654 to 2.164, indicating the level of uncertainty surrounding the estimated

mean effectiveness score. The standard deviation of 0.610 reflects the variability or dispersion in participants' perceptions of the CEO's effectiveness in promoting ethical AI practices. A higher standard deviation suggests greater variability in perceptions among respondents.

Overall, these results provide insights into participants' perceptions of the CEO's effectiveness in promoting ethical AI practices within their organizations, highlighting areas where improvement may be needed and areas of perceived strength.

Question 6: Do you believe CEOs' efforts contribute to fostering trust among AI users?

Figure 7 – Results for the seventh question



	Answer	Count	Percent
1.	Not at all	5	22.73%
2.	Moderately	10	45.45%
3.	Significantly	7	31.82%
	Total	22	100%

Mean : **2.091**	Confidence Interval @ 95% : **[1.777 - 2.404]**	Standard Deviation : **0.750**	Standard Error : **0.160**

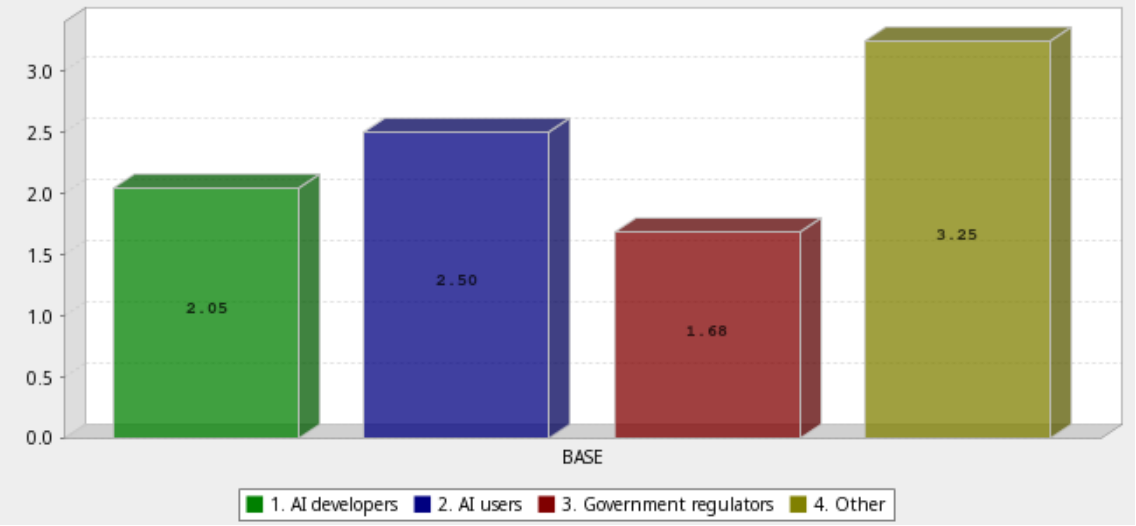
Source: Elaboration of the author, 2024

A notable proportion of participants (45.45%) rated the CEOs' efforts as "Moderately" contributing to fostering trust among AI users, suggesting a moderate belief in their impact. Additionally, 31.82% of respondents believed that CEOs' efforts "Significantly" contribute to fostering trust, indicating a positive belief in their effectiveness. On the contrary, 22.73% of participants indicated that CEOs' efforts do "Not at all" contribute to fostering trust, signalling a negative belief in their impact. The mean belief score, calculated based on the responses, was 2.091 out of a possible scale ranging from 1 to 3. This suggests a moderate level of belief among participants in the contribution of CEOs' efforts to fostering trust among AI users on average. The confidence interval at a 95% confidence level provides an estimate of the range within which the true population mean of belief is likely to fall. In this case, the confidence interval ranges from 1.777 to 2.404, indicating the level of uncertainty surrounding the

estimated mean belief score. The standard deviation of 0.750 reflects the variability or dispersion in participants' beliefs regarding the contribution of CEOs' efforts to fostering trust among AI users. A higher standard deviation suggests greater variability in beliefs among respondents.

Question 7: Where do you believe the primary responsibility lies in the ethical development and use of AI?

Figure 8 – Results for the eight question



Average Rank		1	2	3	4
AI developers	2.05				
AI users	2.50				
Government regulator ...	1.68				
Other	3.25				

Data Table								
AI developers	5	22.73%	12	54.55%	4	20.00%	1	12.50%
AI users	3	13.64%	5	22.73%	11	55.00%	1	12.50%
Government regulator ...	14	63.64%	2	9.09%	5	25.00%	1	12.50%
Other	0	0.00%	3	13.64%	0	0.00%	5	62.50%

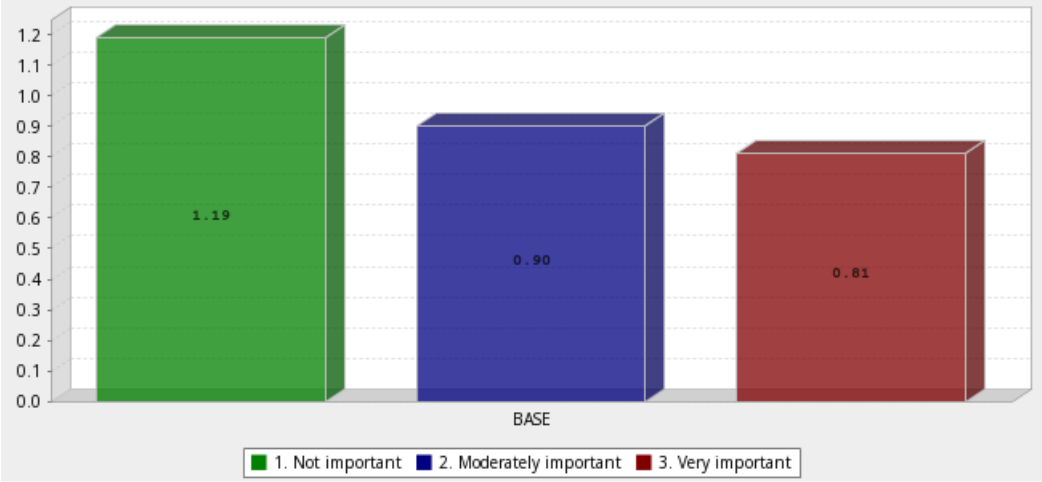
Source: Elaboration of the author, 2024

Upon analysing the responses, it is evident that participants ranked government regulators as having the highest level of responsibility for the ethical development and use of AI, with an average rank of 1.68. This suggests that most participants perceive government regulators as having the primary responsibility in this regard. AI developers were ranked second in terms of responsibility, with an average rank of 2.05. While AI users were ranked third, with an average rank of 2.50. These rankings indicate that participants believe AI developers and users also bear significant responsibility, albeit to a slightly lesser extent than government regulators. Participants ranked "Other" as having the lowest level of responsibility, with an average rank

of 3.25. This category likely encompasses a variety of stakeholders or entities not explicitly listed in the options provided.

Question 8: How important do you think it is to establish a distributed responsibility model for ethical oversight across AI stakeholders and organizations?

Figure 9 – Results for the nine question



Weighted Rank		1	2	3
Not important	1.19			
Moderately important	0.9			
Very important	0.81			

Data Table						
Not important	1	4.76%	0	0.00%	8	100.00%
Moderately important	9	42.86%	5	62.50%	0	0.00%
Very important	11	52.38%	3	37.50%	0	0.00%

	Answer	Count	Percent
1.	Not at all	5	22.73%
2.	Moderately	10	45.45%
3.	Significantly	7	31.82%
	Total	22	100%

Mean : **2.091**	Confidence Interval @ 95% : **[1.777 - 2.404]**	Standard Deviation : **0.750**	Standard Error : **0.160**

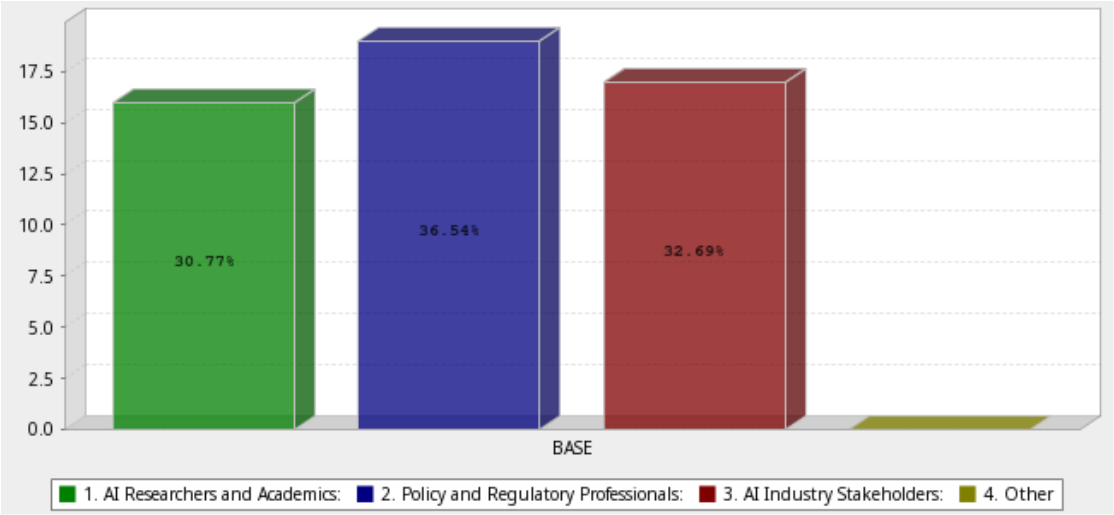
Source: Elaboration of the author, 2024

Upon analysing the responses, it is evident that the majority of participants perceive establishing a distributed responsibility model for ethical oversight across AI stakeholders and organizations as very important. This is reflected in the highest weighted rank given to "Very important" with a score of 0.81. Moderately important ranked second with a weighted rank of 0.90, suggesting that a significant portion of participants also view this aspect as moderately important. In contrast, "Not important" received the lowest weighted rank of 1.19, indicating that only a small proportion of participants consider establishing a distributed responsibility model for ethical oversight across AI stakeholders and organizations as not important. Overall, these results underscore the importance participants place on establishing a distributed

responsibility model for ethical oversight in the realm of AI, emphasizing the need for collaboration and shared accountability among various stakeholders and organizations.

Question 9: Who do you think that should be in charge to establish a distributed responsibility model for ethical oversight in AI development and use?

Figure 10 – Results for the tenth question



	Answer	Count	Percent
1.	AI Researchers and Academics:	16	30.77%
2.	Policy and Regulatory Professionals:	19	36.54%
3.	AI Industry Stakeholders:	17	32.69%
4.	Other	0	0.00%
	Total	52	100%

Mean : **2.019**	Confidence Interval @ 95% : **[1.801 - 2.238]**	Standard Deviation : **0.804**	Standard Error : **0.112**

Source: Elaboration of the author, 2024

For the question of who should be in charge of establishing a distributed responsibility model for ethical oversight in AI development and use, participants were provided with the following options:

1-AI Researchers and Academics;
2-Policy and Regulatory Professionals;
3-AI Industry Stakeholders;
4-Other.

The results indicate the distribution of responses among the provided options, along with the corresponding count and percentage of responses for each category. Among the options provided, Policy and Regulatory Professionals received the highest number of responses, with 36.54% of participants indicating them as the preferred group to be in charge of establishing

the distributed responsibility model. This suggests that a significant portion of participants believe that policy and regulatory professionals should take a leading role in this endeavour. AI Researchers and Academics followed closely behind, with 30.77% of participants selecting them as the preferred group for establishing the model. Additionally, AI Industry Stakeholders garnered 32.69% of responses, indicating a notable level of support for their involvement in the process. Interestingly, no respondents chose "Other" as their preferred option, suggesting that the provided categories were appropriate for this responsibility.

So, in conclusion, the presented results demonstrate participants' perceptions regarding various aspects of ethical oversight in AI development and use.

Regarding the first section, related with the familiarity with AI Regulatory Frameworks, participants demonstrated varying levels of familiarity, with a moderate mean score indicating a need for further understanding and engagement with regulatory frameworks.

As to the second section, related with the role of CEOs, participants viewed them as moderately effective in promoting ethical AI practices, suggesting room for improvement in their roles within organizations.

As for the third section of responsibility, we can conclude that the government regulators were perceived as having the primary responsibility for ethical AI development, indicating a strong expectation for regulatory intervention in ensuring ethical standards. Also, Policy and regulatory professionals emerged as the favoured choice to lead the establishment of a distributed responsibility model, reflecting a recognition of their role in shaping ethical standards and regulations.

These findings underscore the complexity of ethical oversight in AI and the multifaceted approach needed to address ethical concerns effectively. Collaboration among stakeholders, proactive regulatory intervention, and effective leadership within organizations are crucial for promoting ethical AI development and use in the future.

6. Conclusion

"At the moment when modern man, with the extraordinary power of science and technology, can decide that there is no more future for humanity, the future has ceased to represent, for many, a message of hope and has become a threat of destruction. It has been said that our young people today live in the tremendous insecurity of not having a future."(Rocha, 2005).

This statement illuminates a crucial ethical issue in our era of advanced technology and AI. It highlights the importance of human choices and the use of scientific and technological power in shaping our collective destiny. We are faced with the dual nature of our times: a period where the impressive advancements of science and technology hold the promise of propelling humanity forward, yet also harbour existential risks. This juxtaposition is particularly evident in the realm of AI, where the swift progress of capabilities raises pressing ethical concerns demanding immediate attention. The shift from a narrative of hope for the future to one fraught with potential peril serves as a stark reminder of our responsibility in AI development. Therefore, it is imperative that we prioritize the welfare of users and strive to ensure a future that brims with optimism for all. In this context, we could see the efforts that are being made by the stakeholders and the organizations to apply ethics on the new technologies, especially the AI technology, in order to give responsibility to technologies. We are aware that is mandatory to impute ethics, and to advise organizations that being ethical on AI, is not to keep tracking on them, but shows them the worthwhile side, that will allow them to have more trust, and, so, the more trustworthy the organization is, the more practitioners will have.

This paper discusses a comprehensive analysis of the global regulatory landscape concerning AI, as demonstrated by various countries and organizations striving to mitigate potential risks associated with AI. Entities such as the USA, China, ISO, the G7 Code of Conduct, the EU, Portugal, and UNESCO present similar approaches, reflecting diverse cultural and ethical perspectives. Across these frameworks, there is a unanimous acknowledgment of the necessity for a robust ethical framework to guide the trajectory of AI.

The role of the CEO, as elucidated, serves as an organizational response to the challenges posed by AI, symbolizing a commitment to steering technology towards a future where innovation is tempered by responsibility. However, responsibility is not a singular entity but rather extends from individual users to creators, enablers, and regulators of these technologies (Köhler, 2023). It embodies a multifaceted responsibility encompassing all stakeholders within the AI ecosystem, emphasizing the creation of an environment where ethical considerations are intrinsic to AI systems and governance.

Regarding the case study, the insights gleaned from the questionnaire shed light on participants' perceptions regarding ethical oversight in AI development and use. The findings underscore both strengths and areas for improvement in ethical governance. For instance, varying levels of familiarity with AI regulatory frameworks highlight the necessity for ongoing

education and engagement to ensure comprehensive adherence to ethical standards. Additionally, the role of Chief Ethical Officers (CEOs) in promoting ethical AI practices signifies a moderate level of confidence in their organizational roles, yet there is room for enhancement to bolster their effectiveness. Moreover, the belief in CEOs' contributions to fostering trust among AI users underscores the significance of ethical leadership and transparent communication in building confidence in AI technologies.

One noteworthy result indicates that government regulators are perceived to have the primary responsibility for ethical AI development, underscoring the pivotal role of regulatory intervention in upholding ethical standards and mitigating potential harms associated with AI systems. Furthermore, the preference for establishing a distributed responsibility model for ethical oversight across AI stakeholders highlights the necessity of collaborative efforts and shared accountability in addressing ethical challenges. Finally, the preference for policy and regulatory professionals to lead the establishment of such a model underscores the crucial role of regulatory frameworks in shaping ethical guidelines within the AI ecosystem.

In summary, these findings underscore the complexity of ethical oversight in AI and emphasize the importance of multifaceted approaches, including robust regulatory frameworks, effective leadership, and collaborative efforts among stakeholders. Continued research, dialogue, and action are imperative to address emerging ethical challenges and foster trust in AI technologies. In conclusion, this paper establishes that taking in consideration ethics on AI is not about constraining innovation but about ensuring its alignment with humanity's values and well-being. It is about constructing a future where technology serves as a bridge to a more reasonable world.

So, we think we all agree that is mandatory to impute ethics, and to advise organizations that being ethical with AI is not about keep tracking on them, but about showing them the worthwhile side, that will allow them to gain more trust. Thus, the more trustworthy the organization is, the more practitioners will have.

7. Further Research

The proposed future research directions to this paper are to elevate our understanding of Portugal's AI regulatory landscape through a robust and multi-dimensional research approach. The research areas to be explored are to develop a comprehensive understanding of Portugal's AI regulatory landscape using a sound and multidimensional research methodology. Ultimately, the aim is to come up with policies that promote AI innovation and economic expansion, as well as respect ethical principles that guarantee Portugal's competitiveness internationally while taking into account challenges being posed on the horizon.

To analyze the situation in Portugal, we will gather and analyze data on AI regulation, economic indicators, and global AI trends. This research may require examining government reports, legal documents, and economic statistics.

Exploring the research domains, to gain an inclusive insight into Portugal's AI regulatory setting is most likely achieved by utilizing a robust, multi-faceted investigation approach. The purpose of such an initiative would be to generate policies that facilitate AI innovation and economic growth while preserving ethical standards to ensure that Portugal retains its competitiveness in the international market and manages well with challenges yet to emerge in the future.

For the purpose of studying the situation in Portugal, we will obtain and evaluate information on AI regulation, economic indicators, and international AI trends. The study may entail examining official government publications, legal sources, and economic data.

Finally, based on the economic and global situation, it is envisaged to draw up policies for AI regulation in Portugal; to develop answers to the research questions that our study was focused on:

1) What is the international landscape of AI regulation?
2) How does it correspond with Portuguese progress in this area?
3) What are the similarities and differences?
4) Which measures of policy could be taken to improve Portugal's AI regulation, considering economic rationale as well as stakeholder views?
5) What are the objections that these stakeholders have concerning AI regulation in Portugal?
6) Do they consider the current legislative structure and its impact on AI development?

8. References

AMA (2022). GuIA para uma IA ética, transparente e responsável na administração Pública. V.1.1. ama. July, 2022

Arendt, H. (1963). Eichmann in Jerusalem: A report on the banality of the evil. The Viking Press. New York. 275

Barros, G. (2023). Forging AI Pathways: Portugal's Journey within the EU Digital Landscape. GEE. República portuguesa. Available in: https://www.gee.gov.pt/pt/estudos-e-seminarios/gee-papers-category/32990-forging-ai-pathways-portugal-s-journey-within-the-eu-digital-landscape

Barros, G. & Póvoa, I. (2023). A Inteligência Artificial na Transição Climática - Desafios e Potencialidades na União Europeia. GEE. República portuguesa. Available in: https://www.gee.gov.pt/pt/estudos-e-seminarios/estudos-de-temas-economicos-category/33090-te-118-a-inteligencia-artificial-na-transicao-climatica-desafios-e-potencialidades-na-uniao-europeia

CAC - Cyberspace Administration of China (2023). China Regulation on Generative AI. Cyberspace Administration of China. Available in: https://www.cac.gov.cn/2023-04/11/c_1682854275475410.htm###

Deloitte Insights (2020). The rise of data and AI ethics. 'Government Trends 2020'. Report. Available in: https://www.deloitte.com/content/dam/assets-shared/legacy/docs/insights/2022/DI_Government-Trends-2020.pdf

Eckersley, P., Nasser, y., et al., (2017). EFF AI Progress Measurement Project. Electronic Frontier Foundation. Available in: https://eff.org/ai/metrics

European Commission (2018). Ethics guidelines for trustworthy AI. High-Level Expert Group on Artificial Intelligence. Available in: High-level expert group on artificial intelligence | Shaping Europe's digital future (europa.eu)

European Commission (2019). A definition of AI: Main capabilities and disciplines. High-Level Expert Group on Artificial Intelligence. Available in: https://ec.europa.eu/digital-single-maret/en/high-level-expert-group-artificial-intelligence

European Commission (2020). Assessment List for Trustworthy Artificial Intelligence (ALTAI) for self-assessment. Report/Study. Available in: https://digital-strategy.ec.europa.eu/en/library/assessment-list-trustworthy-artificial-intelligence-altai-self-assessment

European Commission (2021). Regulation of the European parliament and of the council. Laying down harmonised rules on AI (AI act) and amending certain union legislative acts. Proposal. Available in: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0206

European Council (2022). Artificial Intelligence Act: Council calls for promoting safe AI that respects fundamental rights. Press release. Available in:

https://www.consilium.europa.eu/en/press/press-releases/2022/12/06/artificial-intelligence-act-council-calls-for-promoting-safe-ai-that-respects-fundamental-rights/

European Parliament (2020). European framework on ethical aspects of artificial intelligence, robotics and related technologies. Think Thank. Available in: https://www.europarl.europa.eu/thinktank/en/document/EPRS_STU(2020)654179

G7 (2023). Hiroshima Process International Code of Conduct for Organizations Developing Advanced AI Systems. G7G20. Japan. Available in: https://g7g20-documents.org/database/document/2023-g7-japan-leaders-leaders-annex-hiroshima-process-international-code-of-conduct-for-organizations-developing-advanced-ai-systems

G7 (2023). Hiroshima Process International Guiding Principles for Organizations Developing Advanced AI System. G7G20. Japan. Available in: https://g7g20-documents.org/database/document/2023-g7-japan-leaders-leaders-annex-hiroshima-process-international-guiding-principles-for-organizations-developing-advanced-ai-system

G7 (2023). G7 Leaders' Statement on the Hiroshima AI Process. G7G20. Japan. Available in: https://g7g20-documents.org/database/document/2023-g7-japan-leaders-leaders-language-g7-leaders-statement-on-the-hiroshima-ai-process

Gibs, S. (2014). Artificial intelligence is our biggest existential threat. The Guardian. Available in: https://www.theguardian.com/technology/2014/oct/27/elon-musk-artificial-intelligence-ai-biggest-existential-threat

GPO (2023). AI Accountability Policy Request for Comment. Federal Register, Stephanie Weiner. 88(71). FR Doc. 2023–07776 Filed 4–12–23; 8:45 am

Heavens, L. (2023). Elon Musk repeats call for artificial intelligence regulation. Reuteurs. Interview, 19.06.23. Available in: https://www.reuters.com/technology/elon-musk-repeats-call-artificial-intelligence-regulation-2023-06-16/

Ideias e negócios (2023). AI.Ethics Portugal – ética em inteligência artificial. Available in: https://www.ideiasenegocios.pt/ai-ethics-portugal-etica-inteligencia-artificial/

IEEE (2019). The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems. Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems, First Edition. USA. Available in: https://standards.ieee.org/content/ieee-standards/en/industry-connections/ec/autonomous-systems.htm

ISO/IEC (2020). IT AI. Overview of trustworthiness in AI. TR 24028, published. ISO. Available in: https://www.iso.org/standard/77608.html

ISO/IEC (2021). AI. Assessment of the robustness of neural networks. TR 24029-1, published. ISO. Available in: https://www.iso.org/standard/77608.html

ISO/IEC (2021). IT AI Bias in AI systems and AI aided decision making. TR 24027, published. ISO. Available in: https://www.iso.org/standard/77608.html

ISO/IEC (2022). IT AI. Overview of ethical and societal concerns. TR 24368, published. ISO. Available in: https://www.iso.org/standard/78507.html

ISO/IEC (2022). IT AI. Process management framework for big data analytics. 24668, published. ISO. Available in: https://www.iso.org/standard/78368.html

ISO/IEC (2022). IT. Governance of IT. Governance implications of the use of AI by organizations. 38507, published. ISO. Available in: https://www.iso.org/standard/78368.html

ISO/IEC (2023). IT AI. Guidance on risk management. 23894, published. ISO. Available in: https://www.iso.org/standard/77304.html

ISO/IEC (2023). Software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE). Quality model for AI systems. 25059, published. ISO. Available in: https://www.iso.org/standard/80655.html

ISO/IEC (2023). IT AI. Management system. 42001, published. ISO. Available in: https://www.iso.org/standard/81230.html

InCode 2030 (2019). Portuguese National Initiative on digital skills. An innovation and growth strategy to foster AI in Portugal in the European context. AI Portugal 2030. Available in: https://www.incode2030.gov.pt/documentos/

Intel (2023). 2022-23 Corporate Responsibility Report. Intel Corporation. USA. Available in: https://csrreportbuilder.intel.com/pdfbuilder/pdfs/CSR-2022-23-Full-Report.pdf#page=45

Kohler, S. (2023). Can We Have Moral Status for Robots on the Cheap?. Journal of Ethics and Social Philosophy. 4(7). Doi: 10.26556/jesp.v24i1.1659

Marsden, J. (2022). Nietzsche, Nihilism, and the "New Materialist" Thought. The Journal of Nietzsche Studies (2022) 53 (1): 59–79. DOI: https://doi.org/10.5325/jnietstud.53.1.0059

NST – National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework. US Department of commerce. DOI: https://doi.org/10.6028/NIST.AI.100-1

OpenAI (2023). What is and what´s the importance of a Chief Ethical Officer in an Organization?. Response by ChatGPT. Accessed 15.11.23

RAII – Responsible Artificial Intelligence Institute (2022). The Responsible AI Certification Program – White Paper. Available in: https://www.responsible.ai/

Rocha, Z. (2005). Esperança não é esperar, é caminhar Reflexões filosóficas sobre a esperança e suas ressonâncias na teoria e clínica psicanalíticas. Revista Latino Americana de Psicopatologia Fundamental. X(2). 255-273

Rothman, J. (2023). Profiles: Why the Godfather of AI fears what he´s built. The New Yorker. Available in: https://www.newyorker.com/magazine/2023/11/20/geoffrey-hinton-profile-ai

Russel, S. (2019). Human Compatible. AI and the problem of control. Viking, USA. ISBN: 978-0-525-55861-3

Smith, B. (2023). Our commitments to advance safe, secure, and trustworthy AI. Microsoft Commitments. 21.07.2023. Available in: https://blogs.microsoft.com/on-the-issues/2023/07/21/commitment-safe-secure-ai/

Smuha, N., et al (2021). How the EU Can Achieve Legally Trustworthy AI: A Response to the European Commission's Proposal for an AI Act. SSRN. DOI: http://dx.doi.org/10.2139/ssrn.3899991

Statista (2022). Can Tech Companies be trusted with AI Governance? 17,193 adults across 17 countries surveyed sep.-oct. sources: KPMG Australia, The University of Queensland. Available in: https://www.statista.com/chart/29607/confidence-in-institutions-to-regulate-govern-artificial-intelligence/

TechCrunch (2023). How generative AI is accelerating disinformation. Kyle Wiggers. Available in: https://techcrunch.com/2023/09/21/how-generative-ai-is-accelerating-disinformation/

The White House (2022). Blueprint for an AI Bill of Rights: Making automated systems work for the American people. OSTP. Available in: https://www.whitehouse.gov/ostp/ai-bill-of-rights/

The White House (2023). FACT SHEET: President Biden Issues Executive Order on Safe, Secure, and Trustworthy Artificial Intelligence. OSTP. Available in: https://www.whitehouse.gov/briefing-room/statements-releases/2023/10/30/fact-sheet-president-biden-issues-executive-order-on-safe-secure-and-trustworthy-artificial-intelligence/

UNESCO (2022). Recommendation on the Ethics of Artificial Intelligence. Programme and Meeting document. Available in: https://unesdoc.unesco.org/ark:/48223/pf0000381137

UNESCO (2022). K-12 AI curricula: a mapping of government-endorsed AI curricula. Educação 2030. Available in: www.unesco.org/open-access/terms-use-ccbysa-port

UNESCO (2023). Artificial Intelligence: UNESCO calls on all Governments to implement Global Ethical Framework without delay. Press release, 30.03.23. Available in: https://www.unesco.org/en/articles/artificial-intelligence-unesco-calls-all-governments-implement-global-ethical-framework-without

UNESCO (2023). Ethical Impact Assessment. A Tool of the Recommendation on the Ethics of AI. Assessment. DOI: https://doi.org/10.54678/YTSA779

UN – United Nations (2022). Principles for the Ethical Use of AI in the UN System. HLCP. Available in: https://unsceb.org/principles-ethical-use-artificial-intelligence-united-nations-system

UN – United Nations (2023). Governing AI for Humanity. Interim Report. Available in: https://www.un.org/en/ai-advisory-body

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