Energy Transition and the European proposal for Artificial Intelligence Act (AIA). Case study: The Dutch AI Providers in The Energy Sector

MASTER THESIS

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Abstract

The proposal of the European Commission for the Artificial Intelligence Act (AIA) classifies AI systems intended to be used in the management and operation of critical infrastructures as high-risk. It means that stakeholders engaged in the energy industry should be ready to interact with this new situation, dictated by the AIA. To investigate the compliance readiness of the AI providers in the Dutch energy system with AIA, this research utilizes compliance theory to investigate "How the providers of the AI algorithm in the energy sector in the Netherlands will comply with the EU proposal for the artificial intelligence act (AIA)". It is found from eight interviews with various providers that all the participants have the social, normative, and economic motivations to comply with the AIA. However, in terms of capacity, the small providers thought they would face some challenges in the short term. Moreover, the high respect for the EU by this target group may also lead to more trust, which in turn can help compliance. Consequently, the results show that even without enforced compliance measures, such as penalties, energy-related AI providers will comply with the AIA to enjoy its economic benefits in the long run.

Keywords: Artificial Intelligent, Artificial Intelligent Act, European Union, Regulation Compliance, Energy Transition, Precautionary Principle, Risk-based Regulatory

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Glossary

	Concept	Definition
1	Artificial intelligence system	"Software that is developed with one or more of the techniques and approaches listed in Annex I of AIA and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with" (EuropeanCommission, 2021).
2	Provider	"A natural or legal person, public authority, agency or other body that develops an AI system or that has an AI system developed with a view to placing it on the market or putting it into service under its own name or trademark, whether for payment or free of charge" (EuropeanCommission, 2021).
3	Small-scale provider	"A provider that is a micro or small enterprise within the meaning of Commission Recommendation 2003/361/EC61" (EuropeanCommission, 2021);
4	User	"Any natural or legal person, public authority, agency or other body using an AI system under its authority, except where the AI system is used in the course of a personal non-professional activity" (EuropeanCommission, 2021);
5	Conformity assessment	"The process of verifying whether the requirements set out in Title III, Chapter 2 of this Regulation [AIA] relating to an AI system have been fulfilled" (EuropeanCommission, 2021);
6	CE marking of conformity	"[CE marking] means a marking by which a provider indicates that an AI system is in conformity with the requirements set out in Title III, Chapter 2 of the AIA and other applicable Union legislation harmonising the conditions for the marketing of products ('Union harmonisation legislation') providing for its affixing" (EuropeanCommission, 2021)

Chapter 1: Introduction

1.1 Importance

Growth in electricity demand and the inevitable transition of energy systems from centralized to volatile and decentralized systems have made energy systems too complex (Bale et al., 2015; Niet et al., 2021). It is predicted that managing such complexity may not be possible by merely using conventional human management methods. Effective governance of such complexity may be possible by using algorithms, such as machine learning and artificial intelligence (AI) models in many parts of energy systems (Jin et al., 2020). However, AI utilization in energy systems may be associated with problems regarding data privacy, cybersecurity, and human autonomy.

Addressing such problems imposed by AI, the EU has pursued a precautionary approach (Hleg, 2019) and has introduced and proposed some regulations, including the General Data Protection Regulation (GDPR) (27.04.2016), the Data Governance Act (25.11.2020), the Digital Markets Act (15.12.2020), the Digital Services Act (15.12.2020), the Proposal for Artificial Intelligence Act (AIA) (21.04.2021), and recently the Data Act (23.02.2022). Although these regulations and rules do not all, directly, focus on AI, they can have indirect effects on the data training and algorithms used in AI development.

Following such a trend, this research will investigate compliance with the European Commission proposal for the AIA (EuropeanCommission, 2021) within the energy industry and AI systems in the Netherlands, as it is the most directly-related regulation mentioning AI governance in its main goal. Due to the probable harm to human life and public health related to the supply of vital commodities such as water, gas, heating and electricity, the AIA has classified AI systems intended to be used in the management and operation of these critical infrastructures as high-risk (EuropeanCommission, 2021). This regulation could increase the energy industry's complexity and cost of regulatory compliance (WEF, 2021). It means that stakeholders engaged in the energy industry should be ready to interact with this new situation, dictated by the new AI Act. Consequently, these risked-based regulations, in turn, impose some risks to stakeholders that need to comply with them, and it makes the assessment of AIA conformity readiness of stakeholders very important.

According to NLAICoalition (2021), the Netherlands can become a living lab for testing AI in the field of energy transition thanks to its suitable innovation system. However, for governing the actual sociotechnical transition towards more decentralized and digital energy

systems, compliance with the regulations is also crucial. As the Netherlands is a member of the EU and the AIA will directly be applicable in all Member States (EuropeanCommission, 2021), it is vital for all the current and future dutch stakeholders to get ready for compliance before it becomes binding in near future.

Consequently, the research question of this thesis is "how AI providers in the energy industry of the Netherlands will comply with the AIA."

1.2 Contribution

As the AIA is very new (the proposal was introduced on 21.04.2021) and is in the negotiation phase, this study will propose whether effective measures, including regulatory education, compliance monitoring, and enforcement strategies are necessary to facilitate the implementation of the AIA in the energy industry of the Netherlands. Although there is some research in terms of other data-related regulation compliance assessments such as the General Data Protection Regulation (GDPR) (Freitas and Silva, 2018), there is no investigation in terms of AIA. Therefore, this thesis contributes to the literature on AI regulatory domain, because it focuses on the compliance assessment of energy and AI providers in the Netherlands with AIA. Furthermore, this study adopts semi-structured interviews, which add original data to the literature in terms of the readiness of providers to come up with the new AI regulation. This qualitative data can be used by policymakers and regulators to do the same research at certain times for monitoring the compliance trend of the stakeholders regarding the different steps of AIA implementation.

1.3 Thesis outline

This study will be divided into six sections. In the background section, the relation between AI and energy transition, the AI definition, and the applications of AI in the energy sector are explained. Moreover, the regulatory approach to artificial intelligence and also the EU AIA as the first law of its kind are analyzed. In the next section, and after justifying the importance of compliance assessment of providers with AIA, the compliance theories and related frameworks introduced for assessing regulatory compliance are described. The methodology chapter will introduce the data gathering methods needed for analyzing the probable compliance with AIA. Finally, findings and discussion, as well as the conclusion chapters, are dedicated to the AIA compliance assessment based on the holistic business compliance framework which is introduced In chapter 3.

Chapter 2: Background

2.1 Definition of artificial intelligence

Although AI is getting popular in every aspect of life and many see this innovative intelligent creature as a promising technology (Müller, 2018), there has not been an agreed definition of what it is (Wang, 2019). According to Kaplan and Haenlein (2020), disagreements in definitions are caused by three factors. First, it is not easy to determine human intelligence, let alone to define artificial intelligence which tries to mimic such human talent. Second, based on the so-called AI effect, once a machine acquires a specific functionality, such functionality is not considered intelligent anymore. This effect makes the AI definition a moving and out of reach target. Third, as there are many types and evolutionary stages of AI, such as weak and strong AI, that are easily mixed up, confusion is inevitable. However, without a clear definition, the policymakers will not be able to evaluate the possible capabilities of AI in the future and the desirability of such creatures is also hard to determine (Bhatnagar et al., 2017).

Since 40 years ago, the definition of AI has changed from AI on mechanical appliances to computer science and programming (Grewal, 2014). However, from the first days of AI's introduction, its definition has been focusing on imitating human intelligence (Boucher, 2020). Based on the "Turing test" introduced in 1950, machines are intelligent as far as their actions cannot be differentiated from human actions (Turing, 2007). John McCarthy was the first one who in the year 1956, coined the term "Artificial Intelligence" as "the science and engineering of making intelligent machines" (McCarthy et al., 2006). This definition of AI as a mechanical replication had changed gradually to an intelligent agent. Poole et al. (1998) and Rusell and Norvig (2003) defined an intelligent agent as a system that can understand its environment and perform actions based on this interaction. Nowadays, AI is interlinked with computer science and it is realized as a computer system that can be similar to the human mind in a certain sense (Wang, 2019).

Considering all the difficulties and different perspectives in defining AI, this study will adopt the European Commission's 2021 definition of AI as it is explicitly mentioned in the European Commission proposal for the AIA. The AIA defines AI as software that is developed based on machine learning, logic- and knowledge-based and statistical approaches to satisfy some determined goals and make decisions on behalf of humans and interact with the environment (EuropeanCommission, 2021).

2.2 AI and energy transition

The new more decentralized energy system has novel features including different energy carriers (electricity and hydrogen from renewable energy resources), and various kinds of renewable energy technologies (solar panels, windmills, geothermal units and nuclear plants) (Jin et al., 2020). Moreover, different end-users that sometimes are producers themselves (prosumers, electrical appliances, EVs and industry), and a range of stakeholders with conflicting interests are the changes related to the social side of energy systems (Jin et al., 2020). These recent changes compared to traditional centralized systems have dictated new business models and policies needed for governing the interaction between these technologies and actors. However, the energy transition towards more decentralized socio-technical energy systems has brought emergent challenges, including grid stability, the balance between supply and demand, and maximal use of locally-produced renewable energy (Djeziri et al., 2020). All of these changes contribute to making such an energy system a complex adaptive system (Bale et al., 2015).

It is predicted that in the future, power and energy systems will become increasingly more complex as more compliances will be connected to the energy grid and as energy flows will become more and more dynamic and multidirectional (WEF, 2021). Following this trend, it is difficult to use conventional human processes of managing centralized energy systems for governing such complexity and uncertainty in more decentralized energy systems. As a result, in recent years, the tendency to deploy AI for having an integrated energy transition and autonomous management of energy systems has increased (Jin et al., 2020).

2.3 AI applications in the energy sector

The goal of energy system operators is to manage the network sustainably, securely and energy-affordably (Niet et al., 2021). For improving the effectiveness of energy governance, AI brings many opportunities for stakeholders in energy systems to produce outcomes including content, predictions, recommendations, or decisions (Niet et al., 2021).

Many frameworks try to categorize the various applications of AI in energy sectors. Referring to these frameworks is important for this research as the AIA has ranked the risks of AI, based on its applications. According to Ahmad et al. (2021), AI applications in energy systems can be summarized as AI-based modeling and decision-making. Improving the accuracy of modeling and promoting the decision-making process are the main goals of AI deployment in the energy system (Ahmad et al., 2021).

Thanks to energy system complexity (Bale et al., 2015), AI has been gradually integrated into every part of the energy system, from load and generation forecasting to infrastructure management (Wang et al., 2020). Ahmad et al. (2021) categorized four main fields of AI application as (1) simulation and improvement, which is related to simulation and scenario planning of energy systems and prediction of weather issues and wind speed, (2) investment and markets simulation, (3) sustainability and safety issues, such as predictive maintenance and providing cyber and physical protection tasks, and (4) services oriented to the customer, such as smart home management, micro-generation, and storage integration with virtual power plants, energy bundling, and billing.

However, applying AI to electricity systems can bring different societal risks, such as lack of transparency, human autonomy decline, cybersecurity issues, the dominance of a limited number of actors, and price manipulation (Niet et al., 2021). So far, to address such risks, policymakers have introduced measures, such as AIA in the EU.

2.4 The risk-based approach to AI governance

Emerging technologies have always inspired in us the imagination of a promising future, although experience has shown they can also impose new risks on our societies. Unlike natural risks, such technological risks are created by human artifacts resulting from scientific and technological achievements (Som et al., 2009). Ulrich Beck (1992) introduced the term 'risk society' for the first time to show that new technologies such as nuclear technologies can put our modern societies at severe risks as their side effects are not only environmental impacts but social ones as well. In addition to these risks, it is noticeable that the speed of technology development, especially ICT technologies, does not allow us to predict and prevent their social and environmental consequences in reality (Harremoës et al., 2001).

According to Som et al. (2009), to face and manage such risks effectively, societies should take conscious measures, even where there is no scientific evidence regarding the specific risks. This approach is called the precautionary principle (PP) towards managing possible future risks that require policymakers to consider scientific uncertainty in the process of the public-related regulation setting (Fisher and Harding, 2006). In recent decades, the PP has become important, especially in international treaties for sustainable development, including the 'Rio Declaration of the 1992 UN Conference on Environment and Development:

> "In order to protect the environment, the precautionary approach shall be widely used by States according to their capabilities. Where there are threats of serious

> and irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation (UNEP, 1992)"

As mentioned earlier, AI also has brought some risks to societies in general and energy systems specifically. In recent decades, policymakers have tried to introduce frameworks that can address the positive and negative consequences of AI at the same time while considering its future evolution. The German NGO, AlgorithmWatch has collected more than 160 AI-related frameworks, whereas the OECD's AI Policy Observatory has identified more than 300 examples worldwide (Budish, 2021). The latest and most famous one is the EU AIA (EuropeanCommission, 2021), whereas other institutions such as the Office of Management and Budget (OMB) for the United States also has started an initiative named regulatory framework for AI (Vought, 2020). This trend shows that AI governance, nowadays, has become increasingly important for public and private decision-makers.

According to Fjeld et al. (2020), the key themes common in all the AI-related frameworks include privacy, safety and security, transparency and explainability, accountability, human control of technology, fairness and non-discrimination, professional responsibility, and human values. They also have found that the more recent frameworks consider more of these eight themes (Fjeld et al., 2020). While, it is also an emerging area of convergence named the risk-based approach to AI, a great number of recent AI policy documents refer to the "risk" as a central element in their governance frameworks (Budish, 2021).

2.5 The European Commission's proposal for the AIA

On 21 April 2021, the European Commission published its proposal for a new AIA, (EuropeanCommission, 2021). The main objectives of AIA include: (1) ensuring the compliance of AI systems, applied to the EU market, with EU values and current law related to fundamental rights, (2) enhancing AI innovations and investments by legal certainty safeguard, and (3) supporting the AI applications market by building a specific market for lawful, safe and trustworthy AI applications (EuropeanCommission, 2021). The AIA is formed based on the most recent initiatives and documents, such as the Ethics Guidelines for Trustworthy AI (EuropeanCommission, 2019a) that have reflected EU legislation on AI. Following the White Paper on AI (EuropeanCommission, 2019b), AIA also put the risk-based approach to AI governance.

The AIA has introduced four categories of AI applications regarding the probable risk they might impose on societies including (1) unacceptable risks due to dangerous applications that are prohibited, (2) high-risk applications that should apply conformity assessment, (3) certain AI applications that need transparency, and (4) all other applications for which there are no new obligations (Budish, 2021). Hence, making a distinction between high-risk and low-risk AI systems is crucial for determining what measures should be applied in terms of AIA (Budish, 2021). Fig. 1 shows these four categories and the measures that should be taken regarding the potential risks.

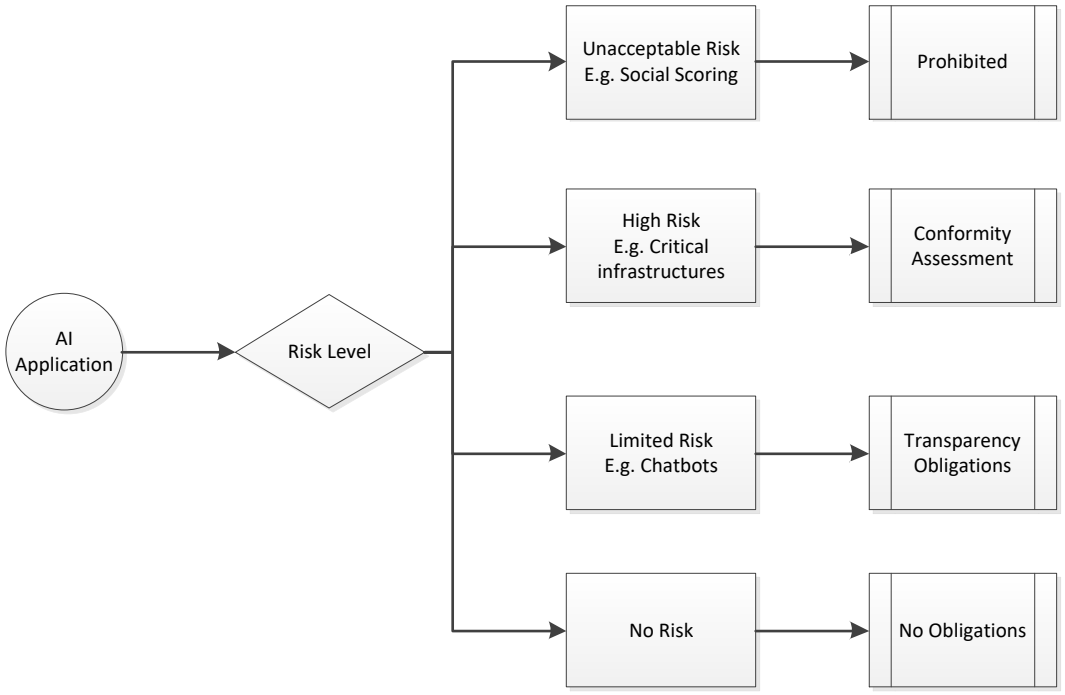

Fig. 1 The risk-based approach to AI governance proposed in the AIA (EuropeanCommission, 2021)

Due to the probable harm to human life and public health related to the supply of vital commodities, such as water, gas, heating, and electricity, the proposal of the European Commission for the AIA classifies AI systems intended to be implemented in the management and process of these critical infrastructures as high-risk (EuropeanCommission, 2021). It is required that high-risk AI systems providers establish a risk management system, identify and mitigate known and foreseeable risks, and perform adequate testing and validation (AIA, Chapter 2 of Title III) (EuropeanCommission, 2021). After an ex-ante conformity assessment, high-risk AI systems will have permission to be active in the EU market (Mökander et al., 2021). In other words, having proved compliance with the AIA, a high-risk AI system will be able to receive a so-called CE marking and become freely engaged in the EU market (AIA, Article 44) (EuropeanCommission, 2021).

To enforce the proposed EU legislation, several mechanisms are included in the AIA. Heavy fines are considered for high-risk AI systems providers that are not able to fulfill the conformity requirements. According to Article 71 of AIA, non-compliance with regulation can impose a fine of up to 30,000 EUR, or 6% of the total annual turnover (EuropeanCommission, 2021). So as to avoid such compliance risks, providers must take into account which procedures are proper to launch their behavior, operations and performance (Budish, 2021).

Chapter 3: Theoretical framework

3. Regulatory compliance

While political rhetoric affirms that the implementation of regulation would be too quick to reach the policy ends, 'compliance' research has shown that the regulation implementation is too complex and depends on the responses of individual businesses and citizens (Drahos, 2017). To explain and understand regulatory compliance, research in various disciplines including individual motivation psychology, firm organizational and institutional theories, and criminology to investigate the causes of law-breaking are needed (Drahos, 2017).

3.1. Definition of compliance

Criminologists, psychologists, sociologists, and legal scholars have investigated regulation compliance from different perspectives (Freese and Gille, 2017). From a regulatory viewpoint, 'compliance' means individuals' and firms' behavioral and attitudinal responses to regulation (Parker and Nielsen, 2011). Parker and Nielsen (2011) made a distinction between the 'objectivist' and 'interpretivist' approaches to compliance. Objectivist approaches determine the quality, reason, and circumstances of compliance or non-compliance behaviors (Parker and Nielsen, 2011). From the interpretive perspective, compliance is a complex and unclear mechanism in which the perception of the regulation is changed as it is interpreted by the aimed groups (Parker and Nielsen, 2011)

According to Simpson and Rorie (2011), compliance behavior is a rational choice of companies between several choices related to costs and benefits. Hence, non-compliance occurs when the criminal behavior benefits outweigh the compliance costs. In this regard, rationality limits including shortage of information, individual differences between targeted groups, and situations also should be considered (Simpson and Rorie, 2011). They introduced an objective utility approach and declared that benefits and costs are subjective rather than objective (Simpson and Rorie, 2011).

3.2. Compliance Theories

Compliance and noncompliance behaviors are complex, their reasons are diverse, and combining them in a holistic framework is not an easy task (Etienne, 2011). Some of these behaviors can be "automatic" and "planned" compliance or noncompliance behaviors that focus on the intended pursuit of different ends, including utility maximization, moral obligation fulfillment, or avoiding the probable sanctions (Étienne, 2010). Such behaviors are also

sometimes explained as the consequences of the regulatees' misunderstanding of regulations, their prescriptions, incompetence, incapacity, or ignorance (Brehm and Hamilton, 1996). Considering all of these attributes of compliance behaviors, the related theories have tried to explain such behavior in recent years.

Legitimacy theory is a compliance theory related to the social acceptance of an organization based on the perception that a 'social contract' exists between an organization and the community at large (Deegan et al., 2000, 2002). The social contract is the sum of implicit and explicit expectations of a society in terms of how an organization should behave in society (Levi and Sacks, 2009). Deterrence theory aims to complement the legitimacy theory by using threats as a means to manipulate behaviors (Mbago et al., 2016). Some scholars argue that increasing the size of the penalty can lead to law-breaking (Sutinen and Kuperan, 1999). According to Zubcic and Sims (2011), enforcement of penalties can increase the regulatory compliance level. The existence of criminals could be a piece of evidence showing that deterrence theory is not enough for reducing the number of offenders.

Another compliance theory that intends to be complementary to others is the stewardship theory. Based on stewardship theory stewards act in favor of their principals' interests. This theory seeks alignment of the interests of the principals and those of the stewards (Donaldson and Davis, 1991). The main assumption is that there is no conflict of interest between managers and principals. However, this theory does not consider that the individualistic interests of stewards can outweigh the collectivistic interests (Mbago et al., 2016). The fourth theory is the institutional theory, which states that the institutional environment can impact the development of the formal organizational structure which is, in turn, a basis for compliance (Mbago et al., 2016).

3.3. The Holistic and Plural Model of Business Compliance

Parker and Nielsen (2011) introduced a 'holistic and plural model of business compliance' in their book 'Explaining compliance'. Fig. 2 shows the holistic and plural model of business compliance proposed by Parker and Nielsen. They argued that the motives of the companies, organizational capacities and characteristics, regulation and enforcement as well as social and economic environments (or institutions) are the four sets of independent variables of interest that can explain the compliance behavior of companies in the short and long term (Parker and Nielsen, 2011). Clearly, compliance choice in this model would be a complex decision-making process with various interdependent factors (Parker and Nielsen, 2011).

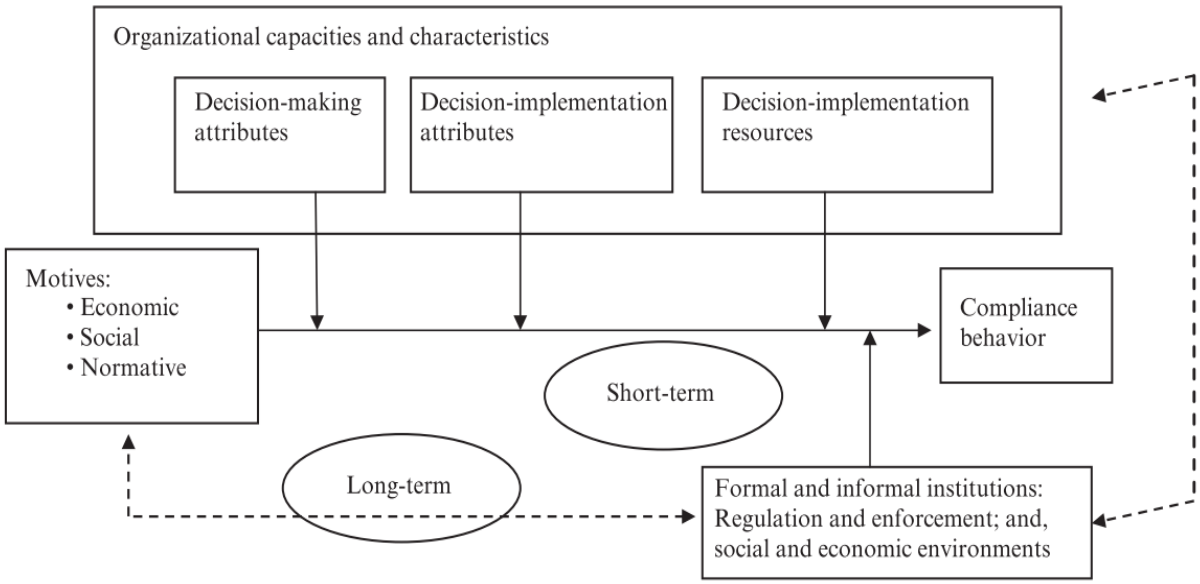

Fig. 2 Holistic and plural model of business compliance (Parker and Nielsen, 2011)

This framework aims to guide the data gathering regarding potential reasons why businesses do or do not comply with particular obligations. It can contribute to designing effective legislation, predicting the probable compliance issues in the future, monitoring compliance, designing regulatory education, setting enforcement strategies, and finally assessing the impacts of regulations after they are implemented (Parker and Nielsen, 2011).

3.4. 14 Questions to Assess the Compliance

In addition to the holistic and plural model of business compliance, Parker and Nielsen (2017) proposed 14 general questions as a guideline for preparing an interview and survey questionnaire. These 14 questions are formed based on the 'Table of Eleven' (T11). Dr. Dick Ruimschotel developed this table for and in collaboration with the Dutch Ministry of Justice to facilitate the need for enforcement of new regulations to improve the compliance level (LawEnforcementExpertiseCentre, 2004). The basis of the 11 factors listed in this table is behavioral science research regarding compliance. Parker and Nielsen (2017) adjusted this table by reviewing and synthesizing the interdisciplinary empirical literature related to compliance. They divided these factors into spontaneous compliance factors and enforced compliance factors. Parker and Nielsen (2017) reaffirmed that for information gathering using these 14 questions, it is crucial to use all 14 factors since the response behavior of people and businesses to regulations is often complex and these questions are based on the proposed holistic model intended to pick up all salient and significant factors. These 14 factors, questions

and the categories related to the main holistic model of compliance are further elaborated in Appendix 1.

3.5. Research Question

Following the discussions in the literature, this study identifies the compliance of AI providers with the AIA as an important subject. Therefore, this study will work on AIA regulatory compliance gap, as it focuses on the compliance assessment of energy and AI providers in the Netherlands with AIA. To fill this gap and make a contribution to the literature, this study focuses on the following main research question:

- How the providers of the AI algorithm in the energy sector in the Netherlands will comply with the EU proposal for the artificial intelligence act (AIA)?

In order to investigate the AIA compliance based on the regulatory compliance framework mentioned above, it is necessary to answer the below sub-questions:

- What are the economic, social, and normative motivations of the targeted group to comply with the AIA?
- Does the targeted group have the capacity to comply with the AIA?
- Do the enforcement compliance dimensions promote the compliance behavior of targeted groups?

This research has two aims: Firstly, to assess the conformity readiness of providers of the AI algorithm in the energy sector in the Netherlands with the AIA. To perform such an investigation, the compliance theory will be applied. Secondly, to evaluate the essence of the potential measures, including regulatory education, compliance monitoring, or enforcement strategies to facilitate the implementation of the AIA in the energy industry of the Netherlands.

Chapter 4: Methodology

This study applies compliance theory for assessing the compliance of energy-related AI providers with AIA. The theoretical framework for regulatory compliance evaluation will be the holistic and plural model of business compliance proposed by Parker and Nielsen (2011). Using the 14 compliance questions introduced by Parker and Nielsen (2017), a list of interview questions is created based on the targeted regulation (i.e., AIA). The goal is to investigate how providers will work with the AIA in terms of the qualities proposed in the selected model (Parker and Nielsen, 2017). By applying these 14 factors in this research context, a deep insight into the nature of barriers and opportunities for AIA compliance arises. Fig. 3 shows the research framework mentioned above.

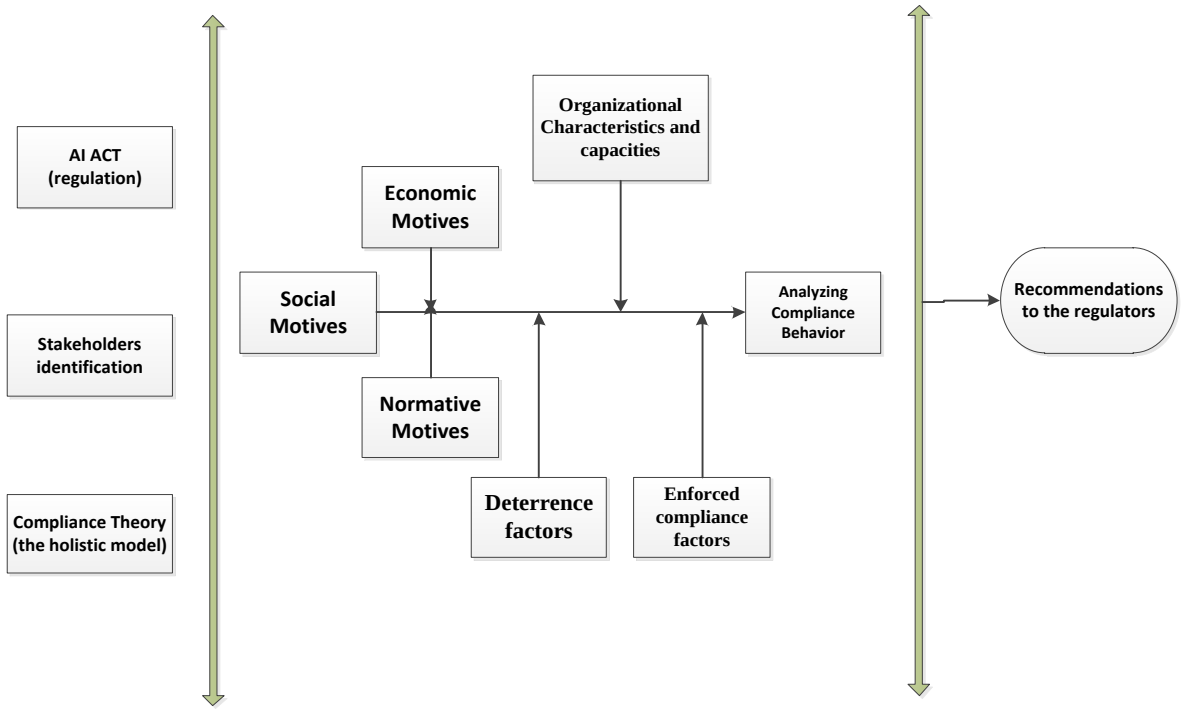

Fig. 3 Schematic Sketch of the Research Framework

4.1. Data Sources and Collection Methods

In-depth expert interviews are conducted to identify the compliance situation and enhance the depth of knowledge on existing determinants. Providers are purposefully sampled based on their relationship with AIA and energy in the Netherlands. The acquired Data are fully transcribed and anonymized. Guidance questions are related to (1) spontaneous compliance factors, which include economic, social, and normative motives, characteristics, and capacities of members of the providers, and (2) enforced compliance factors, which are deterrence factors.

Qualitative content analysis is applied as an appropriate method of evaluation. Main categories are derived in a concept-driven way based on the abovementioned factors and thus followed a deductive approach to knowledge generation. In line with research questions, data will be acquired on the determinants of compliance and non-compliance. Data required to answer the research question and subquestions will be collected using several tools including documents and interviews. The information required and the accessing method are shown in table 1.

Table 3: research question and the kinds of data needed

Research Question	**Data/Information Required to Answer the Question**	**Sources of Data**	**Accessing Data**
How the providers of the AI algorithm in the energy sector in the Netherlands will comply with the EU proposal for the artificial intelligence act (AIA)?	✓ Data about the EU AI Act ✓ providers' motivation to comply with AIA ✓ Characteristics and capacities of providers to comply with AIA ✓ Deterrence Factors	**Secondary Data:** ✓ AIA document **Primary Data:** ✓ AI algorithms providers in the energy sector in the Netherlands	✓ Search method ✓ Questioning: Face-to-face individual interview

4.2. Data collection

As previously described, the main source of data collection is semi-structured interviews. Contact was mostly established by email, with some phone calls included when needed. Initially, the interviewees' oral consent and willingness to participate were requested. After this step, all the interviews were recorded and transcribed. The ability to go back to the transcript and examine the material again was what made it possible to evaluate the generated data and conduct an in-depth assessment. The table 2 contains particular information on how the interviews were carried out, including the scale of the providers, the business type of the companies, and the title of the participants in the interviews.

Table 4: The list of interviewees

+The company names remain anonymous due to privacy

Number	Provider company	Scale	Title	Business
1	Pipeline data aggregator	Small	Founder	Efficient aggregation and display of pipeline data.
2	Global technology company	Big	R&D manager	A global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future by connecting software to its electrification, robotics, automation and motion portfolio.
3	Wind turbines' damage detection	Small	Founder	Accelerating sustainability and increasing wind energy production efficiency and CO2 reduction through early blade damage detection.
4	Smart city design	Small	Founder	Smart city design cooperative made up of architects, data scientists, and civic hackers.
5	Sustainable energy supply	Small	Machine Learning Engineer	Accelerates sustainable energy supply with partners.
6	Smart lighting network	Small	Founder	smart fixtures, produced in the Netherlands, make the lighting network in the municipality the backbone of the sustainable smart city of the future.
7	Provider of digital solutions	Big	IT and Energy industry professional	A world-leading provider of digital solutions for managing risk and improving safety and asset performance for ships, pipelines,

				processing plants, offshore structures, electric grids, smart cities and more.

Moreover, all of the interviews were conducted online using Microsoft Teams, which included recording and transcription options.

4.3. Data Analysis

According to Adams (2015), once the data has been collected, an in-depth assessment of the findings is a good technique to eliminate possible biases. Although software exists nowadays to evaluate open-ended questions, it is always a good idea to take the time and effort to understand the issues that go beyond the question's original intent (Adams, 2015). In addition, he claims that a well-conducted semi-structured interview "should always be worth the effort" in terms of obtaining insights and information (Adams, 2015).

Chapter 5 :Findings and Discussion

Since the AIA is in the negotiation phase and the articles and the terms of this act have undergone some amendments so far, it was at first important to realize whether the companies were aware of such a rule or not. All the eight big and small companies were not aware of AIA and based on the responses most of them became eager to know more about the act and the measures that needed to be taken. This leads the interviewer to explain a bit about the general conditions of the law such as the energy-related high-risk applications of AI (Anexx 3 of AIA), the process of conformity assessment and receiving the CE marking for the algorithms (Article 49, AIA), the sandbox initiative for compliance assessment (Article 53, AIA) and the penalties embedded in the act for non-compliance (Article 71, AIA).

After this short explanation, the questions were asked based on the compliance framework adopted for constructing the questionnaire. These questions were based on factors under the two general categories of the compliance dimensions, spontaneous and enforced (Fig. 4). What follows is a representation of the findings of the interviews with the providers based on these factors.

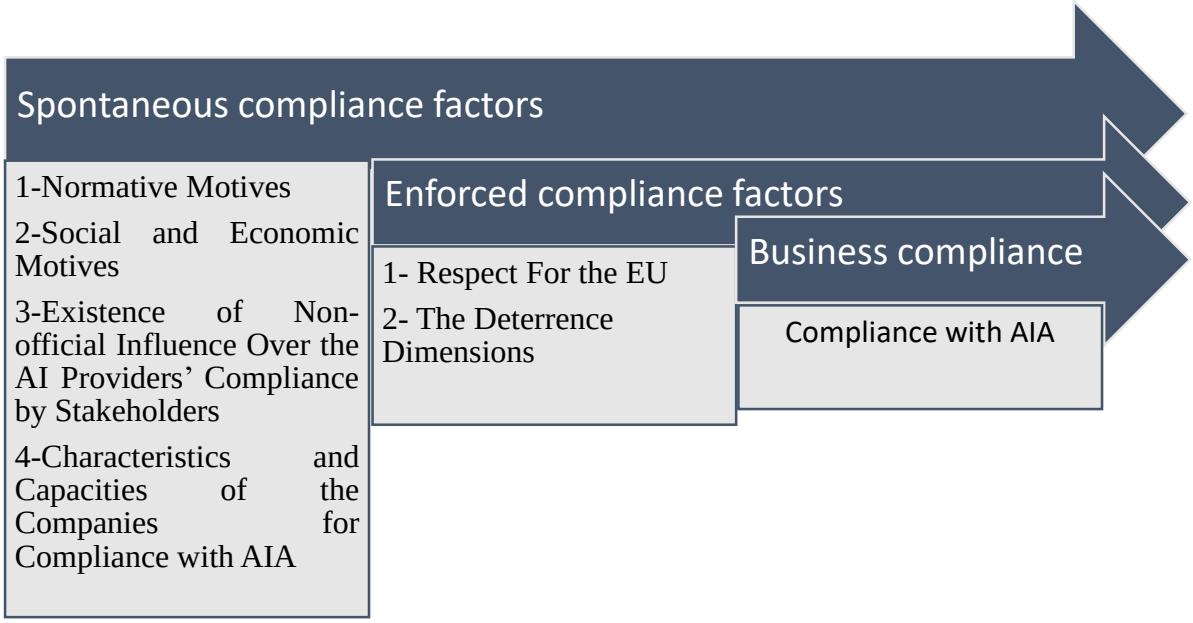

Fig. 4: The process of asking questions based on the holistic compliance model

5.1. Spontaneous Compliance Factors

The spontaneous compliance dimensions motivate providers of algorithms to comply with AIA even if no regulatory measures including law enforcement, education, inspection, etc. are in place (Parker and Nielsen, 2017). These include the economic, social, and normative motivations as well as the capacities and characteristics of the companies to comply with AIA.

5.1.1. Normative Motives

The AIA acceptance degree and the providers' respect for this law relate to businesses' normative motives (Parker and Nielsen, 2017). In this regard, some questions were asked in terms of whether they agree with the mechanism of AIA. Do they believe the AIA can make the AI algorithms trustworthy? Are providers committed to obeying the AIA regardless of their agreement with its mechanism?

All of the providers declared that they agree with such rules implemented by the EU and they think it can help to have a better society as a whole. For instance, the notions below were repeated in the interviews:

> "I think it's actually a good thing overall. So it will make European staff, maybe a bit less competitive unless there's support to get through it. I'd rather like be a global citizen and comply with things like this. So for our company personally, I think, we would try and comply, even if it made making less money." [The founder of a pipeline data aggregator company]

> "I can imagine in a lot of areas I can see the need for it, especially if it deals with people. I can say the morality issues … it is a kind of quality guarantee." [The founder of a wind turbine blade damage detection company]

> "Thank God that we're in Europe and we have some rules for engagement. Right. Those rules are about us like there are digital rights." [The founder of a smart city design company]

It is not a consensus among all the participants that the AIA can easily make the AI systems trustworthy. While it is evident that all the providers have respect for the AIA and agree with that, there are still some concerns regarding the mechanism of assessing its goal. Firstly, they are some debates regarding the criteria and measures intended to analyze the transparency and make the algorithm explainable.

> "… one aspect thereon is to make it more transparent based on which facts?" [R&D manager of a global technology company]

> "We work in one way where we are more or less describing the algorithm, but on the other hand, we also have self-learning algorithms and once that starts self-learning you can describe more or less the input parameters but then you can't really describe the algorithm exactly how it works." [The founder of a wind turbine blade damage detection company]

> "I'm very critical of that. Interpretability that, of course, would be somewhat possible. It's always like very strange to do this because the machine is not really explaining what it's doing. … it's very hard to write good regulation here in this case, because what's the definition of explainability? You just don't really know what's happening. You [are] just trying and you have no idea what actually will result [in] and you start with the necessity in order to be explainable." [The machine learning engineer of a sustainable energy supply company]

Secondly, it is mentioned in the AIA that some sandboxes would facilitate the conformity assessment of the algorithms if the providers are willing to do so (Article 53, AIA). However, a key point is that assessing the trustworthiness of AI in the energy sector is not as simple as testing it in a sandbox that can work for everything and some technical challenges would emerge. Two respondents brought these comments to the research:

> "I think it's not as simple as testing it in [a] sandbox [that] works for everything. [There] may be some technical challenges [in] doing this." [The founder of a pipeline Data aggregator company]

> "Well, what's that? Who is going to update the sandbox? Who defines the sandbox? Who has control over the sandbox and why? Yeah, that's very complicated." [The founder of a wind turbine blade damage detection company]

Thirdly, it seems that on top of such fundamental concerns is a critical point related to the philosophical possibility of regulating AI. This concern was introduced by the founder of a smart lightning network company:

> "The AI will always be a little bit further than we can anticipate. So, I'm curious to hear how a governmental body plans to keep up with technology and have the right regulation?" [The founder of a smart lightning network company]

Adopting the compliance framework here, some providers will want to obey the AIA and comply with the EU regulations regardless of whether they agree with this proposed law or not. It is evident from the findings that all the companies that were interviewed respected the AIA in general and they thought such regulations can bring benefits to societies as a whole. Despite

such respectfulness, still, there are some comments on the mechanism of AIA. Some companies were critical of the procedures intended to make the AI algorithms explainable and transparent. They believed that such things are not inherently possible. Looking into the results, it can be concluded that the normative motive of providers for compliance is high.

5.1.2. Social and Economic Motives

For discovering the social and economic motives of providers for compliance with AIA, some questions were asked regarding the cost, time, and measures needed to comply with this law. Moreover, the advantages of compliance and breaking the AIA for the providers of algorithms were also investigated. By asking such questions, it was also studied whether AIA compliance will help the companies to maximize their material utility or will derogate from it. Moreover, the social motives and commitment to achieving the approval and respect of others were questioned.

The unawareness of the law, which was predictable as the act has not yet been implemented, caused some rough estimations regarding the costs, time and efforts needed for compliance. Looking at the cost from merely a business point of view, it was found that the AIA compliance for big companies is not costly and they can cope with the new situation easily. The two big companies echoed this estimation for compliance with AIA as:

> "… I don't think that this has a relevant slowdown effect …. I mean, the point is, either you earn a lot of money by AI or not. If you don't, you can just sell the product without this feature and if you earn a lot of money, it doesn't matter to pay the cost." [R&D manager of a global technology company]

However, there are still some concerns for small companies in terms of expenses caused by AIA. Such a concern was stated in some interviews as:

> "… you know the validation part of all our engineering equations would probably cost more than it. … it is very expensive." [The founder of a pipeline Data aggregator company]

Time was another factor to be investigated and this was hard for the participants to answer without knowing what the details are. However, the IT and energy industry professional of a provider of digital solutions company estimated that:

> "It shouldn't take much more than one month because then it becomes too expensive." [The IT and energy industry professional of a provider of digital solutions company]

Notwithstanding, if it is intended that the algorithms show what they are doing or explain themselves, more time and cost are needed. This was added by the IT and energy industry professional of a provider of digital solutions company.

> "So … I think that [it needs] more effort… to see if it [the algorithm] does [explain itself], but it says it does then just check the legal compliance. So it needs more time." [The IT and energy industry professional of the provider of digital solutions company]

So far, it is clear that there is a difference between small and big companies in terms of the time and cost needed for compliance. While big companies believe that the cost of compliance is not a big issue for providers to do the conformity assessment, the small companies stated some worries about the cost.

Moreover, participants responded to the questions in terms of the advantages of complying with and breaking the AIA. It was found that non-compliance with AIA does not have any benefit for providers, whereas some think it can have advantages for the short term but not in the long run. The such assertion was repeated in the meetings in different forms.

> "Yeah. I guess in short term, it [non-compliance with AIA] would save time, money, and resources. But in the long term, I guess they [non-compliant providers] would lose. Yeah, you just soon get left behind." [The founder of a smart lighting company]

> "I think for a pure tech startup it would be a disadvantage because you know bureaucracy can slow things down." [The founder of a pipeline Data aggregator company]

> "We just don't comply and by the time when we grow bigger, yeah, then we will take the hit and then we survive." [The founder of a wind turbine blade damage detection company]

Apart from these statements reflecting compliance concerns of small companies, especially in short term, the IT and energy industry professionals of a company providing digital

solutions, who is the representative of a big company that is engaged in not only providing the algorithms for energy companies but also performing the conformity assessments with other regulations such as GDPR for other companies, stated that:

> "Energy companies are nice companies, right in the sense that they are somewhat conservative. They will not use anything that is not proven because as you say it's high risk and a lot depends on it. So if there is a good way to prove that an AI application is trustworthy, I think they will [comply]. They will see the advantage of using it." [The IT and energy industry professionals of a provider of digital solutions company]

Despite such short-term concerns for small provider companies, the results show that all the providers saw more long-term social and economic benefits in compliance for themselves. The companies, especially small ones, saw an opportunity in such quality assurance and receiving CE marking from the authorities. These notions were stated in different meetings:

> "It could actually benefit the smaller companies to be all marked with the same stamp". [The founder of a pipeline Data aggregator company]

> "I think… as a small company if you have that stamp of approval, and it will give you a heads up." [The founder of a wind turbine blade damage detection company]

> "… but if you look at the startup, then nobody knows about this company, right? So if they can show on their website that they have conformance to these AI standards then it's Yeah, valuable to them as well" [The IT and energy industry professionals in a provider of digital solutions company]

> "I think that, when something is steered … through policy measures, then it also brings a leveled playing field for the industry." [The founder of a smart information discovery company]

Based on the pieces of evidence mentioned above, social and economic motivations for compliance with AIA, especially in the long term, are high. Both small and big companies agreed that receiving the CE marking as a quality assurance symbol of the algorithms is a beneficial measure for not only the companies to work in a fair and transparent competitive environment, but also for the customers and societies that need trust to use AI with confidence.

5.1.3. Existence of Non-official Influence Over the AI Providers' Compliance by Stakeholders

It is shown that economic, social and normative motives for compliance with regulation are 'activated' through the behavior and attitudes of the many individuals, firms, and organizations that surround each business or individual (Parker and Nielsen, 2017). This was investigated by asking whether the participants think the stakeholders such as users, industry groups, or trading partners facilitate the non-official influence or not.

It became apparent that because the providers in the energy sector mostly need to work with big companies as the users and implementers of such algorithms, the providers need to comply with AIA and receive the CE marking to show their algorithms have quality assurance. Otherwise, they cannot survive in the market. It was also mentioned that the representatives of the society also will become aware of such regulations and they also will request the conformity assessment. This was concluded based on the notions below:

> "I think [it will be] definitely [important] for the customers and society, I guess." [The founder of a pipeline Data aggregator company]

> "I also think for us that to get credibility with our customers and our customers will be very big companies. but also just because otherwise your customers won't buy from you." [The founder of a wind turbine blade damage detection company]

> "You have to trust the system to work. And if you don't share, and if you don't let other peoples look under the hood, [then] there's no trust" [The founder of a smart city design company]

Regarding the non-official influence over the companies' compliance, it became clear that there is a consensus on the power of the users of the AI algorithm in the energy sector to urge the providers to become compliant with AIA. The respondents believed that as the AI business environment in the energy sector is highly dependent on the energy operators and they are the main customers in this domain, they will request the CE marking and the trustworthy AI algorithm as they need to be sure that the energy network will work in secure status.

Consequently, such behavior from the customer side would force the providers to make their AI standardized.

5.1.4. Characteristics and Capacities of the Companies for Compliance with AIA

Knowledge of the AIA. If the providers are not aware of the AIA, they may unintentionally violate it (Parker and Nielsen, 2017). This may occur when they are unaware of the AIA or it is too complex to understand. Naturally, none of the companies has information about AIA since it is in the negotiation phase. However, to realize the perception of companies, apart from asking about their awareness of the existence of AIA, it was questioned whether they know at what level of risk (i.e., forbidden, high risk, and low risk) their models and algorithms are. After their responses, the part on energy-related high-risk AI systems from Annex 3 of AIA was read by the interviewer and again their opinions were investigated. In Annex 3 of the AIA, the high-risk systems of AI are mentioned and the second application is as below (Anexx 3, AIA):

> "Management and operation of critical infrastructure: AI systems are intended to be used as safety components in the management and operation of road traffic and the supply of water, gas, heating and electricity." (Anexx 3, AIA)

Having asked about the level of the risk for the first time, the founder of a pipeline Data aggregator company and the founder of a smart city design company stated that their businesses are in the high-risk category.

> "I had no information until you'd sent me the message. This was not even on our radar, to be honest. I believe it would be in like the high-risk potential category cause we're looking at pipeline maintenance and engineering integrity" [The founder of a pipeline Data aggregator company]

> "… from the stuff that I do, it's very high risk, but we turn it around to make it. So how we go from very invasive technologies to as you know, policy design tools." [The founder of a smart city design company]

Most of the others, at first, believed that as they are not working with humans their algorithms are ranked as low risk. Some examples of such notions are as below:

> "Let's say in the field of renewable energy, the systems are usually operated in areas where no humans are allowed there. So the risk that somebody gets killed is very low, but it's not zero. No. We will always try to avoid that ranking." [R&D manager of a global technology company]

> "It was new to me. But I expect that we are not too high risk because we don't deal with data of people or things like that." [The founder of a wind turbine blade damage detection company]

> "No. I don't know how we would [be] classified [as] high-risk. Of course. What I do know is that most of the data that we are processing will typically not be related to individual personal data" [The IT and energy industry professional of the provider of the digital solutions company]

> "I did Google it after your e-mail. I would say that we are on the low risk, on the third category." [The founder of a smart information discovery company]

After reading the energy-related part of AIA mentioned above, such perception that this act is only about the human-related turned around and some participants changed their minds and declared:

> "Oh, that's our category." [The founder of a wind turbine blade damage detection company]

> "… that's definitely the case, yeah." [The IT and energy industry professional of the provider of the digital solutions company]

However, the two providers still justified that they are not at high risk based on the definition as they are not working directly with critical infrastructures. It is evident that just by making some communications with the providers, the authorities can raise awareness and so this factor is not a barrier to compliance.

Business model. In this regard, it is questioned whether AIA is relevant to the business model of the providers or not. Apart from the two small companies that responded they are not working on the high-risk applications of AI [The founder of a smart lighting network company & the founder of a smart information discovery company]. The other six interviewees confirmed that they would be ranked as high risk and so it is related to their business model and the algorithm they worked on. However, it seems that in terms of the rise of the cost of

companies, such cost may be compensated by the big companies who are the customers of these algorithms. This is stated in one of the interviews:

> "I think when it comes to pipeline operators, they have money and they will pay. And if you just put 20% on top of your prices, it wouldn't be a problem. So for us being aware of it and adding that into our pricing structure is very important. I think we could pass the cost on to the customers." [The founder of a pipeline data aggregator company]

Besides, it seems that introducing AIA will bring a new business model for other companies to make the algorithms trustworthy or perform the conformity assessment of other companies. This is mentioned by two SMEs interviewed:

> "I can imagine that there will be consultants that are working on the AI act." [The founder of a wind turbine blade damage detection company]

> "I'm also thinking that probably this will bring also a new business." [The founder of a smart information discovery company]

These arguments were approved by the notion of the IT and energy industry professionals in the provider of digital solutions company when he said:

> "… in our business model, we do a lot of these certifications. So it sounds interesting then maybe we can do some of these certifications for customers as well." [The IT and energy industry professionals in the provider of digital solutions company]

Based on the compliance framework, the extent to which the AIA is relevant to the business model of the companies is an important factor that determines their willingness to comply (Parker and Nielsen, 2017). If the AIA obligations for providers are irrelevant to the business models of these companies, it is less likely for them to comply. Since the AIA has defined obligations based on the applications of AI in various domains, the business models of companies that are engaged in high-risk applications should undergo some changes. From this point of view, the AIA is indeed relevant to the business models of the AI developers that will stimulate compliance with this law. It is also interesting that this act not only can change the business models of companies but also can bring about some other businesses that can assess and facilitate the compliance of other companies.

Capacity to comply with AIA. It is accepted that regulated firms are different in terms of fundamental characteristics such as financial resources, technical know-how, managerial capacity, and the personal and professional backgrounds of the people forming the companies and it is true that such differences can determine their compliance behavior (Parker and Nielsen, 2009).

In terms of the capacity to comply with this act, it was questioned whether the providers are aware of the resources needed for compliance and if they have such resources. The small companies that are supposed to receive the CE marking in order to be able to work in the EU market believed this act can be a big burden for these companies, especially in the first phases of implementation.

> "… the costs of these obviously for smaller companies is a bigger burden to bear … so it's harder to draw and you know to bootstrap your startup." [The founder of a pipeline Data aggregator company]

> "… if it is similar to GDPR I get a little bit nervous about the cost because I know that GDPR is quite expensive. But [as] a small company you just don't have the resources to assign people to that … because all these things need to be managed and you need resources to manage it." [The founder of a wind turbine blade damage detection company]

It seems that the capacity to comply with AIA is a big issue for small companies. But the AIA has considered this issue and there are some measures to boost the small-scale providers' capacity for compliance that will be discussed in the next section.

5.2. Enforced Compliance Dimensions

The enforced compliance factors are the different regulatory interventions that influence compliance and noncompliance with the law and regulation (Parker and Nielsen, 2017). These sophisticated interventions will only make a difference in the behavior of companies if they are perceived in the right way.

5.2.1. Respect for the EU

Respect for the EU is more about companies' evaluation of the legitimacy and procedural fairness with which the EU goes about its regulatory task. Such evaluation will influence their trust in the AIA and the regulatory process. It would influence the way companies perceive the

seriousness and effectiveness of monitoring and enforcement interventions and the companies will likely only pay attention to the advice and guidance of the EU if they respect its position as a regulator. Furthermore, it will promote trust between the companies and the EU, which can facilitate compliance behavior in the end (Parker and Nielsen, 2017).

In this term, all the companies agreed that the EU is the best regulator and they respect its position in setting the same regulations such as GDPR. Meanwhile, the justifications for this respect are different. Firstly, it is noted that the EU is a good start for the globalization of the AI regulations:

> "I like Europe doing a lot of good things in leading climate change and I really think that's awesome for this one. I think it's good to start with something like the European Commission and maybe in the future it could be a more global organization but, yeah, you've got to start somewhere, and I think the European Commission is a pretty powerful block." [The founder of a pipeline data aggregator company]

Secondly, it is mentioned that as the EU is an open market so it is needed that at the EU level the standards be set, and in this regard, other companies from outside of the EU borders and the multinational companies which are intended to work in the EU border would also comply in the end. Moreover, it is also stated that the other countries that have the plan to become international and attract investors will adopt the same regulations. These reasons are repeated by providers as:

> "Yes, I think it is a good place because I mean you have open markets if you have open markets, products have to comply with the same standards that make sense. So other countries like China [will] try to learn from our regulations. So that's alright." [The R&D manager of a global technology company]

> "Yeah, I think if you want to do this, well, then you should do it on an EU level. … let's say otherwise you get different regulations per country… I think multinationals [multinational companies] can be used as a way to export this regulation." [The founder of a wind turbine blade damage detection company]

> "… if they [UAE] want to position this economic hub in the world for all these people from around the world … they will have to adhere to some international standards because they will not be interested in moving there and setting up businesses and things if they know that the state is going to be exploiting people and exploiting communities and things like that." [The founder of a smart city design company]

The IT and energy industry professional of a digital solutions provider as the representative of a big international experienced company believed that such regulations should be done at the EU level but in the energy sector which means there should be some independent and energy-related institutions to set and monitor the AI and energy rules.

> "… they are kind of regulated by Entso-e. Right, which is the European TSOs. I would find it natural that for that industry it would be regulated by Entso-e, and then you have something for the distribution operators [DSOs] and maybe also for other aspects that would make it. Then you can also look at the specifics for an industry right and make it more specific for energy. So you could maybe set up an independent agency. We have such agencies in the Netherlands. The privacy of data agency." [The IT and energy industry professional of the provider of the digital solutions company]

Although the machine learning engineer of a sustainable energy supply company affirmed the power of the EU in making the regulations not only within its borders but globally, he had some concerns based on his experience with GDPR and he thought this act was not good.

> "I think that the EU has a very powerful position in this regard. Of course, they have made some problems. I mean GDPR. I don't think it's a good act. There are a lot of things wrong with it. And they are mostly favoring like big companies in this regard. … Yeah, you are like a very big market. They have like 25 the world's GDP 25%, something like this. So yeah, the regulations that they make have an effect." [The machine learning engineer of a sustainable energy supply company]

In terms of the EU's fair behavior as the AIA regulator, the participants thought that this institution does not treat selectively, however, there are some concerns that the regulatory field that will be established by the EU would not be fair enough and the small companies would be the losers. Such statements are as follows:

> "I think everyone would be treated equally, but I always come back to [the fact that] larger companies can have the resources to take this but smaller companies don't necessarily have the resources to do this in the early stages". [The founder of a pipeline data aggregator company]

The founder of a wind turbine blade damage detection company also believed that the EU behaves fairly but if the AIA is going to be as strict as GDPR, it will weaken the small companies and innovation as a whole.

> "I … trust that they will behave fair and equal … in GDPR they tried to make all the difference between large and small companies but still it is. So if it is too restrictive, then you kill off all the small companies because they can't comply. They don't have the resources to do the extra work. Yeah. If you make it too restrictive, you will give a huge advantage to the big companies. And that means smaller companies are better at innovation." [The founder of a wind turbine blade damage detection company]

In general, it is clear from the statements that although there are some concerns in terms of the consequences of the AIA for companies, they all affirm that the EU has behaved so powerfully in data governance so far and that such regulations have the potential to become global with a considerable impact on human lives. They also believe that the EU behaves fair and there is no exemption or discrimination regarding the implementation of the rules. Apart from this respectfulness, again some of the respondents worried about the mechanism of AIA and they thought the experience with GDPR showed that such rules can put a huge burden on small companies, who are in fact innovation leaders.

5.2.2. The Deterrence Dimensions

These dimensions all relate to the various ways in which the EU seeks to prevent non-compliance of AI providers through enforcement. As the AIA is in the negation phase, the deterrence measures have not yet been defined. However, in article 71 of this act, the penalty for non-compliance would be €30M or 6 percent of worldwide annual turnover (whichever is higher). After reading this, it was questioned whether the participants see a severe risk that forces the providers to comply with AIA. In this regard, some of the respondents stated that as they had not seen the details of the AIA, they cannot estimate whether such a fine is a deterrent for breaking the AIA or not. Nevertheless, as it is apparent below, most of the participants in this research found this amount of penalties to be somewhat strict.

> "That's pretty strict. So I'm sure people will comply." [The founder of a pipeline data aggregator company]

> "What's for me, 6% sounds reasonable. I mean that's the risk. It's not super high, but if you can manage you will try to comply" [R&D manager of a global technology company]

> "If there is this … kind of fine of 6% or something, then that's also a cost risk, of course. Then you might also lose your partners or customers." [The founder of a smart information discovery company]

> "That's kind of steep, but I guess that would work, yeah." [The founder of a smart lighting network company]

The machine learning engineer of a sustainable energy supply company brought this estimation to the research that it is not only the amount of penalty stated in the AIA, but still, they would be some other measures that companies should do to prevent any sanctions:

> "… but they still have to hire a lawyer and go to court and blah, blah, blah, I don't think it's the 6%, it's all the things around it that would kill the startup." [The machine learning engineer of a sustainable energy supply company]

The IT and energy industry professional of the provider of the digital solutions company believed that this act is detergent inherently and without the penalty, companies will follow the rules as they want to survive in the competition:

> "You will kick out from the market. it typically works that in tenders you would require this AI certificate to be present right and then naturally the vendors that would not comply with this would be excluded from a tender process. That's how I think it should work."

Following the dimensions introduced by Parker and Nielsen (2017), it seems that the last notion of this part is to some extent true. It means that the spontaneous AIA compliance dimensions are strong enough that even without enforced measures such as penalties, the providers will follow the rules to enjoy the benefits of this act for a long time.

Therefore, due to the special characteristics of the energy sector in which the customers and users are big energy companies, and it is important for them to obey the rules and regulations, especially in terms of safety and reliability issues, the AI providers will comply with AIA to

show that their algorithms are trustworthy and in this way expand their market. Considering this issue, it seems that there is not necessary that the regulators put effort and energy into the enforced compliance factors such as penalties.

In short, the findings show that the only possible barrier for small providers to comply with AIA in short term would be their capacity, especially in terms of financial resources that can have an important negative effect on economic motivation. Apart from these two factors, the analysis shows that the EU and dutch regulators will not face severe challenges to implement the AIA in the energy sector in the Netherlands.

5.3. Discussion

By applying Nielsen and Parker's (2012) business compliance model the AIA compliance of AI providers in the energy sector in the Netherlands was analyzed and as introduced in the finding section one of the main concerns for the small providers is the resources needed to change the algorithms and prove the trustworthiness of the AI through the conformity assessment proposed in the law. These small companies declared that in the short term the initial cost of adaptation with the AIA can lead to market distortion, and big companies that have money to enjoy the consultancy services are the winners. Some of these small companies declared that they have been struggling with the same issues in terms of GDPR that have brought them huge monetary burdens.

It should be mentioned here that the EU has been aware of such concerns and the Article 55 of the AIA is related to the measures for small-scale providers and users. These measures are about the priority of the small-scale and startup companies for receiving the CE marking through the sandboxes that will be established in the future, giving the information to these small-scale providers and raising their awareness as well as taking into consideration of the needs and interests of small scale providers in terms of the fees for doing the conformity assessment and the penalties regarding the non-compliance behavior (Article 55, AIA). It is also important that accompanied by the penalties introduced in article 71 of the AIA, it is noted that “[the authorities] shall take into particular account the interests of small-scale providers and start-up and their economic viability” (Article 71, AIA).

It is clear that the measures proposed to support the small providers mentioned above are aligned with the concerns declared by these companies. Providing such supportive policies for SMEs not only can reduce the market distortion between different suppliers, but also may promote innovation and AI development and energy transition towards a more distributed

system as a whole. Moreover, the CE marking initiative is also a facilitator for compliance that should be promoted by the regulator to help spontaneous compliance and reduce deterrence efforts and resources. In the next concluding chapter the policy measures, as well as the future research recommendations, will be proposed based on the findings introduced in this chapter.

Chapter 6: Conclusion

6.1. Summary

Applying the holistic and plural model of business compliance leads to a holistic view in terms of many aspects of compliance with AIA. In this stage, not only the main questions but also the sub-questions below which are related to compliance or noncompliance behavior of providers in the energy sector in the Netherlands have been answered.

How the providers of the AI algorithm in the energy sector in the Netherlands will comply with the EU proposal for the artificial intelligence act (AIA)?

- What are the economic, social, and normative motivations of the targeted group to comply with the AIA?
- Does the targeted group have the capacity to comply with the AIA?
- Do the enforcement compliance dimensions promote the compliance behavior of targeted groups?

To find the answer, two kinds of factors were analyzed qualitatively: spontaneous and enforced dimensions. To begin, the motivations of the providers were questioned. The results show that all the providers, whether big or small, have high normative and social motivations as they think such regulations would lead to a good society and business environment and even such acts will be extended all around the world and other countries and continents will follow the EU regulations in the end. In terms of economic motivation, it is clear that all the providers think that compliance with AIA and receiving the CE marking is a big facilitator for compliance. However, the small providers are to some extent worry about the AIA as they have some negative experiences in terms of GDPR compliance. It seems that the EU as a regulator has been also aware of such concerns echoed by the small providers and article 55 of the AIA mentions the measures needed to support small-scale providers and users, especially in short term.

Characteristics and capacities to comply were other factors related to spontaneous dimensions that were questioned. All the providers agreed that the AIA is directly related to their business models as it is needed that they make some changes in the algorithms they use to convert them to trustworthy AI algorithms. This matter will push the providers to comply with the AIA. As discussed in the economic motivation part, small companies will have some challenges in terms of the resources needed for compliance in the short term.

Enforced compliance factors are investigated based on the questionnaire. The results show that all the providers respect the EU and think in terms of AIA this regulator will behave fairly. However, some of the small providers still have some concerns in terms of the market distortion caused by such regulations. This analysis so far indicates that in the energy sector, the AIA can be implemented without the need for any severe penalties or sanctions as it seems that the spontaneous factors would cause the compliance behavior of providers. However, companies, in general, saw the 6% of the annual revenue of the companies who do not commit to the AIA as a fine for breaking the rule, huge enough to prevent non-compliance behavior.

The salient factor in terms of compliance with AIA is the resources small providers needed for compliance in short term. Another matter mentioned in the interviews was the essence of education, communication, and knowledge sharing which is included in article 55 of the AIA. The participants in this study thought that this education is not only necessary for the targeted group, but also for the ones who are intended to perform the conformity assessment of the providers and the users.

To sum up, it has become clear that providers of the AI algorithms will comply with AIA as they think having the CE marking as a quality assurance stamp of their AI algorithms can help them to apply their digital products and small companies can compete better in the market. Besides this economic motivation, they believe that such regulations introduced by the EU can become global as other countries and continents will follow these rules if they want to enter the EU market. However, there are some concerns in terms of the technical and conceptual challenges that would emerge as the AI domain is totally new and defining AI has many challenges, let alone its applications and the ways to make such intelligent human-made creatures trustworthy. The users will also play a key role in the market as they will ask for the conformity assessment and the CE marking to apply the algorithms in the energy infrastructures. This will lead to non-official forces for compliance without enforced factors such as sanctions or penalties.

As the spontaneous factors would make a proper situation for AIA compliance in the energy sector, it seems that it is not necessary to activate the enforced factors. The high respect for the EU as the AIA regulator also will boost the trust between the EU and the providers in the end and will facilitate compliance with this law.

6.2. Recommendations

It is recommended based on the results of this study that as the characteristics of the energy sector are different from other high-risk sectors mentioned in AIA, the regulators should take into account this subject and they should assess the conformity of energy companies separately. It is also a beneficial measure if not only the detailed regulations but also the institutions for monitoring the conformity assessment should be dedicated to the energy sector.

The next specific concern would be about the concept of trustworthiness in the energy sector in the sense that all the providers in the energy sector would be able to follow the rules and the process of conformity assessment. It means that all the algorithms of AI and machine learning are not on the same level, some are weak while others are strong AI and it is obvious that the trustworthiness of both is not similar.

The other crucial policy measure echoed by most interviewees was the education needed for compliance. Fortunately, these measures are also taken into consideration by the EU, and information sharing, especially between small providers and users is an incentive for these players. However, companies declared that this education should be informative and not obligatory which can be funded by the regulators at the national level.

Financial incentives are also another policy measure requested by small companies for compliance. These funds can be some loans or even subsidies for the companies which want to use the sandboxes and paying the fees along with the time needed for performing conformity assessment is a burden for them.

6.3. Future research

Here are some of the limitations of this research, and for future research, some recommendations are proposed. As the AIA have been experienced some changes in the past year and the access to real quantitative data regarding the cost it will impose on the providers is not determined yet, this research reported the analysis merely based on the existing proposed AIA which does not explain the expenses of conformity assessment, for instance, in detail. Such vagueness in law so far leads to limitations for this research as the interviewees could not estimate the exact resources they will need for compliance.

The other limitation was related to some important concepts which are mentioned in the law. Explainable AI was a controversial term that the technical interviewees had some concerns about as they declared that making the unsupervised learning algorithms are not explainable as

easy as the supervised algorithms are. Considering this matter, such techno-philosophical matters in terms of the goal of the AIA (to make the AI trustworthy) should be also investigated in similar research.

The AIA will go through pre-implementation in the coming months, and it is proposed that some future research be done on compliance after the pre-implementation as an ex-post analysis. It is also necessary to compare the assessment results in terms of time for monitoring the improvements and discovering the probable difficulties after the binding period of AIA. As this research focused on merely the providers, it is suggested that some studies also be done in terms of the users and the regulatory authorities in the Netherlands.

The lesson learned from the GDPR can be valuable as some companies in this research had some severe concerns regarding this regulation and they thought the AIA will also bring them more challenges. These experiences that can be investigated by independent research not only can improve the AIA implementation but also can help to predict the future same barriers in terms of innovation and energy transition improvement.

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Appendix 1: The 14 compliance questions

The general 14 compliance questions proposed by Parker and Nielsen (2017) for evaluating compliance with a specific regulation are introduced in table 3.

Table 3: The 14 compliance questions (Parker and Nielsen, 2017)

Spontaneous compliance factors
Economic, social and normative motives
1. Social and economic costs and benefits Does the target group believe that it costs too much time, money, and effort to comply? Does the target group believe that there are tangible advantages to be gained from breaking the rules? Does the target group see any advantage to them in complying with the rules?
2. Degree of acceptance of this regulation Does the target group agree with the policy objectives and the principles that underpin the rules surrounding their licensed activity? Do they agree with how the policy and principles have been put into practice—for example, do they think particular obligations are unacceptable?
3. Respect for the law in general Does the target group generally believe in abiding by the law; do they believe that complying with the law is a good thing to do regardless of whether they agree with a specific obligation?
4. Existence of non-official influence over the targeted group's compliance Do industry groups and other regulatees, customers, investors, trading partners, local communities, industry groups, non-governmental organizations, or other stakeholders facilitate compliance?
Characteristics and capacities of members of the target population
5. Business model Is compliance relevant to the target group's business model or is it an 'afterthought', or even irrelevant?
6. Knowledge of the rules Is the target group aware of their obligations? Do they know the rules that govern the particular activity? Are the rules comprehensible or are they too complex to understand?
7. Capacity to comply Does the target group have the capacity to comply with the rules? Or do they lack the money, time, education, or expertise to become aware of their obligations, decide to comply and implement compliance? Do they have good enough management systems to implement compliance?
Enforced compliance factors

8. Respect for the regulator Does the target group respect the regulator and how it goes about its tasks? Do they have a relationship with the regulator? Do they respect the judgment of those responsible for law enforcement?
Deterrence factors
9**. Risk that any violations of the rules will be reported to the authorities** Is there a high risk of violations being reported to the authorities, either by members of the target group's community or by the public? Is the target group deterred from noncompliance because they fear they will be complained about or reported if they do not comply?
10. Risk of inspection Is there a low risk of particular businesses being inspected by the regulator, either by a physical inspection or by a records inspection? Do members of the target group perceive themselves as likely to be subject to inspection?
11. Risk of detection Is there a high risk of any violations of the rules being detected if there is an inspection or some other monitoring (such as an audit)? What is the impact of factors such as an inspection only selectively examining records, particular violations being difficult for inspectors to detect, or the ease of falsification of records? How does the target group perceive the risk of detection?
12. Selectivity of inspection and detection by the regulator Is the regulator selective in identifying and prioritizing targets for inspection? Do some members of the target group perceive themselves as falling outside the priority targets for inspection? Are they aware of how the regulator 'screens' for breaches when inspecting or investigating?
13. Risk of sanction Is there a major risk of a violation, once detected, being sanctioned? Does the regulator have a practice or policy of dismissing charges or not enforcing charges? Does the target group believe that the risk of being sanctioned is low even if they are caught and the breach can be proved?
14. Severity of sanction Does the target group believe that the sanction they will face for a particular violation is severe, that it will be imposed quickly and will have other tangible disadvantages for the person concerned? For example: does the person suffer a loss of reputation from being sanctioned that has a negative impact on their business activities?

Appendix 2. The interview questions regarding the AIA compliance of the providers

1- Do you know about AIA? Do you know at which level of risk AIA would be your activities?
2- Do you know how much it costs for you to comply with AIA?
3- Do you think how much time is needed that you can comply with AIA?
4- Which measures do you need for compliance with AIA?
5- What advantages have compliance with AIA?
6- Do you think not complying with AIA has also some benefits?
7- Do you agree with the mechanism of AIA implementation such as conformity assessment?
8- Do you think despite the compliance cost imposed with AIA, compliance with this regulation is good? Why?
9- Do you think it is important for your society and customers to know that you will comply with AIA?
10- What effects would have AIA compliance on your business model? Do you need to change it? Is it in line with AIA?
11- What resources do you need for complying with AIA? (Time, money, and human resources) Do you think you can provide these resources or do you find it hard to comply with AIA?
12- Do you think all the parties in the EU should comply with AIA? Do you believe it is right that the European Commission is in charge of such regulations? Are you happy with the EU regulations in terms of DATA in general?
13- Do you think the regulators are selective in terms of inspection, detection, or put sanctions regarding non-compliance behaviors with AIA?
14- How much is the risk of being sanctioned for non-compliance with AIA?
15- What consequences will non-compliance with AIA as an AI business have? (direct or indirect)