

GOVERNMENTS ARE COMING FOR ARTIFICIAL INTELLIGENCE

A comparative case study of France and the
United Kingdom

Student: Katinka Eetgerink

Supervisor: Dr. J. S. Oster

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Universiteit
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Introduction

The literature has drawn the attention to conflicting discourses of Artificial Intelligence (AI) that disagree on the potential, impacts and future of AI technology. It seemed therefore noteworthy that, in a world full of misconceptions and disagreements of AI among world leading AI scientists, governments have entered the AI arena. National governments have been doing so by adding political strategic visions concerning AI in order for their country not to miss the AI-global-race-train that is heading for a conceived leadership in AI technology (Dutton 2018).

“Already the UK is recognised as first in the world for our preparedness to bring Artificial Intelligence into public service delivery. [...] and we are establishing the UK as a world leader in Artificial Intelligence, building on the success of British companies like Deepmind. (Theresa May 2018).

“The key driver should not only be technological progress, but human progress. This is a huge issue. [...] If I manage to build trust with my citizens for AI, I’m done. If I fail building trust with one of them, that’s a failure,” (Emmanuel Macron, Thompson 2018).

Quotes from the French president Emmanuel Macron and the British Prime Minister Theresa May present examples of political viewpoints respectively to AI. Academics have started to explore AI within social and political context, but this translates currently often into primary resources instead of secondary sources. To generate fresh insights to AI in political contexts, this thesis will attempt to answer the following question: *“What can France and the United Kingdom teach us about the role of the state in developing an Artificial Intelligence strategy that aims to ensure Artificial Intelligence that benefits society as a whole?”* The following summary of the literature indicates how this research could move existing scholarship forward.

The financial and innovative capacity of data-driven Multinational Corporations (MNCs) has increased significantly during the recent decades, together with MNCs capacity to lessen the degree of national control (Kuhlmann and Edler 2003, 624). In the years before the 21st century, nations were often considered as strong innovative players within the context of international competition for Science and Technology (S&T). Governmental efforts to create national innovative ecosystems were often driven by the international competitors such as the USA (Kuhlmann and Edler 2003, 624). In the 21st century, competition expanded and strengthened by the growing presence of MNCs that entered competition of these innovative ecosystems (Kuhlmann and Edler 2003, 624). The 21st century has additionally witnessed an

increasing interest in responsibility within the field of S&T developments, especially among policy-makers (Arnaldi et al. 2015, 81). Over time, public debates concerning S&T developments have shifted towards technological issues linked to ethics, accountability and human-centered technology developments (Arnaldi et al. 2015, 81). These developments have raised questions as to the role of technology within human societies, and potential accumulation of power among S&T MNCs and which role the state should have in current and future S&T development processes (Dafoe 2018; Villani 2018).

The literature review also indicated the key academic debates concerning terminology and developments of AI, the social challenges of AI, the efforts of national governments and the importance of technology understanding among governments. Drawing from the literature, this thesis outlined a set of theoretical assumptions. First, the role of governments as drivers of innovative change is slowly changing (Dafoe 2018; Kuhlman and Edler 2003). Nations, but also companies, have recognized the strategic character of AI technology (Dutton 2018). Instead of governments' leading large investment programs to stimulate innovative growth, companies have taken over the government's role as key drivers of disruptive innovative change (Runciman 2014). Second, large technology companies own sizable collections of data that is necessary to further develop AI systems and increases the company's financial capacity (Bostrom, Dafoe and Flynn 2018). The financial capacity of the companies developing AI technology, combined with the increased capacity to drive innovative change seems to be changing the influence and role of companies in the world. Third, academics point towards a development of societies in which AI takes an increasingly prominent role in society's daily life (Bostrom, Dafoe and Flynn 2018; Tegmark 2017).

The literature highlights the transformative potential of AI, including the ability to enhance social and wellbeing of humans (Cath et al. 2018, 506). Academics argue that this transformative character has the potential to change society's structures (Bostrom, Dafoe and Flynn 2018; Duettmann et al. 2018). In conjunction, academics stress potential risks and potential impacts of current AI technologies. The interwovenness of AI technology with civil societies could be problematic since AI technologies still show unresolved errors that could pose risks to society's fundamental value, such as diversity, pluralism and right to privacy (Crawford 2017; Klein and Kleinman 2002). Due to increase in data monopolies among large technology companies, governments worldwide have started to develop AI strategies in which they attempt to maximize the benefits of AI and minimize the risks (Dutton 2018; Cath et al. 2018; FLI(b) 2019). Many academics argue that most strong developed nations are joining the

AI global race to become the world's leader of AI technology. Because of the transformative potential of AI, national AI strategies include the promise of a future in which AI benefits all citizens of society to avoid the exclusion of certain groups in society. Each national AI strategy is tailored to the needs and values of a nation but, notwithstanding this, AI experts and academics stress the necessity of technology understanding among governments to be able to design and implement effective technology policies (Bostrom, Dafoe and Flynn 2018; Hilpert 1992). In summary, the findings led to believe there might be a causal relationship between the technology understanding among governments and the role of the state in developing an AI strategy. Drawing from the literature review, this thesis surmises “*the causal connection between technology understanding among a national government and the role of the state in the development and final national AI strategy.*”

To test the hypothesis, Part 3 and Part 4 of this thesis employs a comparative case study with an interpretative analysis that will determine whether the hypothesis will be adopted or rejected. France and the United Kingdom represent the two cases. The main analytical conclusion states that the government's approach in developing AI seems to have an intensifying effect on the technology understanding of the French and British government. The analytical observations that supported this conclusion are threefold. First, the French long-term relationship with the academic sector seems to contribute to the government's technology understanding. The British liberal approach to the British academic sector has led to globally competitive AI academic sectors but does not contribute to the governments understanding of technology. Second, the number of AI companies seems to benefit a country's competitiveness and potentially a government's technology understanding. Without substantive collaboration, however, technology understanding remains seems to remain largely absent among governmental actors. Third, regarding the national promise to ensure AI that benefits the entire society, the British government seems less aware of the conditions that are necessary to ensure AI operates within these principles of plurality and equality compared to France. Eventually, this thesis finalizes the research in the final chapter Conclusions.

Part 1. Literature review

Artificial Intelligence – key terms and conceptualizations

Like any other new disruptive technology, AI poses new threats, risks and challenges to the global society. The main question for AI developers is how to develop technology in the smart and human-centered way (FLI(b) 2019). In other words, how to ensure that that technology is developed according to human values (Tegmark 2017; FLI(b) 2019). The following literature review gives an overview of the most relevant academic contributions that add new perspectives to the current debate on AI.

Artificial Intelligence (AI) is a General-Purpose Technology (GPT) (Dafoe 2018, 1; Brynjolfsson and Andrew McAfee 2017). GPT innovations are known to create new markets, industrial changes and economic and social environments (Bresnahan and Trajtenberg 1995; Foray, David and Hall 2019). GPTs are widely applicable to productivity systems throughout the entire global industry and continuously foster novel industrial and social innovations (Hall 2002, 4). Innovations such as the semiconductor technology and the Internet are established examples of GPTs (Hall 2002, 2). Economic scholars Bresnahan and Trajtenberg defined GPTs as *“key technologies, fully shaping a technological era, are characterized by the potential for pervasive use in a wide range of sectors and by their technological dynamism”* (1995, 84). AI is the core GPT invention and the subsequent applicability to most sectors is the mere consequence of commercializing the GPT industrial process (Foray, David and Hall 2019, 22; Bresnahan and Trajtenberg 1995, 84). Brynjolfsson and McAfee (2017) argue that there are two main reasons to categorize AI as a GPT: (i) AI automates capabilities that humans could formerly not automate and, (ii) devices with machine learning abilities are able to learn faster and develop specific skills more efficiently than humans are often able to do. An example of the widespread impact of GPTs is the development of renewable energy technology that forced energy corporations worldwide to re-design their factories, infrastructures and services to ensure compliance with societal standards (Bresnahan and Trajtenberg 1995, 84). In conclusion, AI could be categorized as GPT of this industrial cycle and societies will have to adapt to be able to participate in the current information technology revolution centered on AI technology.

The rapid speed of AI-breakthroughs in combination with the fear of human-replacement fuels the need for research and debates on ethics in AI (Russell 2017; Tegmark 2017, 35-36).

Technological myths, fiction-based comparisons and conflicting future predictions are currently dominating the debate in most societies. It should be noted that there is no consensus among scholars and AI developers on the exact definition of AI (Campolo et al. 2017). The generalizability of most published research and the plethora of available AI definitions in scholarly work is problematic. To avoid multiple interpretations, the following text will outline the main AI definitions of the key actors (scholars and organizations) within the field of AI.

It is necessary to outline common definitions and taxonomy of the terms AI, machine learning and deep learning to avoid further confusion. In the literal sense, there is not much debate since the term ‘artificial intelligence’ means intelligence that is created and pursued artificially. When AI is discussed by scholars or in popular media, often AI is mentioned within the same context as machine learning, deep learning, robotics and data science. However, there is a hierarchy between the concepts. For example, AI is an overarching technology (Elements of AI 2019). In general, AI is classified in three levels: narrow, broad (general) and universal (superintelligent) AI (Carriço 2018, 29; Elements of AI 2019). The first level, narrow AI, is able to accomplish a narrow set of goals, with humans providing the input for the goal (Tegmark 2017, 39). In the current age, only narrow AI is applied (Dafoe 2018). The second level, broad or Artificial General Intelligence (AGI), is able to handle any intellectual task even including tasks that demand abilities similar to the cognitive intelligence of human beings (Elements of AI 2019). According to Dafoe (2018, 20) AGI is strategically relevant for governments because of the potential to combine narrow AI functions, its transformative potential and the expectation of the early arrival. AGI is not reality yet but prominent scholars have already started developing policy desiderata and transnational cooperation scenarios to map the potential and possible risks of the arrival of AGI technology (Bostrom, Dafoe and Flynn 2018; Duettmann et al. 2018).

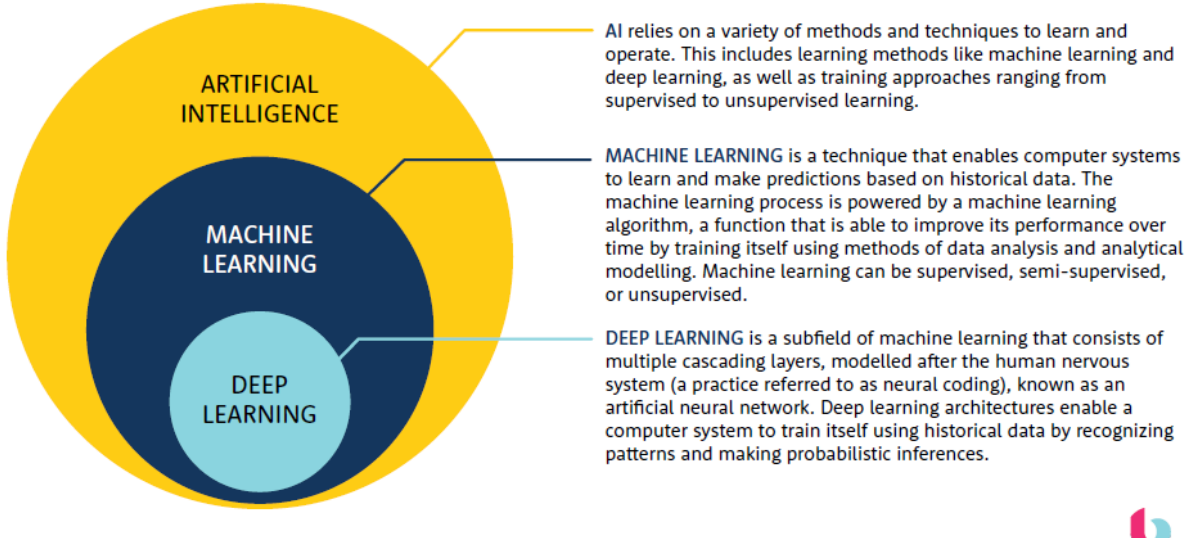
A subfield of AI, machine learning takes a prominent position in the general debate on AI. Brynjolfsson and McAfee present a slightly simple, human centered definition:

“The most important general-purpose technology of our era is artificial intelligence, particularly machine learning (ML) — that is, the machine’s ability to keep improving its performance without humans having to explain exactly how to accomplish all the tasks it’s given. (Brynjolfsson and McAfee 2017, 1).

Engineers of AI applications feed the machine learning technology a single or set of algorithms to enable the computer to increase its efficiency and improve its performance

(Elements of AI 2019; Malli, Jacobs and Villeneuve 2018, 4). This thesis however further deploys the working definition of machine learning by Malli, Jacobs and Villeneuve because it provides the most detailed, yet clear definition:

“Machine learning is a technique that enables computer systems to learn and make predictions based on historical data. The machine learning process is powered by a machine learning algorithm, a function that is able to improve its performance over time by training itself using methods of data analysis and analytical modelling. Machine learning can be supervised, semi-supervised, or unsupervised.”



1 "Hierarchies of AI"(Malli, Jacobs and Villeneuve 2018, 4).

Deep learning, as a subfield of machine learning, seems more difficult to explain because of the high degree of complexity. Elements of AI explains defines deep learning as follows:

“the “depth” of deep learning refers to the complexity of a mathematical model, and that the increased computing power of modern computers has allowed researchers to increase this complexity to reach levels that appear not only quantitatively but also qualitatively different from before.”(Elements of AI 2019, “related fields”)

In other words, deep learning is a technology that mirrors the human neural system and enables AI and machine learning technology to learn and improve its performance. In general, these definitions as described present necessary oversimplifications but are suitable within the scope of this research. The technology ‘machine learning’ forms a sub-field of AI, and deep learning’’ forms subsequently a sub-field of machine learning (Elements of AI 2019). This section uses the Euler diagram¹ to exemplify the interconnectedness of the technologies. The

¹ The Euler diagram is used often by AI-scientists because the diagram reveals the hierarchy between corresponding terms and technologies (Elements of AI 2019).

Euler diagram below shows that machine learning is part of AI, deep learning is a part of machine learning and therefore AI too (Elements of AI 2019; Malli, Jacobs and Villeneuve 2018, 4). AI itself is part of the broader field of ‘computer science’, which encompasses a broad architecture of computing technologies and software designs (Elements of AI 2019). Thus far, this literature review has provided AI definitions, classifications and a contextualization from a scientific perspective. The next section will deal with the current controversies, risks and challenges of AI technology advancement.

Societal challenges of AI

This section presents some of the most relevant academic contributions that engage in the short-and long-term (potential) challenges of AI’s impact on society.

It depends on the theoretical perspective and terminology as to which effect technology can have on society (Brey 2018, 39). Political scientist Philip C.G.A. Meurs (1990, 25) argues that technology impact on society depends on the definition and the perspective applied of technology. For example, narrow definitions tend to separate the building part of technology from the social environment in which technology it is created (Meurs 1990, 25). Social theories however take a wider variety of factors into account. Social constructivist theory of technology constructions calls on the ‘*structural factors in the social shaping of technological development*’ (Klein and Kleinman 2002, 28). The main argument of this theory is that the effect of relevant social influences and the structural factors that shape these social structures are important when determining which social structures impact technology development. This theory builds on previous social constructivist emphasis on the relevance of actors, and actors’ agency in technological developments. Klein and Kleinman (2002, 35) consider structures as “rules of play” in which they refer to conditions to which actors are limited or have unrestricted access too, including underlying configuration of power. The focus is on the potential effects that occur at multiple levels of social groups preexisting the physical designing process such as the existence or absence, and rules of access influencing decision-making of the technology development (Klein and Kleinman 2002, 37). In addition, the theory indicates the relevance of cognitive structures of an organization, intragroup dynamics, sources and varieties of power and the deep institutionalization of social values of society. Social constructivist perspective provides a wide variety of analytical categories that can potentially detect social influence of the shaping process, combined with the eventual impact

of a GPT on society. Based on the theory, it could be argued that indeed social structures should be recognized when developing AI technology if AI technology would comply with the core principles of Beneficial AI.

In respect of societal challenges, accountability and bias are prominent topics within the philosophical debates on AI (FLI(b) 2019). Since AI operates autonomously, a key question in accountability concerns who would be considered morally and legally accountable when damage occurs? A second challenge in AI technology is bias. Bias is an effect that machine learning and AI systems can produce based on its training data (Tegmark 2017, 321). Biases are known in the social world but nowadays, technical biases are becoming central news regarding AI (Crawford 2017). Bias has conflicting social definitions but in AI, bias refers to rational discrimination within the output of AI systems (Crawford 2017; Danks and London 2017). The bias in training data could lead to a 'rational discrimination' because autonomous systems operate without a human interfering, which implies that such a system must take action or decisions based on its algorithm(s) even though the system itself is not prejudiced (Danks and London 2017, 4691). The most salient examples of algorithmic biases are the gender bias; facial recognition and google translate (Crawford 2017). The root cause of algorithmic bias could be found in the training data of autonomous systems; e.g. incomplete data, non-transparent implementation of training data or biased data (Crawford 2017). According to Crawford (2017), bias in AI context is problematic because AI systems are increasingly affecting human daily life and the social costs of such errors are becoming large scale.

The ethical issues in AI technology seem similar to most emerging GPTs but there is a fundamental difference between AI and previous GPTs according to Campolo et al. (2017, 30). The difference is that AI has made machines able to decide on human activity and daily human life (Campolo et al. 2017, 30; Malli, Jacobs and Villeneuve 2018, 9). The ethical questions concern to what extent these automated machines should be allowed to make specific decisions on their own and to what extent humans should be involved in the matter (Campolo et al. 2017, 30; Tegmark 2017, 99). According the report by West, Whittaker and Crawford (2019, 6), current ethical debates consider i.e. value alignment, lack of diversity and discrimination within technology while AI engineering environments are barely included in the ethical debate. Concerning diversity, the problems in AI technology revolves around power and that it manifests into two highly related problems: "*issues of discrimination in the workforce and in system building*" (West, Whittaker and Crawford 2019, 6). The report

stresses the homogenous environments in which AI is developed, primarily consisting of an elite group, often white and male, AI-developers working for large technology corporations. The discrimination problem manifests in multiple ways. The homogeneity of AI-engineers, subsequently leads to missing or falsified data about ‘normal persons’ since the makers and their viewpoints do not correspond with diversity among end-users of AI applications. Discrimination is also visible in the nature of AI technology since AI systems learn to make distinctions in types of data (West, Whittaker and Crawford 2019, 6). The report urges to re-evaluate “*the use of AI systems for the classification, detection, and prediction of race and gender*” and this recommendation seems to address a problem that has long been overlooked by AI scientists and policy-makers (West, Whittaker and Crawford 2019, 3).

In the context of AI, safety poses a prominent challenge for the design, implementation and regulation of AI systems. Safety in AI systems refers to “*the ability to operate without posing a risk or causing harm to humans*” (Malli, Jacobs and Villeneuve 2018, 11). In other words, when an AI system is designed to be beneficial to humans without causing any harm or accidents. The science community defined AI safety as ‘beneficial AI’ or ‘robust AI’ in which scientists argue, “*we should become more proactive than reactive*” (Tegmark 2017, 94). Safety is a topic relevant to the designers of AI systems and policy-makers that regulate these designs. An important sub-topic of AI safety is the threat or existence of ‘dirty data’ in national database systems. “*“Dirty data” is a term commonly used in the data mining research community to refer to “missing data, wrong data, and non-standard representations of the same data.”*” (Kim et al. 2003; Richardson, Schultz and Crawford 2019, 195). The scholars add an extension to this definition since dirty data also includes: “*data that is derived from or influenced by corrupt, biased, and unlawful practices, including data that has been intentionally manipulated or “joked,” as well as data that is distorted by individual and societal biases.*” (Richardson, Schultz and Crawford 2019, 195). These definitions indicate the problems of data collection within governmental structures since there is no such thing as objective data collected by governmental bodies or agencies. Data based on human decisions or reports of events and persons do not guarantee objectivity due to human bias (Richardson, Schultz and Crawford 2019, 226). As governments rely heavily on objective data to pursue their governmental duties, subsequently the risk increases to the fairness, equity and justice of the governance system (Richardson, Schultz and Crawford 2019, 226). Richardson, Schultz and Crawford (2019, 225) show the downside of the increasing level of which governments pursue data driven decision-making and policy-making processes, public services and the use

of AI-technologies. The research argues that there is no solution to ‘dirty data’ yet, nor is there a technology that is able to detect and address faulty or missing data (Kim et al. 2003). In summary, the existing body of literature indicates a multitude of societal challenges of AI development and application. There has been a trend in publications covering ethical and technical challenges but there is a need for more insights into the social construction of AI technology. If societies want to be prepared for a future of AI-led societies, more research of social construction of technology could be fruitful.

National efforts of technology progress

The main objective of this section is to discuss relevant academic contributions of theoretical literature towards national governments and the development of General-Purpose Technologies (GPTs). This part includes an overview of recent national developments in AI progress, theoretical explorations of national Science and Technology (S&T) progress and technical understanding within governments.

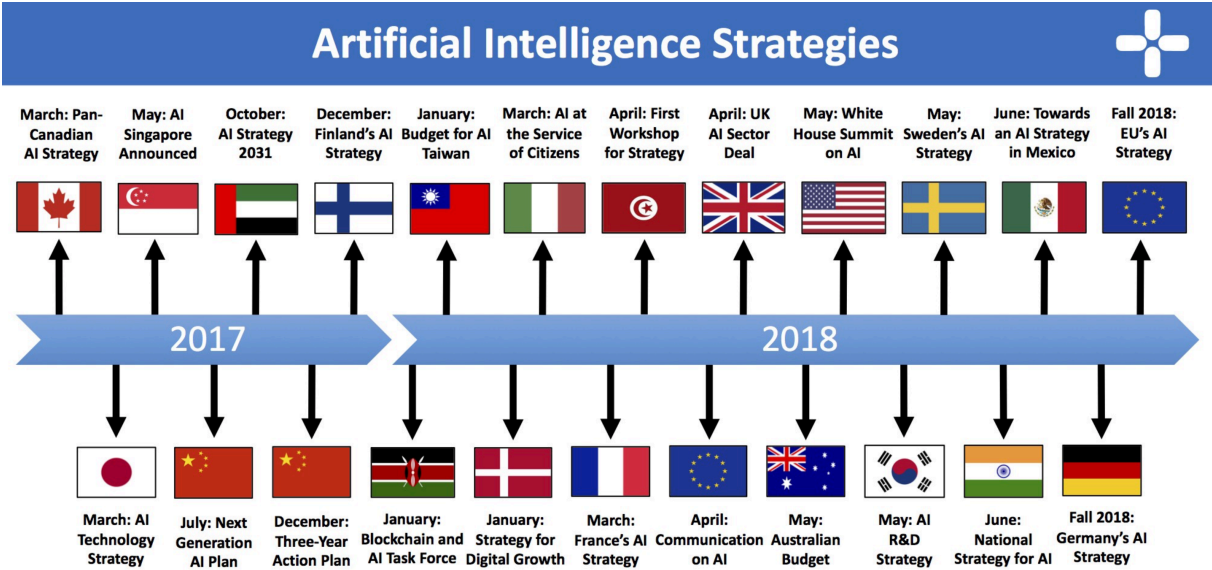


Figure 2 Dutton (2018) in "An Overview of National AI Strategies"

Since 2016, national administrations have been joining the private sector in AI-related public publications through the publishing of communications and assessments reports regarding the future of AI technology. As a frontrunner in the global race for AI leadership, China published the national strategy *Made in China 2025* (Allen 2019, 4). In the year 2016, the Chinese government published the “*Three-Year Guidance for Internet Plus Artificial*

Intelligence Plan (2016-2018)” together with the “*The Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018–2020)*” (Dutton 2018; FLI(a) 2019). These plans could be interpreted as the Chinese government intention to provide rapidly a set of guidelines to jumpstart the top-down approach in Chinese AI development (Ding 2018, 8; FLI(a) 2019). In 2016, the US government under the Obama administration published three reports regarding the definition, current state-of-play and research and development (R&D) opportunities of AI in the USA: “*Preparing for the Future of Artificial Intelligence,*” “*The National Artificial Intelligence Research and Development Strategic Plan,*” and “*Artificial Intelligence, Automation and the Economy*” (Cath et al. 2018, 508; Duettmann et al. 2018, 14). The documents highlight a distinct liberal and market-oriented approach, especially when defining the role of the government in AI development (Cath et al. 2018, 508). In 2017, Canada, Singapore, China, Finland and Japan were among the first to publish a national AI strategy in an attempt to steer and foster the development of trustworthy AI (Dutton 2018). In 2018, other nations joined the trend, including international organizations such as the UN and OECD (Dutton 2018). In conjunction with these governmental strategies, the academic and NGO AI-community published various sets of AI-principles for developing AI that benefits mankind and aligned according to human values (FLI(b) 2019). In March 2019, the OECD has developed the first international principles that should guide the development trustworthy AI globally (OECD 2019). The speed of newly published national AI strategies brings attention to the willingness of nations to participate in the global race for AI leadership and to the increasing level of competition within the AI-science and policy field.

Before exploring theories regarding technology understanding among governments, it is important to review literature that explains governments’ recent efforts in governing technological development that is closely intertwined with society. Hagendijk and Irwin (2006) have researched public deliberation and governance as regards to science and technology. Hagendijk and Irwin observed trends that characterize European governance of science and technology. The observations revealed increasing trends of governments involving public platforms with technology and science experts and public consultations in policy processes, although public engagement seems constrained to ethical debates and to primary phases of formal policy-making (Hagendijk and Irwin 2006, 174). These observations differ from US technology policies; contrasting to US government’s view of its limited role in AI development, the national public debates repeatedly included the idea that US policy-

makers would address the technological challenges via regulation and government actions (Duettmann et al., 2018, 16). Alongside the increase in involving public technology experts, Hagendijk and Irwin (2006, 175) observed a predominant focus on international competitiveness in technology governance, especially when public consults are considered obstacles to policy-making. It seems that European governments' endeavors in public engagement are considered genuine when governments state clear commitments to adopt public consultation outcomes, (ii) refrain from separating science and public issues in the debates and (iii) include all relevant international commitments and frameworks (Hagendijk and Irwin 2006, 182). Hagendijk and Irwin conclude i.e. that European governments tend to separate ethical and science issues during (in) formal policy-making processes. It is possible to argue that separating public and scientific topics limits the absolute influence of NGO's and civil discourse in technology policy-making.

Generally in Europe, a relatively small number of experts often dominates the framing of the public debate often (Hagendijk and Irwin 2006, 175). Historical explorations of the UK and EU support the theory of deliberative democratic processes within S&T policies. To exemplify this statement: the UK government has always had a culture of public engagement but often only regarding normative technology issues, even though most policy was designed to market-preferences and industrial preferences (Hagendijk and Irwin 2006, 179). The BSE² crisis forced the UK government to see the importance of public engagement in S&T due to considerable influence of the fears among civil society (Hagendijk and Irwin 2006, 180). The European Commission policy-makers gained similar insights when the GMO-crisis³ struck Europe and public (civil society and NGO's) felt excluded from policy developments that were of public concern (Arnaldi et al. 2015, 85). The Commission's argument for increasing public engagement was that S&T has become integral part of civil society and this should be taken into account in policy-making processes (Arnaldi et al. 2015, 85).

² BSE stands for Bovine spongiform encephalopathy but is often known as 'mad cow disease'.

³ The Genetically Modified Organism (GMO) crisis revolved around societies' fears that GMO's could threaten the welfare of humans and the environment (Hagendijk and Irwin 2006).

Technology understanding

Moving on now to consider the current academic debate on technology understanding within AI policy governance. This part discusses relevant theoretical perspectives, concepts and theoretical examination of technology understanding among nations. At a time when a few multinational corporations control mainly all future technology advancements, it is imperative for national governments to be well placed when taking measures that ensure technology advancement develops in such a way it benefits the nation 'society. It depends on the research perspective how one can study different political perspectives on technology (Dawson, Clausen and Nielsen 2000, 7). To put it differently, the organizational political culture towards specific technology has the ability to influence political processes and political actors' agency while tackling political technology issues. From a (social) constructivist research perspective, the actors' perceptions of technology play a key role when analyzing the construction of political technology processes (Dawson, Clausen and Nielsen 2000, 8). From this perspective, Dawson, Clausen and Nielsen (2000, 8) write that it is possible to research technology understanding within political environments when analyzing perceptions, social shaping of technology and political processes in government. Duettmann's et al. (2018, 16) research exemplifies this theory: the research highlights a decline in the number of US technology policies, and US governments' ability to effectively design and implement technology policies. This slowdown cannot be attributed to current disunity among opposing parties in the federal government of USA but rather to the personal views of leading political actors (Duettmann et al. 2018, 16).

The following review of the literature attempts to clarify what 'technology understanding' means within the context thesis and which conditions should be fulfilled. Technology understanding indicates the presence of a technological frame, which envisages "*the shared assumptions, knowledge and expectations about the purpose, context and importance of technology*" (Orlikowoski and Gash 1994). AI-scientists Bostrom, Dafoe and Flynn (2018, 24) argue that technology understanding indicates the agency of governmental actors to incorporate the necessary technical knowledge and principles in their decision-making. The scholars emphasize the necessity of technology understanding among policy makers due to lack and importance of political agency in AI technology advances (Bostrom, Dafoe and Flynn 2018, 19). From a substantive perspective, social scientist Ulrich Hilpert (1991, 25) notes that technology understanding within an AI context depends on the level of understanding of the conditions necessary to ensure effective innovative technology progress.

Hilpert (1991, 26) emphasizes the strategic role of academic research and the state's ability and willingness to fund expensive sectoral research. Applying technology understanding to the international context, scholars Kuhlman and Edler (2003, 632) advocate the usage of transnational policies, such as the EU, which has been advocating for socioeconomic cohesion in EU S&T policies and programs. Eventually, if a nation wants to participate in international competition arenas, it will have to be competitive at strategically led S&T research (Hilpert 1991, 26). Innovation scientists Kuhlmann and Edler (2003, 619) emphasize the importance of recognizing transnational and regional programs and policies that exist to amplify or supplement national S&T efforts. Often countries possess specific knowledge on technology, also at strategic and political levels, that could complement each other. In relation to France and the UK, the EU-membership offers a wide range of S&T funds, programs, collaborative networks and other opportunities to enhance its members' competitiveness (Kuhlmann and Edler 2003, 620). Taking the example of China, a government known for its technology understanding, key political actors often come from family and academic backgrounds of engineers (Duettmann et al. 2018, 17). The private sector is integrated highly with the military and political sector compared to the rather strict separation of US private and public sectors (Cath et al.2018; Duettmann et al. 2018; Hall 2002). The difference in technology understanding in China and the US emanates furthermore from the relationship each national government has with the private sector that develops and designs AI technology (Duettmann et al. 2018, 18). Based on Chinese government's efficiency in technology understanding, public-private partnerships or the involvement of private actors in national efforts to develop technology policies could potentially enhance a nation's technology understanding.

Some AI-scholars argue that governments lacking technology understanding are bound to create a communication gap (FLI(b) 2019). According to advisory reports of leading AI-scientists, there is a need for private and public sectors to participate in exchange programs and cross-sector collaboration projects to reduce a communication gap (FLI(b) 2019). If national governments exclude private technology actors from the policy-making processes, then a 'communication' gap is bound to occur (Duettmann et al. 2019, 18). China and the US both have strong commercial AI sectors, which are leading most of the AI technology development (Ding 2018, 27; Cath et. al 2018, 513; FLI(a) 2019). Hilpert (1991, 16) emphasized the importance of MNOs presence within a national technology structure. MNO's presence in a nation could not only increase the level of technological competitiveness but also increase the pool of available technology experts that potentially could collaborate with

national governments. Taking again the example of the US, the government initiated self-regulatory partnerships that potentially could reduce a communication gap (Cath et al. 2018, 513). To summarize, technology understanding indicates the agency of governmental actors to incorporate the necessary technical knowledge and principles in their decision-making. According to established literature, governments express technology understanding when policy-makers, (i) understand the conditions necessary to ensure effective technology progress, (ii) employ the strategic role of research, combined with state's willingness to fund this research, (iii) recognize transnational and regional available R&D programs to support technology development. In addition, policy-makers environment should include (iii) collaboration and exchange of technology expertise and (iv) presence of multinational AI companies to increase pool of AI-experts available. There is also the possibility of a communication-gap between the private and the public sector if governments do not increase their technology understanding by collaborating with private actors.

This chapter presented theoretical explorations of AI technology terms, contexts and societal challenges and efforts engaging in AI advancements. These theoretical explorations combined with the literature respecting technology understanding within social and political context, indicate the social construction of conditions and multilevel networks of technology actors and institutions that contribute to the effectiveness of a nations' S&T efforts. The final part outlines academic contributions to the relationship of governments with technology and their understanding of technology.

Part 2. Research design

“What can France and the United Kingdom teach us about the role of the state in developing an Artificial Intelligence strategy that aims to ensure Artificial Intelligence that benefits society as a whole?”

This section expands on how this research will evaluate whether the prediction inferred from the theory is true. This thesis hypothesis is *“the causal connection between technology understanding among a national government and the role of the state in the development of a national AI strategy.”*

This thesis includes a comparative case study with an interpretative analysis that will determine whether the hypothesis will either be rejected or adopted. The comparative case study design offers the possibility to analyze two countries that have developed a national AI strategy: France and the United Kingdom. The case selection is based on three similarities: (i) EU membership, (ii) important global actors in AI technology development and (iii) national AI strategy published. The first uniformity concerns EU membership; presents commonalities for France and the UK; both countries have been operating within the scope of EU’s fundamental principles and regulations and within the same EU market since 1950 and 1973. The second uniformity, important leaders in AI development, constitutes as a comparable background condition. France and the UK have similar economic and industrial opportunities compared to developing countries and benefit from their prominent status among EU. Finally, both countries have published national AI strategies in which they include their aspiration to become a global AI leader (Dutton 2018). The French and British national AI strategies are uniform regarding the year of publication and the aspiration to become a global AI leader.

In the case study analysis, the comparisons are drawn between the French government and the British government in their approach to develop an AI strategy. The comparison provides the input necessary to formulate conclusions that could either reject or adopt the hypothesis. The comparative analysis of France and the UK should contribute to a better understanding of the relevant governmental initiatives that are necessary to develop a national AI strategy that will eventually benefit all layers of society in the future. The comparisons between France and the UK will be drawn from primary sources consisting of three main documents per country and complementary primary sources to enhance the integrity of the case study data. The first source is an independent review of the country’s current economic, industrial and social conditions with regard to AI set up by the government. The review includes a thorough

examination of the possible challenges and opportunities of AI, including a set of recommendations for the national AI strategy. The second source is the national AI strategy. These strategies are often short but highlight the priorities of the incumbent government. The final source is a speech by the country's leader in which they present the national AI strategy. The speech displays the viewpoint of the respective government and of the leader of the government. Formal statements and press releases of public officials that concern governmental efforts to develop and implement the national AI strategy have complemented the three sources.

Following the factual data collection of each case, this research will continue with comparisons made between France and the UK. The cases will be compared in respect of (i) the structural role of the government, (ii) EU frameworks, (iii) strategic priorities, (iv) AI that benefits all in society, (v) government relationship with the business sector and (vi) government relationship with the academic sector. The comparisons will be interpreted based on the conceptual framework of technology understanding. To recap, technology understanding within the context of this research indicates the agency of governmental actors to incorporate the necessary technical knowledge and principles in their decision-making. The theoretical framework implies that technology understanding is visible when a government's actions and statements (i) show understanding of the conditions necessary to ensure effective technology progress, (ii) employ the strategic role of research, combined with state's willingness to fund this research, (iii) recognize transnational and regional available R&D programs to support technology development. In addition, policy-makers environment should include (iii) collaboration and exchange of technology expertise and (iv) presence of multinational AI companies to increase pool of AI-experts available.

The interpretive analysis will draw inferences from the comparisons between France and the UK to determine whether there is a causal relationship between technology understanding among a national government and the role of the state in developing an AI strategy. If a government displays technology understanding throughout the comparisons and the government takes a central role in the development, the hypothesis will be adopted. If governments display more technology understanding and the role of a government is decentralized, the hypothesis will be rejected.

Part 3. Case studies France and United Kingdom

The following part presents the case study data, divided into the French case and the British case. The second part presents the comparisons between the French and British case including the interpretive analysis. The case studies are based on three main documents, (i) the national AI strategy, (ii) the independent review of the country's current situation and (iii) a speech of the national leader in which he/she talks about the future of AI. First the document elaborates briefly on the common contextual background of both cases, the EU. Second, the case studies results will be presented. Each case study is divided into four sections: (i) contextual background, (ii) government initiatives, (iii) public-private sector relations and (iv) AI for society.

The United Kingdom and France are currently members of the EU, which implicates that national governments must act within the legislative framework of the EU where applicable. All EU members must operate within the boundaries of the General Data Protection Regulation (GDPR) provides rights of EU citizens to enjoy free movement of personal data, the protection of personal data and protects these rights (Art. 1, GDPR). Notwithstanding, Member states have to comply with policy-areas in which the European Commission has exclusive powers such as competition policy and consumer protection stated in Articles 101 to 109 of the Treaty on the Functioning of the European Union (TFEU). Regarding AI, the EU provides a wide variety of research and innovation programs and funding to support collaborative European innovative developments via programs such as Horizon2020 that takes part of the Innovation Union (European Commission 2018). Within European borders, there is already a wide variety of interdisciplinary AI research and development initiatives such as the European Lab for Learning and Intelligent Systems (Ellis). Ellis is an initiative by European scientists with the sole purpose of enhancing the European economy by creating European research infrastructures. The Confederation of Laboratories for Artificial Intelligence Research in Europe (CLAIRE) is a similar example of European initiatives to bundle AI expertise and knowledge to benefit a wider Europe (CLAIRE 2019).

France

Contextual background

The French S&T sector has always been ruled via a centralized government structure (European Commission 2006). The French Minister President, together with the Parliament and the government set the research and innovation priorities each term (European Commission 2006). Within the context of AI, Emmanuel Macron, the current French President, has a central position as regards to leading AI development from the public sector (European Commission 2006). As to AI, the French Prime Minister's office obtained AI-coordination function to be able to oversee and guide implementation of the national AI strategy (OECD 2019, 125). The national research and innovation priorities are further coordinated by the Ministry of Higher Education, Research and Innovation, which subsequently involves the Ministry of Economy, Finance and Industry (European Commission 2006). There are two formal advisory bodies linked to the government: the Parliamentary Office for Evaluation of Scientific and Technological Options (OPECST), and the Higher Council for Research and Technology (CSRT) (European Commission 2006).

Government initiatives

In August 2018, the French government published the French-Finnish Joint Statement for Cooperation on Artificial Intelligence. On December 2018, the Canadian and French governments announced their partnership for the creation of an international research group that has to promote responsible AI (République Française 2018). France announced that France will host a 'Global Forum on AI for Humanity' to be held on 29-30 October in Paris (AI for Humanity(b) 2018). In 2018, the French government made brought two important publications forward. Cédric Villani published the report, 'For a Meaningful Artificial Intelligence: Towards a French and European Strategy', an extensive review of the French AI sector, including a set of recommendations for the future of AI in France. The French Prime Minister Édouard Philippe provided Cédric Villani with the Parliamentary mission to create a foundational framework for a national AI strategy (Villani 2018, 2). Villani, professional mathematician and Member of Parliament (MP), has been researching and talking about AI within academic and corporate environments (Villani 2018, 3). As the vice-president of OPECST and a member of the French National Assembly, Villani operates in cross-sector environments (Villani 2018, 149). The Villani team includes policy actors, AI engineers and

legal and institutional experts (Villani 2018, 149-150). The report is set up in seven focal points; “(i) *developing an aggressive data policy*, (ii) *targeting four strategic sectors*, (iii) *boosting the potential of French research*, (iv) *planning for the impact of AI on labour*, (v) *making AI more environmentally friendly*, (vi) *pening up the black boxes of AI* and (vii) *ensuring that AI supports inclusivity and diversity*” (Villani 2018). The report starts with the relevance and meaning of AI in today’s world and discusses the role of France and Europe within current global digital transformation processes (Villani 2018, 6). The Villani report (2018, 6) acknowledges corporate and international pressures from competitors in the AI global race and considers China and US as strong competitors. Within the AI global race, Villani considers France and EU to be at a disadvantageous position because of the lack of investments, AI companies and lack of AI talent compared to US and China. The strong international competition, in combination with the rising competitive power of the UK, Israel and Canada, fuels the French desire to re-establish the role of the French state (Villani 2018, 6). Part of the state’s role is to understand the future direction of AI and to restructure the sectors that concern the general public interest: health, ecology, transport/mobility and defense/security. Respecting research, the report identifies the state’s central role in attracting and retaining AI-scholars and experts and by setting up national research infrastructures (Villani 2018, 60).

The second announcement occurred at the AI for Humanity Summit 2018 where President Macron announced the French AI strategy, including his vision for EU’s development of AI frameworks (AI for Humanity(b) 2018). The strategy is structured around four themes: (i) ensure a resilient AI ecosystem, (ii) provide public support to ensure data sharing, (iii) establish a (European) regulatory and financial framework and (iv) ethical and socially responsible AI (AI for Humanity(b) 2018). Macron announced to invest 1.5 billion euro in the French AI ecosystem to support the actions laid down in the strategy (AI for Humanity(a) 2018). The 1.5 billion to upgrade French existing industries will be spend over the current 5-year term; 700 million euros will go to the financing of research, 100 euros to startups, and 400 euros spend to industrial AI (AI for Humanity(b) 2018). The French AI strategy includes a plan to set up four or five major research institutes within the borders of France (AI for Humanity(b) 2018). The strategy focuses on the French and European context to develop AI that aligns with French and European values (AI for Humanity(b) 2018). During the AI for Humanity Conference, large technology companies used the opportunity to present their new research facilities located in Paris.

Public-Private Sector relations

“I think that the core basis of artificial intelligence is research. And research is global. And I think this artificial intelligence deals with cooperation and competition, permanently. So you need an open world and a lot of cooperation if you want to be competitive”. (Emmanuel Macron in Thompson 2018)

France is home to 26 AI startups, which earns France the third place in the top 10 countries that accommodate AI startups (Mols 2019, 32). Concerning companies, France houses 39 AI companies and Paris provides currently AI research centers of Facebook, Google, Samsung, DeepMind, Fujitsu and IBM (AI for Humanity(b) 2018; Mols 2019, 32). According to the French government, industry and academics are not cooperating sufficiently but the government wants to address this problem: *“the industry and public research sectors are currently two different worlds. Public researchers will from now on be able to dedicate 50% of their time to private entities”* (AI for Humanity(b) 2018). The Villani report (2018, 37) acknowledges the separation of private sectors and argues that the government has bodies that could support the dialogue between the private and public sector: the General Directorate for Enterprise, the French National Services Commission, the French National Commission for Cooperation and Commerce and the French National Advisory Council for Industry (Villani 2018, 37). In addition, government plans to support AI technology development, the government invested as well in AI technology applications within French public services. The report highlights the Interministerial Centre of Information Technology for Human Resources (CISIRH), which has implemented a ‘chatbot’ to *“providing easy access to regulations concerning human resource management in the civil service for the benefit of managers within the Ministries of Culture and Social Affairs”* (Villani 2018, 57). Similar to CISIRH, a chatbot has been put in place by the Agency for French Government Financial Information System (AIFE) for Chorus, an information system based on small and medium sized companies (Villani 2018, 57). Departments of the French government are using algorithms to detect potential fraud cases and address the problem of financial trafficking (Villani 2018, 57).

The Villani Report (2018, 6) addresses the importance of AI private sectors in multiple ways. France wants to ensure a constant dialogue with large technology companies to ensure the collaboration between state and private. Regarding large technology companies, the French state recognizes the position of power these companies have obtained through ownership of big data and considers data-circulations as the solution to these data monopolies:

“The benefits of data, which are central to developments in AI, are currently enjoyed by a set of a few major stakeholders who tend to limit their capacities for innovation to their ever more powerful enterprises.” (Villani 2018, 6).

The national AI strategy highlights a two-tier function for big technology companies: (i) large resource pool of talent and knowledge and (ii) efforts needed to comply with the GDPR (AI for Humanity(b) 2018). The big companies should engage more in interdisciplinary research initiatives and use their knowledge and experience to develop innovative tools that benefits society (Villani 2018, 68). The French state also considers the responsibility of companies to provide trustworthy data to these public databases. Part 2 of the Villani Report (2018, 60) concerns the promoting of agile and enabling research in which Villani sees the academic world in competition with the big technology companies. Villani argues that currently, key actors that work in competitive Silicon Valley’s AI companies predominantly make eminent decisions on AI governance (Villani 2018, 5). The argument continues that these companies are at the forefront of AI development and have the power to set the primary rules that could set the future of AI development. There could be danger for Europe; if US private companies remain at the forefront of advances in AI, Europe will be forced to follow US private standard setting.

With reference to Small and Medium sized Enterprises (SMEs) and startups, France wants to improve this relationship by collaborative initiatives to develop novel AI solutions for the public sector while simultaneously creating opportunities for the academic sector, such as traineeships, Ph.D. programs and internships (Villani 2018, 68). The Villani report (2018, 8) addresses the importance of collaboration with the private sector throughout the entire document, specifically regarding startups and SMEs. An example of a public-private collaboration is French Tech, a public initiative that aims to assist the French society, mainly startups, with the adaptation and preparation for disruptive and transformative digital technologies (République Française 2019). The center also provides public services to boost the competitiveness of startup businesses in France. The French National Institute for Research in Computer Science and Control (INRIA) – leads the research department of French Tech Central. It is a version of the GovTech initiative from Singapore; however, French Tech Central is focused on boosting competitiveness rather than developing applications for public procurement (République Française 2019). FrenchTech, similar to French Tech Central, provides a prominent platform within France that offers government support for startups nationwide (AI for Humanity(a) 2018). Macron believes that these public-

private platforms could help promote ethical and beneficial AI among smaller business by stimulating issues such as awareness of responsibility, transparency and diversity in organizational and labor recruitment processes (Villani 2018, 144).

In relation to the academic sector, the French state envisages a central role. The first line of the national strategy states, “Bet on French talent”, that is supported by the promise to set up the AI program, supported by four or five national research centers that will be led by INRIA (AI for Humanity(b) 2018). The promise includes an increase of AI educated students, 50% time off for public researchers to dedicate their time to AI research and 700 million euros investment.

AI for society

Predominantly, ethical and human-centered AI play a central role of the Villani report and the national AI strategy. The Villani report (2018, 6) states that governments cannot let market-based industries obtain political independence and that the state has to ensure meaning full AI development; Macron argued that human progress is the key driver of technological progress and the government should ensure safe, open public databases (AI for Humanity(a) 2018). Furthermore, the report stresses AI’s capabilities to ensure ecological transitions in the French and European context. Part 5 of the Villani report (2018, 112) addresses the ethical considerations in AI technology that lay at the heart of public debates. The ethical challenges mentioned are examples such as transparency, corporate responsibility, explainability of machine-learning algorithms, bias, and the position of power of corporate entities in designing AI. The report mentions the problem of black boxes in AI, which means that people will not trust AI solutions if they cannot understand how the AI system takes decisions. The black box problem constitutes as a reason to develop ‘ethics by design’: ethics should be part of the training of AI designers and engineers (Villani 2018, 119). Part 6 is dedicated entirely to diversity and inclusiveness and emphasizes the role of public policy to address diversity and gender equality problems (Villani 2018, 132). The problems due to lack of diversity in AI design environments is recognized as an effect of diversity problems civil society. The report considers the state’s obligation to support diversity by developing policy measures that for example impose a minimum percentage of women.

The United Kingdom

The UK has a historical background in Artificial Intelligence (AI) research since 1950, starting with Alan Turing who wanted to discover whether computers could think (Hall and Pesenti 2017, 18). In 1983, the UK government launched the Alvey Programme as a response towards the promotion by governments worldwide in Research and Development (R&D) regarding AI-related technology development (House of Lords 2018, 17). According to the House of Lords report (2018, 17), establishing the Alvey Programme was a reaction by the UK government to the worldwide trend of governments investing increasingly in R&D programs. In 1993, the Department for Trade and Industry's Neural Computing Technology Program accumulated a fund of 5.75 million pounds to "raise awareness of neural networks" (House of Lords 2018, 18). The government's interest in AI programs eventually slowed down due to the rising importance of other, more salient General-Purpose Technologies (GPTs) (House of Lords 2018, 18). Since 2016, the UK has primarily been involved with the possibility of a withdrawal from EU membership, which has dominated the British political debate (May 2018). Nevertheless, the UK government has been actively publishing formal documents relating the future of AI in the UK and relating Science and Technology (S&T) policies.

The Government of Science advises the Prime Minister and Cabinet respecting long-term strategic issues within the science field of public decision-making and policymaking (Government UK(a) 2019). The Council for Science and Technology (CST) is an independent body, not publicly funded and advises the Cabinet and the PM regarding science and technology policies issues (Government UK(a) 2019). Regarding AI development, the Department of Digital, Culture, Media and Sport together with the Department of Business, Energy and Industrial Strategy lead the process of developing and implementing UK's national AI strategy (Government UK(a) 2018). There are three (non) governmental bodies supporting the government departments (Government UK(a) 2019). The Centre for Data Ethics and Innovation (CDEI) is set up to assess the ethical and societal impacts of AI in the UK. It constitutes as an independent advisory body. The AI Council is a multidisciplinary body that is put in place to support the implementation of the AI Sector Deal. The Office for AI (OAI) constitutes as the secretariat of the AI Council and plays a key role in implementing and steering UK's efforts in developing AI. The OAI receives advice from private sector actors such as Demis Hassabis, advisor from Google DeepMind (Hall 2018).

Government initiatives

At September 2016, the House of Commons' Science and Technology Committee published a 44-page report on "Robotics and artificial intelligence," (House of Commons 2016). The report recognizes the slowdown in AI R&D in the UK, and therefore also a stagnation in government attention and the need for ethical and safety AI discussions (House of Commons 2016, 3). In 2016, the Government Office for Science published the report 'Artificial Intelligence: opportunities and implications for the future of decision-making' (Government Office for Science 2016). The report focusses on the implications of AI in the British society and presents an overview of potential benefits and challenges the public policy-makers are facing (Government Office for Science 2016).

In January 2017, the All-Party Parliamentary Group⁴ on Artificial Intelligence (APPG AI) had been established with objective to address the impact of AI on civil society. The APPG AI consists essentially of members of Commons and Lords and the 'group supporters' consists of mainly large multinational consultancies and IT-corporations that advise the group members in their group activities (APPG-AI 2017). In 2017, the Royal Society (2017) published the report 'Machine learning: the power and promise of computers that learn by example'. Also, in 2017, the government published the White Paper *Industrial Strategy: Building a Britain fit for the future* that covered four grand challenges, including UK as one of the leaders of AI development. The government commented on the AI challenge: "One of these is for the UK to maximise the economic and societal benefits of the current global technological revolution." (Government UK 2017).

In 2017, the UK government asked Jerome Pesenti, mathematician, and Wendy Hall, Regius Professor of Computer Science, to lead the review on how AI could be developed in the UK (Hall and Pesenti 2017). Regarding professional experience, Hall has a deeply rooted background in academic computer science, leading positions within the academic sector (Hall 2018). Pesenti has mainly pursued his science interests via corporate structures, such as his incumbent position as Vice-President of Facebook since 2018 (Hall 2018). The review process included more than 100 stakeholders from the private sector (industry and academia) and the government (Hall and Pesenti 2017, 17). Hall and Pesenti used publications concerning machine learning by the Royal Society and a report of the British Academy on

⁴ APPG's are informal parliamentary groups that consists of member of House of Lords, members of House of Commons and non-governmental individuals (APPG-AI 2017).

Data Governance, as reference work for their review of the UK AI sector (Hall and Pesenti 2017, 17). After Hall and Pesenti published their UK AI sector review, key actors from the private sector were involved to advise on the drafting process of the UK AI Sector Deal (Hall 2018).

Ten days after the Hall and Pesenti review was published, the House of Lords Select Committee on AI published the report “AI in the UK: ready, willing and able” (Dutton 2018). The report assesses the economic and societal implications of AI development in the UK and includes a set of recommendations for future governmental action. The report advised the government to focus on strategic leadership in ethical AI because this is UK’s area of expertise (House of Lords 2018, 138). The general criticism reads that the review of Hall and Pesenti lacked details on accountability, deeper insight to ensure human aligned AI technology and the importance of concrete political engagement explaining AI to the public (House of Lords 2018, 6). The report emphasized the importance of civil awareness of AI technology with the corresponding risks and benefits in sensitive public sectors (House of Lords 2018, 6). Among the final recommendations, The House of Lords suggested to include AI, emotional intelligence and ethics into primary and higher education curriculums. The House of Lords advised the government to improve technology understanding among policy-makers to be able to produce effective technology policies (House of Lords 2018, 6). In response, the government published a formal response to the publication by the House of Lords (UK Parliament 2018). With the document, the government responds to the recommendations made in the House of Lords report.

In 2018, the government published the UK AI Sector Deal. The Sector Deal is part of UK’s Industrial Strategy and outlines actions that should support the development of AI and the adaptation of AI in the society. The Sector Deal is built upon the recommendations from Hall and Pesenti, and according to UK officials, the Sector Deal is supposed to be the start of “*strong partnership*” between industry, academia and government and make UK a global leader in AI technology (Government UK(a) 2018, 4). The British government has taken a market-based approach to set up the AI Sector Deal (May 2018). The UK has a tradition of liberal public policies that ensure a light regulatory touch. The strategy is part of UK’s Industrial Strategy and focuses mainly on boosting R&D intensity, adoption of AI technology in economic sectors and boosting UK’s AI-business sector. The Sector Deal includes 93-million-pound investment from the Industrial Strategy Challenge Fund that applies only for the development of robotics and AI research specifically targeting safety and beneficial AI

development for extreme environments in industries (Government UK(a) 2018, 13). Additionally, the Sector Deal includes 20-million-pound investment to support AI technology in the British services sector.

Prime Minister May presented the UK AI Sector Deal at the World Economic Forum in Davos (May 2018). May addressed AI for all humanity; exploitations of malign AI-systems; financial and corporate actors to accept social responsibility to tackle ethical and safety problems and the power of business as the source for good. Regarding the role of the state, conditions for business growth and public investments are key (May 2018). In addition, May stated that strategy and partnership between government and business is key to harness opportunities of AI and to address technological risks via business-led technology, and to ensure a backdoor in technologies to remove criminal and potentially harmful data automatically. The speech included an official statement concerning a future partnership with the World Economic Forum to develop responsible public procurement in AI (Government UK(b) 2019; May 2018). Additionally, in 2018, the UK government strengthened ties with the French government when initiating plans for an international conference to foster cross-sector collaboration between private and public actors in both countries (Department for Digital, Culture, Media & Sport 2019).

Public-private sector relations

The UK, and specifically London, has been breeding ground for small and large technology companies for decades (Mols 2019, 32). Prominent AI companies such as DeepMind, owned by Google, and Amazon, Element AI and HPE are located in London (Government UK(a) 2018, 25). Regarding the number of AI startups, the UK is ranked first in Europe (Mols 2019, 32). The UK-based AI companies are not evenly spread out in the UK since London holds the most AI companies (80%) and Cambridge, Oxford, Bristol and Edinburgh hold the most AI research organizations (Hall and Pesenti 2017, 30). The UK houses a group of public/private research institutions and organizations that contribute to the development of Beneficial AI (Hall and Pesenti 2017, 38). These institutions are: Tech City UK, TechUK, the body for the UK Electronic Systems & Technology Industry (NMI), Digital Catapult, Royal Statistical Society (RSS) Data Science Section, National Innovation Centre for Data, Open Data Institute (ODI), the Alan Turing Institute, the Turing Data Study Group, the Engineering and Physical Sciences Research Council and the Leverhulme Centre for the Future of Intelligence (Hall and Pesenti 2017, 36). These organizations support public and private actors that work to design,

operate or implement AI or use applications of AI and cooperate often with British public initiatives and programs.

The British research institutes participate in Ellis and CLAIRE, even though the British government does not officially support the CLAIRE organization (CLAIRE 2019). The government and the private sector will bear the costs of AI investments via public-private deals to support UK's AI industry: 300 million pounds investment from the government, 700 million investment from private sector businesses and academic organizations (Government UK(a) 2018, 21). In terms of Public-Private Partnerships, the UK government employs GovTech structures to improve public services via new digital technologies (Filer 2019, 4). The government gives start-ups specific assignments for public sector clients. In 2017, the UK government launched the GovTech Catalyst team and £20 million fund “*to help tech firms deliver innovative fixes to public sector challenges*” (Government UK 2017). In a public-private collaboration, the OIA and the Alan Turing Institute (NGO), together with the UK Research and Innovation (UKRI) (NGO) established the ‘AI Fellowships’ (Government UK(b) 2018). With this 50 million pounds initiative, the UK government aspires to fight brain drain, and to attract and retain AI-talents (Government UK(b) 2018).

AI for society

Hall and Pesenti (2017, 14) did not include ethics, beneficial AI or algorithms in their review because of practical reasons but also because the review was supposed to assess the industrial strategy of UK in relation to AI. The reports by the Royal Society and the British Academy are considered complementary to the review and focus on governance and ethics in data management (Hall and Pesenti 2017, 14). The government has acknowledged that it will address issues related to ethics and beneficial AI via the OIA, CDEI, and the AI Council (UK Parliament 2018). The government excluded information on accountability and substantive actions in the future of the OIA, CDEI and the AI Council and AI regulatory frameworks (House of Lords 2018). In the House of Lords report (2018, 125), includes a recommendation to establish a cross-sector AI code that could be based on five recommended principles. The principles included beneficial AI development, intelligibility and fairness, right to privacy, right to AI education and prohibition of malign autonomous power in AI technology (House of Lords 2018, 125). These principles are recommended to support public trust in AI applications and to harmonize the wide variety of AI ethical principles that already exist in

private and public organizations (House of Lords 2018, 120). The principles form the basis of other recommendations made in the report regarding diversity in AI design environments, recognition of bias and accountability problems, reviewing power of data monopolies and right to access among AI-experts (House of Lords 2018, 13-18).

Part 4. Comparative case study analysis

This chapter presents the comparative case study analysis, based on the results from literature review and data from the French and British national AI strategies. The following text will introduce the comparisons made between the French and British governments' AI strategies and the analytical interpretations. The role of the government in developing AI and the technology understanding are evaluated in analyzing the results of (i) two speeches given by the French and British MP respectively on AI development, (ii) the national AI strategy and (iii) the independent reviews preceding the national AI strategies by Hall and Pesenti (2018) and Villani (2018). The conclusion of the analysis helps to determine whether to reject or adopt the following hypothesis: this thesis surmises, *“that there is a relational connection between technology understanding in a national government and the role of the state in the development of the national AI strategy.”* This analysis does not aim to measure the impact of the variables but rather aims at understanding whether the variables interact with each other.

The cases will be compared regarding (i) the strategic role of government (ii) EU frameworks, (iii) the strategic priorities, (iv) AI that benefits all of society, (v) the relationship with the business sector and finally, (vi) the relationship with the academic sector. The comparisons will be interpreted based on the conceptual framework of technology understanding. To recap, technology understanding within the context of this research indicates the agency of governmental actors to incorporate the necessary technical knowledge and principles in their decision-making. The theoretical framework considers technology understanding when governments (i) show understanding of the conditions necessary to ensure effective technology progress, (ii) employ the strategic role of research, combined with state's willingness to fund this research, (iii) recognize transnational and regional available R&D programs to support technology development. In addition, policy-makers environment should

include (iii) collaboration and exchange of technology expertise and (iv) presence of multinational AI companies to increase pool of AI-experts available.

Structural role of government

In the following analysis, the French and British governments will be compared with regard to role both governments portray when developing a national AI strategy. The role the government aims to embody, will be evaluated in an interpretive analysis of the structural approach taken to AI, as well as by considering the technological understanding of AI displayed by the governments. The French and British leaders respectively on AI development do this through analyzing both speeches, and the government's role descriptions set out in the independent reviews and national AI strategy.

When comparing France and UK, all three sources indicate a strong top-down approach in the French AI approach compared to the deliberate distant position of the British government towards AI R&D. The British and French government have indicated a strong interest and willingness to take necessary action to ensure AI that benefits society in the future. The number of formal AI reports and assessments preceding the development of an AI strategy can be interpreted as governments that are aware of the strategic character of AI and aware of the necessary input of the government.

When comparing French and British national leadership, the French leader Macron's displays more technical understanding than in comparison to Prime Minister May. It is possible consider Macron's technology understanding as necessary since Macron has the formal obligation to set the nation's research and innovation priorities, together with the government (European Commission 2006). In contrast with the French president, the British Prime Minister merely has to present formal statements respectively of AI, while specific departments of the British government manage all technological content. Macron's speech reflected an awareness and understanding of the AI-related issues that are recognized by AI leading experts. It is possible to interpret British Prime Minister to lack necessary technology understanding when analyzing May's speech in Davos. To exemplify, while May devoted a substantial part of her speech to ethical issues in AI though she calls upon the private sector to address these issues of social responsibility, she did not mention any technological aspects. Another conflict arose when May promised to ensure the rights of privacy and right to data

portability but proposed a backdoor in messaging-apps so companies could automatically remove malign use of data when the government suspects criminal intent.

EU frameworks

Moving to the next analysis, this section compares the extent to which both countries integrate the EU perspective into their strategy.

Even though the desire is similar, the French government perceives a more French-European leadership while UK envisages leadership without the EU. The French strategy is designed to align with the European AI guidelines and to promote the overall European position. In comparison, the British goal does not include references to EU frameworks. This does not imply that Britain excludes itself from all AI European initiatives and platforms; it merely could be interpreted as British leadership without regards to the European position.

According to the framework of technological understanding, the French initiative to develop a European approach bears witness of recognition of international and regional frameworks that support effective technology policy-making. The British case displays various signs of international cooperation but compared to the French strategy, the Sector Deal does not engage as much as France does in European AI collaborations. Concerning strategic priorities, the French-European priorities deviate from the purely national British priorities. The French AI priorities and objectives explicitly mention compliance with EU priorities and objectives such as the European Data Ecosystem and European data policies. The EU positioned itself as a normative power within the AI global context and the French AI strategy reflects this normative viewpoint on AI. The lack of accountability to the government does not indicate understanding of technological conditions necessary to ensure AI that benefits all layers of society.

Concerning national leadership, France and UK seem to diverge on the issue of technology expertise among political actors. The UK government appears to consist of political actors, which are being advised by (often)-independent advisory bodies that consist of actors with strong backgrounds in technology/industry/science. The French government exists of mainly political actors too, but Macron deliberately involved actors with a science background within his government. The advisory bodies, such as OPEST, consist of public and private actors, which advise the government on scientific issues such as AI. This could be interpreted via the

government's central role in science and technology policies, which requires more technical understanding compared to the British case where the government merely provides strategic direction.

Regarding AI that benefits all, the French 'human-focused' approach differed from the British market-led approach. The intensity of the French approach towards the role of the state in ensuring AI development that will benefit the entire society forms a sharp contrast with the light regulatory touch in the British approach. Both independent reviews display a high level of technical understanding because AI-experts led both country assessments and incorporated opinions and advice from a wide variety of AI-experts from diverse backgrounds. The British decentralized approach could also be interpreted because of the British focus on public-private collaboration to develop AI in the future. The French approach seems to embody more issues that are central to current public debates compared to the industry-led Hall report, which the Sector Deal builds on.

Strategic priorities

In the subsequent analysis, the French and the British approach respectively of AI development will be compared with regard to the strategic priorities and core principles of the national AI strategies. The strategic priorities embody a nation's strategic objectives, which are set in the national AI strategies, mentioned in the independent reviews and British and French leadership speeches on AI.

Comparing the French and British strategic AI priorities shows that both cases have the desire become the global leader in AI and both governments have aimed at specializing in ethical issues of AI. Despite similar global aspirations, the French approach aims to support a French and European AI leadership and to develop meaningful AI⁵ and explainable AI⁶. AI in France has to support AI that considers human progress as one of the key drivers of AI technology. Contrasting to the French priorities, the UK aims for British AI leadership and recognizes AI as one of its key priorities to ensure global competitiveness and social welfare. Both cases

⁵ Villani describes meaningful AI, as "A meaningful AI is another way to say that it is not an end in itself. Its development should take several considerations into account" (Villani 2018, 7).

⁶ Villani describes explainable AI as "explaining this technology to the public so as to demystify it—and the role of the media is vital from this point of view—but also explaining artificial intelligence by extending research into explicability itself" (Villani 2018, 10).

have a national strategy that is predominantly based on the independent reviews. Interestingly, the British assessment by Hall and Pesenti deliberately excludes ethics because the British strategy treats ethical issues as falling outside of the scope of the national strategy. While the French assessment was not restricted to discuss ethical issues, Villani was obliged to follow the government's strategic research priorities.

AI that benefits all in society

The following analysis compares the French and the British focus on ensuring AI technology that benefits everyone within the national borders. AI that benefits all implies the French and the British promise to develop a national AI framework that avoids concentration of wealth created by AI or the exclusion. In addition, AI that benefits all of society refers to the government's recognition of social structures influencing the social shaping of the technology development process.

Regarding inclusive AI development, the British government and the French government diverge on substantive government's commitments to ensure AI technology that benefits all. The French focus on inclusivity is visible throughout most formal publications by the government, which forms a contrast with the British government that promises AI that benefits all of society based on free-trade and British competitiveness in AI. France displays signs of commitment towards ensuring ethical AI by addressing conditions throughout the entire AI design process.

Regarding the national promise to ensure AI that benefits the entire society, the British government seems less involved in the ensuring necessary conditions to ensure AI operates within these principles of plurality and equality compared to France. The French approach emphasizes ethics by design; responsibilities of all actors involved in decision-making plus the right to access of decision-making and is, contrary to the British government, not willing to sacrifice the right to personal data for the benefit of technological progress. The British government consistently mentions topics relating inclusivity and diversity in conjunction with the societal responsibilities of AI businesses. Regarding the implementation or concrete actions, the UK has redirected the responsibility to the newly established AI institutional bodies that consist of corporate and civil actors.

Government relationship with the business sector

The subsequent analysis below, analyses the relationship between the government and the national business sector. The relationship with the national business sector indicates the availability of AI business resources such as AI-expertise, financial capacity and competitiveness in AI technology. The relationship also indicates the presence of large technology companies, which are established within national borders, and the extent of collaboration with the business sector that supports the AI national strategy objectives.

Concerning government's relationship with the business sector, the French indicates a reluctant attitude towards large data-driven companies compared to the British pragmatic and liberal attitude as to large data-driven companies. The French review labels the empowered capacity of big technology companies as potential threats to society, even though it does promote corporate led research by the worlds' largest technology companies. Hall and Pesenti's report and the House of Lords' report both recognize social structures and social shaping of technology, similar to France. Notwithstanding, the British strategy translated the issues of influence in technology developments into corporate responsibilities, in collaboration with the academic sector. The British strategy aims to employ the innovative capacity of UK business that own the most data and AI expertise to develop safe and beneficial AI.

Regarding collaboration with the business sector, France and UK's governmental efforts show similarities. In both cases, the strategy pursues a public-private dialogue in which academics, industry and government, even though the French dialogue reflects a federal approach while the British dialogue indicates a decentralized approach. Both France and UK recognize the strategic value of technology companies established in a country, and both recognize the risks of data monopolies, influence in technology developments and standard setting. The UK seems to derive strength from a long tradition in AI research and the highest number in Europe of AI companies and startups present. Especially the presence of large technology companies indicates large volumes of data, strong available computing power and a growing pool of AI-experts. France seems to fall behind in AI companies compared to UK and France displays more reluctance towards the utilization of large AI businesses.

Government relationship with the academic sector

The following analysis concerns the government's relationship with the actors and institutions from the academic AI sector. In this context, the relationship with the academic sector refers to prominence of academic strategic research, public investments and the government's attitude towards the employment of the academic sector to further progress in AI.

Considering the relationship with the academic sectors, both countries perceive academic research as the core of a national AI strategy. The British case displays the government's employment of strategic research within AI Sector Deal. The Sector Deal includes large proportions of investments for strategic research and programs to ensure the value of the innovations. France's pledge to bet on French talent is ensured by governmental initiatives to set up national research centers but also because of the arrival of big corporate technology research facilities.

Regarding government's relationship with the academic sector, the British government seems to have a stronger AI-research environment compared to France but a less involved relationship with academic institutes. The French state has long-term experience in setting R&D priorities that contribute to the country's innovative capacity and the British government preferred a market-led approach. The British liberal industry-led approach aims to invest in strategically led AI research academic institutions such as the Alan Turing Institute and the AI Turing Fellowships. To exemplify, the French central role seems to imply that all relevant academic stakeholders are connected to the government via institutional or financial means. In addition, the French government needs a certain level of technology understanding to be able to set the national research priorities or take the lead in public-private collaborations. British liberal approach of regulating the AI academic sector has led to globally competitive AI academic sectors but does not contribute to the governments understanding of technology. The British government applies a more decentralized, liberal approach to its relationship with the academic sector. The liberal approach requires less technical understanding from the government and focusses more on strategy and industrial priorities of the academic sector.

To conclude, this chapter analyzed key comparisons made based on case study data: the structural role of government, EU frameworks, strategic priorities, AI that benefits all of society, government relationships with the business sector and government relationships with the academic sector. The objective of the interpretative analysis was to determine or reject *a*

causal relation between the presence of technology understanding among a government and the government's approach in developing an AI strategy that benefits the entire society. As the analysis has shown, the British government pursues an industry-led approach focused on industrial progress and economic value whereas the French government pursues a predominantly research-led approach that focuses on AI autonomy and transformative capabilities of AI. The main analytical conclusion drawn from the comparative case study is that there seems to be a causal relationship between technology understanding and the government's approach to AI development: the government's approach in developing AI has an intensifying effect on the technology understanding among a government, which implies the adoption of the hypothesis.

The analysis is supported by three analytical observations. First, the French long-term relationship with the academic sector seems to contribute to the government's technology understanding. The British liberal approach to the British academic sector has led to globally competitive AI academic sectors but does not contribute to the governments understanding of technology. Second, the number of AI companies seems to benefit a country's competitiveness and potentially a government's technology understanding. Without substantive collaboration, however, technology understanding seems to remain largely absent among governmental actors. In contrast to France, the British government has strong connections with the private sector, but instead of collaboration, the private actors often take part in independent advisory councils that advise policy-makers. The French government has incorporated technology experts within the formal structures of governments, who continuously collaborate on the substance of French technology policies. It seems that the centrality of the French government in research and innovation policies has led to a continuous collaboration with the private sector, especially with the academic sector. Collaborating with academic AI experts could further increase the French governments understanding of the conditions that need to be fulfilled to create effective AI policies. Third, regarding the national promise to ensure AI that benefits the entire society, the British government seems less aware of the conditions that are necessary to ensure AI operates within these principles of plurality and equality compared to France.

Conclusion

This thesis set out to answer the question “*What can France and the United Kingdom teach us about the role of the state in developing an Artificial Intelligence strategy that aims to ensure Artificial Intelligence that benefits society as a whole?*” Based on the literature review, this thesis assumed that there seems to be a causal relationship between the technology understanding in governments and the role of governments in developing a national Artificial Intelligence system and strategy. Based on a comparative case study between France and the United Kingdom, this thesis anticipated to adopt the hypothesis. The main result from the case study analysis is that both government’s approach in developing AI seems to have an intensifying effect on technology understanding of a government. Drawing from the analysis, the British government pursues an industry-led approach focused on industrial progress and economic value whereas the French government pursues a predominantly research-led approach that focuses on AI autonomy and transformative capabilities of AI. The following analytical observations supported adoption of the hypothesis.

The first observation is that the government’s relationship with the academic sector seems to influence the extent of technology understanding among governments. If France takes a more central position in the relationship with the academic sector, the presence of technological understanding increases, including the necessity for technological understanding to be able to cooperate on a substantive level. If the British government takes a more distant role in the relationship with the academic sector, the presence and necessity of technology understanding decreases.

Second, the number of (international) AI companies benefit a country’s competitiveness and a technology understanding of a government because the AI, and data-driven companies, attract a pool of AI-experts and own often large databases, which contributes the country’s **competitiveness**. Without substantive collaboration between government and AI businesses, however, technology understanding remains seems to remain largely absent among governmental actors.

The third observation is that when a government wants to ensure AI that benefits all of society, technology understanding seems inevitable. The observation implies that technology understanding helps policy-makers to understand which conditions are necessary to ensure that the AI technology will eventually benefit all of society. If France takes a more central role, it seems that France is forcing itself to become involved at a substantive level to include

all necessary conditions into government policy (or strategy). The British government has not made any substantive promises to ensure AI for all of society.

In conclusion, the case study analysis indicated that because of the distant governmental role, the technology understanding of the government appeared inadequate to correspond how a future society with AI will benefit all of society and will not exclude certain social groups. When a government had a more central role in AI, it seems more aware of the necessary conditions in technology design (and further development for applications) that would ensure a future with AI technology that includes the entire society.

Notwithstanding the relevance of this research, some conclusions can be drawn; several questions remain to be answered. The following recommendations are made based on the research results. First, this thesis recommends more future research to governance and politics in the context of Artificial Intelligence. Further work is required to establish the viability of governments agency in the future of AI technology and to identify the political challenges and opportunities when dealing with disruptive technologies within the digital age. And second, limited research seems to investigate the importance the social structures that have the ability to shape technology development processes. It would be interesting to research whether the social structures influence the impact of AI on society.

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