T.C.
ANKARA YILDIRIM BEYAZIT UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES

PUBLIC POLICIES ON ARTIFICIAL INTELLIGENCE: COMPARISON OF THE USA AND CHINA'S AI PUBLIC POLICIES

MASTER THESIS

Hilal SAYGILI

DEPARTMENT OF POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

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ANKARA, 2020

STATEMENT

I declare that this thesis study is my own work and I don't have unethical behaviors that violate patents and copyrights in all stages from the planning to the writing of this thesis. I also declare that I obtained all the information in this thesis in accordance with the academic and ethical rules and I've cited and referenced all the information and interpretations benefited in this thesis. (31.08.2020)

Hilal SAYGILI

DEDICATION

Bu teze başlarken bana her aşamada yol gösteren, gerek akademik gerek motivasyon aynı zamanda manevi olarak desteğini esirgemeyen, beni bir öğrencisi olarak değil meslektaşı olarak gören, bana her zaman güvenip, hiçbir zaman yalnız bırakmayan sayın hocam Prof. Dr. Murat ÖNDER'e teşekkür gönül borcumdur. Hocama tüm desteği, hoşgörüsü, sabrı, sevecenliği, tezimin her adımında beni yönlendirdiği, en önemlisi beni hiç yalnız bırakmadığı için sonsuz teşekkür ederim.

ÖZET

Yapay Zeka Kamu Politikaları: ABD ve Çin'in Yapay Zeka Kamu Politikalarının Karşılaştırılması

Çoğunlukla bilim kurgu filmlerinde ve romanlarda işlenen bir konu olarak karşımıza çıkan yapay zeka geleceği ekonomik, sosyal, kültürel ve politik olarak çok yönlü olarak şekillendirecek, tüm dünya ülkelerinin gündemlerini dolduran bir çalışma alanıdır. Çoğu ülke, bu alanda başarılı olmanın, ülkeler arası güç dengelerini değiştireceğinin farkında olup yapay zekâ politikalarını oluşturup geliştirme çabası içerisindedir. Bu bağlamda çalışma, ülkelerin ulusal yapay zeka stratejilerini yayınlamaları ve bu süreç içerisinde yapmış oldukları yapay zeka kamu politikalarının ülkeler arasında ne gibi farklılıklar gösterdiğini incelemeyi amaçlamaktadır. Bu karşılaştırmayı yaparken, yapay zeka üzerine yaptıkları çalışmalar, başarılar ve yapay zeka kamu politikalarında büyük bir rekabet içerisinde olan Amerika Birleşik Devletleri ve Çin örnek ülkeler olarak seçilmiştir. Öncelikle, yapay zeka ve kamu politikaları üzerine kavramsal ve karşılaştırma çerçevesi çizilmiş, daha sonra iki ülke ayrı ayrı incelenerek karşılaştırma yapılmıştır. İki ülkenin yapay zeka politikasının değerlendirilip karşılaştırılmasında, tarihsel arka plan, kamu politikalarının belirlenmesinde etkili olan aktör ve faktörler, kamu politikalarında öncelikli alan ve sektörler, ekonomik hedef ve etkileri, yasal düzenlemeler, stratejik belgeler vb. gibi temel unsurlar dikkate alınmıştır. Bu bağlamda iki ülkenin yapay zekâ kamu politika süreci, politika süreç analiz modeli ile incelenerek kapsamlı bir değerlendirme yapılmaya çalışılmıştır. Ayrıca bu değerlendirmede, ABD ve Çin'in yapay zekâ kamu politikalarının karşılaştırılmasında, iki ülkenin en son güncelleştirilmiş ulusal yapay zekâ stratejik belgeleri MAXQDA 2020 programından faydalanılarak çift vaka analizi ile incelenmiştir. Yapılan değerlendirme sonucunda, yapay zeka konusunda çok daha güçlü bir geçmişe sahip olan ABD'nin, yapay zeka politikalarını aşağıdan yukarıya bir yaklaşımla, hedef kitlelerle ve hizmet sağlayıcılarla uygulama stratejisini benimsediği, Çin'in ise uzun bir yapay zeka araştırma geçmişine sahip olmamasına rağmen, daha merkeziyetçi ve yukarıdan aşağı yaklaşım benimseyerek politikalarını başarıyla uyguladığı ortaya çıkmaktadır.

Anahtar Kelimeler: Yapay Zekâ, Kamu Politikası, ABD ve Çin'in Yapay Zekâ Kamu Politikaları

ABSTRACT

Public Policies on Artificial Intelligence: Comparison of The USA And China's AI Public Policies

Artificial intelligence, which is mostly used in science fiction movies and novels, is a field of study that will shape the future economically, socially, culturally and politically in a multifaceted way and fill the agendas of all countries of the world. Most countries are aware that being successful in this area will change the balance of power between countries, and they are trying to form and develop their artificial intelligence policies In this context, the study aims to examine how countries publish their national artificial intelligence strategies and how the artificial intelligence public policies they have made in this process differ between countries. While making this comparison, the United States of America and China, which are in great competition in their studies, achievements, and artificial intelligence public policies, were chosen as sample countries. First, a conceptual and comparison framework on artificial intelligence and public policies was drawn, and then the two countries were examined separately, and a comparison was made. In evaluating and comparing the artificial intelligence policies of the both countries, basic elements such as historical background, actors and factors that are effective in determining public policies, priority areas and sectors in public policies, economic goals and effects, legal regulations and strategic documents were taken into consideration. In this context, the artificial intelligence public policy process of the two countries has been examined with a policy process analysis model and a comprehensive assessment has been made. In addition, in this evaluation, in the comparison of the artificial intelligence public policies of the USA and China, the latest updated national artificial intelligence strategic documents of the two countries were examined with double case analysis using the MAXQDA 2020 program As a result of the evaluation, the USA, which has a much stronger history in artificial intelligence, has adopted the strategy of implementing artificial intelligence policies with a bottom-up approach, target audiences and service providers, and although China does not have a long history of artificial intelligence research, it appears that it successfully implements its policies by adopting a centralist and top-down approach.

Keywords: Artificial Intelligence, Public Policy, The USA and China's AI Public Policies

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LIST OF SYMBOLS and ABBREVIATIONS

AAAI : Association for the Advancement of Artificial Intelligence

AI : Artificial intelligence

c. : Century

CEA : Council of Economic Advisor

CRS : Cyber Reasoning System

CISTP : China Institute for Science and Technology Policy at Tsinghua University

DARPA: Defense Advanced Research Projects Agency

EU : European Union

FLI : Future of Life Institute

GDP : Gross Domestic Product

IDRC : International Development Research Centre

IMF : International Monetary Fund

IMPACT: Information Resource Management Program for Accessible Computer/Communication Technology

MLAI : Machine Learning and Artificial Intelligence

NCO : National Coordination Office

NITRD: Networking and Information Technology Research and Development.

NLP : Natural Language Processing

NSTC : National Science and Technology Council

OECD : Organization for Economic Co-operation and Development

OFAC : Office of Foreign Assets Control

OMB : Office of Management and Budget

ONE AI: The OECD Network of Experts on Artificial Intelligence

OSTP : Office of Science & Technology Policy

PRC : The People's Republic of China

UN : United Nations

USD : United States Dollar

USGS : United States Geological Survey

VC : Venture Capital

WTO : World Trade Organization

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1. INTRODUCTION

The dizzying acceleration of technological developments reveals innovations that will change the whole world. Artificial intelligence (AI), which can be considered as the last link of these developments, is one of the most important agenda topics of our century. In the 1950s, as the scientists came up with the idea that machines can do everything a human can do, the area where this idea occurred was called Artificial Intelligence (AI). The significance of AI gradually increases over the years. It becomes one of the most important and remarkable issues in the world and continues to be the subject of a much-debated agenda with its various effects and functions. Scientists, universities, research centers, companies, internal and international organizations, and governments highly interested in making researches about AI and its future.

The study area of AI is based on the programming of computers which has the characteristics of human mind and, shows its effects in every field of human life. This area is remarkably effective in the agenda of the countries by trying to define the human mind and behaviors in the best possible way and trying to program machines that can think like human beings. Although AI cannot do everything a human can do today, it has capability to function as human in many areas and argued to surpass human being in the future. Together with advancement in AI new usage areas are emerging. A high competition has been observed among various nations and institutions. From the emergence of the first artificial neural network-based computer SNARC (Stochastic Neural Analog Strengthening Calculator) to the most rapidly available AI-based mobile phones, it has been highly valued issue for all AI developers and users throughout the world.

The AI, which existed in the form of different methodologies, initially known and showed its effect mostly with the emergence of expert systems. The emergence of these expert systems can be shown as one of the main reasons why artificial intelligence has become a high-tech industry and attracted the attention of countries. With the use of expert systems from many companies in the service sector, many countries have started to allocate large resources to encourage AI research. For example, The US stated in its 2020 budget document that it has allocated a budget of $ 71 million for AI and machine learning (Budget of the USA Government, 2020: 37).

We have seen pioneer scholars and politicians underline the significance of AI today with different perspectives. Russian President Putin said, "AI is the future, not only for Russia, but for all humankind. It comes with colossal opportunities, but also threats that are difficult to predict. Whoever becomes the leader in this sphere will become the ruler of the world." (Putin, 2017). Hawking who is a famous theoretical physicist, cosmologist, and author say about AI "Success in creating AI would be the biggest event in human history. Unfortunately, it might also be the last, unless we learn how to avoid the risks." Turing, the founder of Turing Test, pointed to the future of AI by stating that the machines will achieve the thinking method, this is not in the distant future, so that the machines can take control at some stage.

AI has been used in many policy areas such as health, transportation, defense, social life etc. Countries are trying to develop and progress day by day with the support of both the private sector and the public in a fierce competition. Many new technological advancements make AI to be known in all kinds of daily lives products in different fields. For example, Apple's Siri, Microsoft's Cortana, Amazon's Alexa, or Google's Google Assistant are voice assistants; the applications that occur with the method of processing natural language -one of the AI types- understand the voice commands and perform the related tasks within the scope of the commands, are the AI applications that we often encounter.

The recommendation system used by e-commerce sites such as eBay, Amazon and Alibaba are an example of AI algorithms that aim to provide the most meaningful and accurate products for the user by filtering useful contents from large data pools. Cogito is used as a software system that uses AI to improve the quality of conversations and emotional connectivity in real time in sales and customer service calls. UC Berkley's BRETT and the infamous MIT dog or Sophia the robot, are some of the examples of AI-powered robots. These are deep learning robots which could learn to complete tasks that entail improved perception and manipulation abilities.

We also have witnessed the various usage of AI among different sectors. The main role of AI in mobile banking field has been known to develop customer service. With online banking, there is a great deal of convenience in bank affairs, and thanks to the automation developed, the banking process is simplified. Ride- sourcing companies of the USA Uber and Lyft are using AI for urban transportation. Uber and Lyft carrying millions of passengers in every day, use AI technologies for intelligent transportation. "One Click Chat", a mobile feature developed in Uber Chat which is a way of providing communication between the passenger and the driver. This communication is provided by Uber's back-end service and

machine learning platform, Michelangelo, using natural language processing (NLP). In this way, estimated situations are created for the possible target.

This study concerns with the AI and public policies of governments on AI. It is important to conduct an in-depth study of this area, which will shape the countries' policies in all economic, social, cultural, and political aspects. Based on the idea that the policies implemented in a country influence the whole world with the domino effect, considering the policies implemented by the countries. In this study, comparison and evaluation between the leading the USA and China in terms of AI policies is of great importance as it can guide all countries in the analysis of policies applied in this field.

Public policy studies are especially important in terms of understanding and explaining the causes and consequences of the decisions taken by the countries about the societies. It is generally accepted that political science and public administrative should emphasize public policy studies, in particular (i) to develop scientific understanding, (ii) to facilitate problem solving, and (iii) to make more realistic recommendations on policies (Demir, 2011: 110). Public policy studies will help to gain knowledge about what socioeconomic forces and political system features shape the content of policies, the effects of public policies on society and the political system, to find solutions to the problems encountered in practice, and on the facts to solve the problems faced by society. It also plays an important role in explaining which policies will best serve these purposes if they have specific goals.

The introduction chapter covers the following main subtitles of background, purpose and scope of the thesis, research question of the thesis, study plan of the thesis, and methodology.

1.1. Background

AI is a developing field that involves the studies to create intelligent computer programs in a way like human intelligence. With the development of AI technologies enterprises increase their investments day by day in this field. 2019 is the biggest year in funding for AI initiatives yet. The USA and China emerge as the two leading world powers in the field of AI. They are world leaders in AI R&D. It is seen that at the 2017 AAAI Conference, one of the important conferences in the field of AI research, 34% of the papers presented belongs to the USA and 23% to China (Transfer: Zhang, Dafoe, 2019: 26). The quarter of 2019 saw a total investment of the USA $7.4 billion in AI startups, largely going to transportation and healthcare companies (Kumar, 2019).

We can say there is huge information for AI in private sector but, there is insufficient resources for AI in public sector. Governments make public policies for preventing problems in the society and to satisfy the needs of the citizens. Especially, public policies on AI is an area where studies are quite lacking.

This study will be beneficial both the AI field and the public policy field. It is an important study because of using comparative method. This will be a comparative public policy study and, as Jreisat (2011: 113) said: “Cross-country comparative policy analysis expanded the knowledge base about the world and provides choosing better policies.” It is a fact that different countries adopt different, alternative strategies on a common issue. Based on the idea that problems, policies, and events in a country affect other countries, the comparison between the leading countries in terms of AI policies in this study has an importance to guide other countries in this regard.

The USA is a highly significant country with investments in industries that are the world's largest technology businesses such as Apple, Amazon, Facebook, Microsoft, and Alphabet which have a total market value of over $ 3 trillion. American policy makers are trying to find industry experts to play an important role in forming the policy process environment of the future. Lawmakers are establishing formal channels of communication between innovators and the final decision makers. For example, last year two lawmakers of the USA who are John Delaney (D-MD) and Pete Olson (RTX) founded the Artificial Intelligence Caucus (FTI Consulting Inc, 2018: 3). Main purpose of this caucus is to provide better dialogue between the industry professionals and policymakers with collective working to perform technology secured and more sustainable. There is an act which named as

Fundamentally Understanding the Usability and Realistic Evolution of Artificial Intelligence Act of 2017, or the "Future of Artificial Intelligence Act".

Currently, China is on the agenda with the steps taken in the field of AI. The People's Republic of China (PRC) has the important place for development AI policies in China. The country is consistently getting power with the current leader and plans to transform the world's "Premier AI Innovation Center" by 2030 (Fischer, 2018: 1). China demonstrates that it is one of the fastest digitalizing countries in the world by making use of the most up-to-date technology in every field. According to data from Statista (2020): "Almost 4.57 billion people were active internet users as of July 2020, encompassing 59 percent of the global population. China, India, and the United States rank ahead all other countries in terms of internet users."

According to State Council of PRC (2020): "China had 1.319 billion mobile internet users by the end of 2019, accounting for 32.17 percent of the world's total, according to a report on China's internet development. The country's e-commerce industry saw a transaction volume of 34.81 trillion yuan (about $4.97 trillion) last year, ranking first in the world, said the report, released on July 23 at the online opening ceremony of the 19th China Internet Conference. Online payment transactions amounted to 249.88 trillion yuan in China in 2019, and the added value of the digital economy stood at 35.8 trillion yuan, ranking second in the world, said the report. Miao Wei, minister of industry and information technology, said at the ceremony that China will accelerate the building of new infrastructure such as 5G, and promote the innovative and integrated application of technologies, including cloud computing, big data, and artificial intelligence (AI). More than 30 online forums on 5G, AI, industrial internet, and blockchains are set to be held during the three-day virtual conference." In July 2017, the PRC's State Council executed the AI strategy plan which is an extensive, all-of-nation strategy to progress the development of AI in China in three major steps: catching up with the West by 2020, overtaking it by 2025, and becoming the global leader by 2030 (Fischer, 2018: 2). AI is in the public life of China, particularly in public safety. AI provide service in this sector for example, by helping the police solve criminal cases faster.

1.2. Purpose and Scope of the Thesis

This study addresses AI within the framework of public policy analysis approaches. It was designed to evaluate the AI policies and national strategies of the United States and China, which are two major countries in the field of AI. Firstly, the thesis aims to do literature review on AI and public policy and gather information about the public policies on AI and understanding the development process, origins, principles, and the main actors of AI public policies. To understand what accounts for adopting AI policies by governments is the main purpose of this study. This question has been explained by using China and the USA country case studies.

Public policy is an important term which should be need a better understanding for the science of public administration and political science. After a better understanding of these questions: “What is public policy?” “What are the features of public policies?” and “What are the actors which have a significant role in public policy process?”, we can also be competent about public policies of AI. For this purpose, a conceptual framework will be formed about the concepts of public policy and AI, then information will be gathered in the light of previous literature and researches about public policies on AI.

For this purpose, official documents (strategy and action documents, development plans, legal documents, and reports) determining and specifying the AI policies of the United States and China were examined by comparative method. After that, comparative framework was developed to compare both countries with public policy processes model and content analysis. With this comparative analysis, the study aims to contribute public policies on AI.

The scope of this study is a case study which will be an in-depth study of the public policies on AI of two countries. Benefiting from the previous literature and researches, comparative framework will be developed to compare two countries public policies on AI. When analyzing countries based on the comparing policies there will be taken advantage of the policy process model it may be summarized in two propositions:

First, that the style of policy making and the nature of policy conflicts will vary significantly from sector to sector and from country to country. And second, that policy making will exhibit either strong similarities or differences depending on national context.

1.3. Research Question of the Thesis

This thesis seeks explanations for the questions of "what accounts for adopting AI policies?". Following sub questions are expected to help in explaining main research question; (1) Do AI policies differ across countries?, (2) What are the main public policy areas on AI of the USA and China?, (3) What are the main policy actors in the U.S. and Chinese AI policies? (4) What are the differences and similarities between the American and Chinese governments' public policies on AI?

The main question of this thesis is explaining the factors which provide to adopt AI policies by countries. Many driving forces can be considered among countries' goal of adopting and applying AI policies. It can be said that the main driving forces in the adoption of public policies for AI are to solve major social problems and promote economic progress (Intel, 2017: 1). The thoughts of, to have a significant impact on the development of countries in many respects, to cause significant developments in the public service and to be a determining factor in the competition between countries play a part under the general adoption factors of AI policies. AI, which is a new and developing area in the context of public policy, is a step that can lead to significant developments in public policy environment. To supervise the decision makers and regulators of public policies on AI is important for the society to rely on AI. Sectoral collaborations are important to examine problems related to policies and to develop specific solutions. For example, this can be achieved through groups such as Artificial Intelligence Partnership (Intel, 2017: 1).

When the AI policies of the countries are examined, it can be said that the primary objectives of these countries are the targets of being the leading power in the field of AI. However, considering that public policies are based on action and problem-solving and implementation-oriented, countries may have different reasons for applying these policies. One of the sub-problems of this study is to determine whether different governments apply different public policies or the same policies, by defining public policy from the definition of Dye (2013: 3), which is things that governments choose to do or not to do. In the past, like the US and Soviet Union's space race, AI policies of states have led to new digital borders between countries. Parallel to the fact that AI is primarily determinant in different sectors, especially in defense and economy, countries are already implemented policies that determine their strategies in this area. China, the United States and Russia, which have carried out significant work on AI and expected to contribute more than $15 trillion to the

global economy in 2030, are trying to identify their strategies to develop their policies and define the future (Tunçsiper, 2017:1).

There is intense competition between the USA and China in the context of public policies on the field of AI. The Obama administration which believes that the developments related to AI is mostly carried out by the private sector, has published two reports on its plans for the future of AI. It is an important turning point of public policies in the field of AI in United States of America. The report, which was published on November 12, 2016, emphasized the importance of developments in AI technology to create new markets and new opportunities for development in critical areas such as health, education, energy, and environment. The report also provides recommendations for specific actions by Federal agencies and other actors. (Executive Office of the President NSTC Committee on Technology, 2016). In this report, firstly the research information related to AI was presented and the actors who could play a role in the development of AI were evaluated, the impact of AI in different systems and sectors was mentioned and, at the end of the report, twenty- three policy advices for the USA were given.

The second report is Artificial Intelligence, Automation, and the Economy which was published in December 2016 by Executive Office of the President. In addition to the previous report, this report also explores the impact of AI-driven automation on the U.S. labor market and economy and outlined proposed policy responses (Executive Office of the President, 2016). After these reports the USA government required the Secretary of Commerce to establish the Federal Advisory Committee on the Development and Implementation of AI, and for other purposes. The name of this act is the "Fundamentally Understanding the Usability and Realistic Evolution of Artificial Intelligence Act of 2017" or the "FUTURE of Artificial Intelligence Act of 2017" (section 1). This law is an important example for the public policies on AI of the USA because it contains important issues about how to follow the AI policies.

China, which is competing with the U.S. on public policy on public intelligence presented the Next Generation Artificial Intelligence Development Plan (AI Plan) in July 2017. With this plan, which was prepared by the Chinese State Council, The People's Republic of China has set up a high-level design plan that determines the country's approach to developing AI technology and applications by setting broad goals. This policy outlines China's strategy of creating a domestic AI industry worth around $ 150 billion over the next few years and its goal of to be the leader AI power in 2030 (Future of Life Institute, 2018).

According to the USA-China Economic and Security Review Commission' reviews, the USA continues to be the leader in the amount of funds provided, the number of AI firms and the number of patents offered (Fischer, 2018: 4). Although the achievements of the USA, China's forward-looking goals and strategies in the issue of AI with in the local and national level, is an indication that China will continue to be an especially important competitor to the USA. In recent years, it has been seen that the USA is fall behind in strategy implementation at government level, and this is a sign that the USA is lagging behind in the new steps towards AI public policies.

Countries adopt different tactics and strategies in the implementation and decision-making processes of public policies. Therefore, in this study, all these criteria will be developed, and an evaluation will be made while examining the public policies of the USA and China in the field of AI.

1.4. Study Plan of the Thesis

The study consists of five chapter and conlusion part. The first introductory chapter of this study was created in accordance with the subtitles of background, purpose and scope of the thesis, research question of the thesis, study plan of the thesis, and methodology. Second chapter consists of the literature review on definition of AI and, public policy, types and actors of public poliy and relation with AI, and public policy analysis. In chapters three and four, first of all, the AI strategies and policies of the United States of America, and the Chinese Government's AI strategies and public policies were evaluated by examining national strategy documents, reports, laws and regulations.

In the fifth part of the study, there is a qualitative research which made by using content analysis technique and policy process analysis. In this context, National AI strategy documents of the USA and China has been analyzed on the basis of dual case model via MAXQDA 2020. With this regard, public policy process of both countries has been examined through process analysis model, which composed a comprehensive conclusion at the end. Concluding chapter covers to explain and summarize the whole chapters, and there have been developed policy recommendations for other countries.

1.5. Methodology

The research methodology comprised of the secondary research involves data collection from well-attested public data sources involved government sites, strategic documents of governments, articles, press releases, journals, white papers, and research publications. This study is a qualitative research which uses dual case analysis for national AI documents of the selected countries of the USA and China.

The USA and China were selected as a case study in the thesis since they are leading countries in AI. Examining the process and application areas of AI in public policy of both countries will make a significant contribution to the literature of AI public policies. It is also important to examine examples of public policies on AI, to provide information that will benefit all public policy decision makers of the countries in the world.

In the comparison of the AI public policies of the USA and China, the latest updated national AI strategic documents of both countries were examined with Dual Case Analyses using the MAXQDA 2020 program. With this analysis, the current strategy documents of both countries were coded, and the priority policy areas and AI strategic goals were determined.

2. CONCEPTUAL FRAMEWORK: ARTIFICIAL INTELLIGENCE, PUBLIC POLICY, PUBLIC POLICY ANALYSES

The field of research that scientists have done with the idea of creating computer systems with mental and emotional abilities, such as the human brain, is defined as AI today. Although it is not possible to make an exact definition of this concept which arises from the idea that the existing features in the human brain can be adapted to computers by artificial simulations, the definitions of the concept which are existed in the literature, will be covered in this section.

There is expanding interest of governments on AI technologies and applications. This transformative and developing technology has the potential to substantially change societies and how public institutions operate. Many countries in the world, started to adopt AI policies. The concept of public policy which covers all actions and operations of states in the field of public and political affairs, by related public authority or officer who is competent in any matter, will be dealt with as an important concept to be discussed in this part of the study. As a result, in this section there will be conceptual explanations about AI public policies which governments do or may do.

2.1. Fundamental Concepts and Approaches of Artificial Intelligence and Public Policy in The Framework

In this section, which is an introduction to the study, firstly, AI, public policy and public policy analysis, which are the basic concepts that make up the study, are emphasized and these concepts are discussed within the framework of the relevant approaches. Then, types and technologies of AI, types and actors of public policy are examined. At the end of the section, the policy process analysis model, which is one of the public policy analysis methods, was examined and evaluated for use in the study.

2.2. Definition of Artificial Intelligence

There are many AI definitions in the literature. The Oxford defines AI as “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages”. In 1956, Dartmouth Conference which is the first conference on intelligent behavior in machines led by Minsky, McCarthy, Rochester and Shannon was held and, the concept of AI was first used by McCarthy in 1956 (Smith, 2006: 4). Other names in the conference are the founders of the concept; McCulloch, More, Samuel, Selfridge, Solomonoff, Widrow, Newell and Simon (Boden 1996: 142). Although the concept was first used in this conference, the idea of creating machines which were capable of thinking emerged long before this concept took place in the literature. At the stage of the emergence of the concept, firstly, it was observed that computer programs could perform mathematical operations. This situation revealed that the idea of thinking, which is another function of the human mind, can be done by machines.

Turing who is an English mathematician, computer scientist, had been recognized with his keen interest in thinking that there might be machines that could think like human beings; he described a machine called "Turing Machine" in an article (Turing, 1936: 241). In 1950, Turing published a book titled "Computing Machinery and Intelligence", which opened the doors to the so-called "Artificial Intelligence". After this book, he started with a simple question which is "Can machines think?" and, Turing proposed a method known as Turing's test to show that machines could think (McGuire, 2006: 5). In 1951, Turing's test was applied for the first time after 40 years. This test, which has emerged to show that a computer can think indistinguishably from an intelligent human movement and cause various discussions, has an important place in the history of AI.

AI is a concept that information about it should be updated continuously and, can be explained with new definitions every day. It will be an important step to evaluate different definitions in terms of understanding the concept better. Barr and Feigenbaum have described AI as a sub-branch of computer science for interested in designing intelligent computer systems (Cited in Jacob et all 1988: 24). They have stated that those systems have characteristics that resemble human intelligence as language understanding, learning, interpretation, problem solving etc. Dilworth (1988: 23), on the other hand, has defined the

term as an umbrella term for describing advanced computer technologies that try to imitate the human mind and emphasized that these technologies are key to increasing productivity.

Describing the concept as a branch of computer science, Clocksin (2003: 1721,1722) describes how to equip machines with reasoning and sensing abilities in two ways: practical and theoretical, and explains these two methods: 1- Applied; to create systems that can perform the tasks that require intelligence if carried out by a human being, 2- Theoretical; to look for a scientific explanation of the underlying principles of intelligent behavior as seen in humans and other animals. Herbert Simon, who contributed to many fields such as economics, psychology, cognitive science, decision theory and organization theory, he has focused on synthesizing artificial things within the concept of artificial world, sometimes by common sense, sometimes with no sense of common sense by people in his work on a AI (Baber, 1988: 330). In the Center for Public Impact's report, AI is defined as software that develops and automates information-based work carried out by people (Centre for Public Impact, 2017). It is emphasized that this new field takes a permanent root beyond the science laboratory as a rapidly expanding technological research area by utilizing different fields such as computer science, cognitive psychology, philosophy and neurology. AI is the general concept of autonomous calculating machines. Different types of machine learning and architectural structures are included in the concept of AI (Frey & Osborne 2017: 255).

OECD defines the concept: "A machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. AI systems are designed to operate with varying levels of autonomy. In addition, AI are "machines performing human-like cognitive functions" (OECD, 2019: 12).

From those definitions, AI, which can be defined as creating machines, computers, software, programs, robots with a certain intelligence, is an attempt to reveal a mind similar to their mind structures by examining people's own mind structures, way of working and characteristics. It can be said that this process can occur in the form of a computer, a computer-controlled robot or a cleverly designed software, capable of thinking, speaking, understanding concepts and sentences, as well as problem-solving skills as much as possible. This concept refers to an area that can be embodied by how the human mind works, as a basis for developing intelligent software and computer systems, as a result of which people study, decide and follow a way to solve a problem.

2.3.Types of AI

With the increase of computer and programming power in many areas, AI is developing with new types day by day. Considered the advances in AI, four types of AI can be identified: reactive machines, limited memory, theory of mind and self-awareness (Hintze, 2016).

2.3.1. Type I: Reactive Machines

Unlike advanced AI systems, reactive machines, the most basic type of AI, do not have the ability to create any memories and to recognize their past experiences. The best example to this type of machine is "Deep Blue" which was developed by IBM in the 1990s. Grandmaster G. Kasparov was sustained a defeat by Deep Blue which is a chess program (Gimbel, 1998:145). After the defeat, Kasparov (1997) mentioned the long-term decisions of the machine that brought the results related to the positions and machine's acting by recognizing the danger just like human beings. This type of AI directly perceives the world and acts on what it sees. This is not based on an inner concept of the world. Another example of these machines that are specialized only in a specific area is Google' s AlphaGo which is the first computer program to defeat a professional human Go player and a Go world champion in 2015 (Hintze, 2016). This AI program is more improved than Deep Blue because of using neural networks.

2.3.2. Type II: Limited Memory

This type of AI is seen in the examples of autonomous cars and Chatbots, consists of machines with limited experience and remember some objects which were introduced to them (Hintze, 2016). In the case of self-driving cars, cars can observe the speed and direction of other cars, and these observations are added to their pre-programmed representations, including other important elements, such as self-driving cars, lane lines, traffic lights and road curves. However, the experiences of those machines are temporary. With such an AI program developed by Mitsubishi Electric, autonomous cars can calculate duties in a much shorter time thanks to the filtering technology that only looks at the information required for certain types of analysis (Matthews, 2017).

2.3.3. Type III: Theory of Mind

This kind of AI, which is much closer to understanding human mind and behavior, consists of the idea that all entities and objects in the world can have thoughts and emotions that affect their own behaviors like human (Hintze, 2016). In fact, this type of AI is focused on thinking like a human being, so it is the closest type for reaching to the goal of AI exactly. This type of AI which can be seen in the fictions of the movies for now, helps to envision the intelligent machines of the future.

2.3.4. Type IV: Self-Awareness

The final type of AI is self-representing and conscious machines. Self-awareness belongs to only conscious presences; they can know their own emotions and can predict others' feelings. The idea of totally solving the human mind and inventing machines like this mind is the product of this kind of AI. The self-knowing AI is an ongoing phase of AI theory. What is meant here is that the machines can benefit from human cues and can also react on one's own (Matthews, 2017). An example of this type of AI is the robot called "Ava" in one of the science fictions films "Ex Machina". A young programmer is chosen to join in a ground-breaking experiment in AI by benefit from the human qualities of a highly developed humanoid A.I (IMDP, 2015).

2.4. Primary Tools of AI

The basic technologies forming AI types can be examined under six headings. These are machine learning, artificial neural networks, computer vision, speech recognition, natural language processing, and robotics.

2.4.1. Machine Learning

Machine learning is a type of AI that allows a machine which learn to do it all by itself. The most important reason why machine learning is referred to as a type of AI is that machines can present learning ability. A. Samuel who was one of the pioneers in AI field and, he was also interested with the machine learning studies. His important works were the making computers learn their experiences. His instrument for this job was the checkers game (McCarthy and Feigenbaum, 1990:10). He defined Machine Learning as a large AI sub-domain dealing with the field of work that gives computers the ability to learn without being explicitly programmed.

The important function of machine learning is specifying models in very large amounts of data (Accenture, 2018:13). The ability of machine learning at the center of AI systems to acquire information from raw data reinforces the visible indicators of AI, which are becoming more common today. With the developments in the field of AI, the use of machine learning increases. We are confronted with machine learning in every aspect of modern life. For example, with big data and machine learning, Netflix knows what movies people like to watch, and Google can make a lot of predictions about people's interests based on search histories. Indeed, Google has recently begun to replace most of the existing non-machine learning technology with machine learning algorithms, and it is thought that these techniques may provide similar improvements in many sectors (Beam and Kohane, 2018:1).

2.4.2. Artificial Neural Networks

According to Russell and Norwig (2010: 728), a neural network is just a collection of units connected to each other; the features of the network are identified by its topology and the features of the “neurons.” On the other hand, researchers in the field of AI are interested in more abstract features of neural networks, such as distributed computing, tolerant noisy inputs, and learning abilities. As a result of research on cognitive ability and machine design, AI has been developed as a combination of neural networks (Kutsurelis, 1998: 5,6).

Artificial Neural Networks are the computer systems that perform the learning function which is the most basic feature of human brain with the help of examples. Especially, “artificial neural networks in classification, pattern recognition, signal filtering, data compression and optimization studies” are the most powerful techniques. In many areas such as data mining, optical character transport, optimum route determination, fingerprint recognition, material analysis, work scheduling and quality control, medical analysis, it is possible to see successful examples in our daily lives (Öztemel, 2012:15).

2.4.3. Computer Vision

Computer vision is a wide and varied area of AI dealing with problems of processing and interpreting images of events (Eric and Grimson, 1993: 9791). According to F.F. Li, computer vision is defined as “a subset of mainstream AI that deals with the science of making computers or machines visually enabled, i.e., they can analyze and understand an image.” (Li, 2015). The visual function of the computer vision is, machines' learning to see just like people; naming of objects, identification of people, understanding relationships, emotions, events and violence. For example, computer vision is used in an application of the Pinterest social network that offers new ideas for people, the name of this application is Lens. As a result of holding the camera to any visible object, the application offers many new ideas. Social media platforms, consumer offerings, law enforcement, industrial production, unmanned vehicles, personalization, interfaces, household appliances and cameras are just a few of the ways in which computer vision can improve the quality of life (Mathur, 2018).

2.4.4. Speech Recognition

Speech recognition is a type of AI software that helps people to interact with their computers and other mobile devices (Metcalf and Petro, 2014: 50). It is a software system that is designed to take inputs of human speech, interpret and convert them into text. There are four favorites in the AI assistant space for speech recognition: Amazon (Alexa), Apple (Siri), Google (Google Assistant) and Microsoft (Cortana). Apple's Siri was the first audio assistant created by major technology companies in 2011(Goel, 2018). In Siri, Speech Recognition works by transforming a human speech into a textual form. For example, when you start Siri by saying, "Hey Siri," Apple's powerful speech recognition system comes into

play and converts your voice to the corresponding text format - "Hey Siri". Recently, significant results have been obtained in recognition of speech through deep learning. Thanks to these developments, the word error rate of speech recognition engines fell below 10%. Strong hardware utilizing speech recognition algorithms that can be trained on datasets has a large share on those developments.

2.4.5. Natural Language Processing

Natural language processing (NLP) is “the product of mathematical and computer modeling of various aspects of language and the development of a wide range of systems” (Joshi, 1991: 1242). It is usually conducted by AI techniques planned to automate the learning process, it uses computers to manage nonconstructive data (i.e., narrative text or speech data) in the case of a certain mission (Wong, et all, 2018:822). With NLP, AI can understand the meaning of natural languages and answer simple questions, as well as understand the meaning of words in context. These systems include systems for speech recognition, language understanding and language production. This kind of systems supply an interface to databases and knowledge bases such as airline information and reservation systems, expert systems for programming, planning, and repairing. Rapid diagnosis in hospitals is an example of the use of these systems. For example, NLP software has been seen to help identify and analyze data in clinical decision making for cancer imaging and reviews. (Seligman, 2018: 37). With this kind of software, many disease risks can be determined more effectively, unnecessary procedures are used less and early diagnosis and faster treatment can be provided.

2.4.6. Robotics

Industry 4.0 is an important term for better understanding of the robotics technologies of today. It took place in recent industry with the support of the German Federal Government for the first time in 2011, was supported by important countries and caused them to plan their future targets in line with industry 4.0 (Vaidya et all, 2018: 234). It consists of systems like integrate computation, networking, physical processes and include a numerous technology that span mobile devices, the Internet of Things (IoT), AI, robotics, cyber security, and 3D printing (Piccarozzi et all, 2018: 1,2). Robots are type of AI that act rationally, can evaluate any situation and make decisions about this situation, in short can be defined as machines that perform physical activities.

Nowadays, robot technology is developing and the number of robots, which are tried to be made like human characteristics, is increasing day by day. The most important issue in this area is the idea of robots cannot be distinguished from humans in the future, and the danger and risks that this may cause are. Sophia, the most advanced AI robot in the world, was produced by Hanson Robotics (Hanson Robotics, 2017). Sophia, with its incredible human likeness, expressive power and remarkable story, which can be a fascinating front page technology, is a genius developing AI. Sophia who has owned citizenship by Saudi Arabia, sets light to the developments which could realize in this area in the future.

2.5. Definition of Public Policy

There are different views on the time of emergence of policy studies, according to Birkland, the classical literature began with the invitation of H. Lasswell's (1902-1978) to develop a specific political science and, is about fifty years old (Birkland, 2011: 7). Lasswell is an important person in academic policy analysis and, is the founder of the "policy sciences" ideal (Turnbull, 2008: 73). He defined public policy as "a projected program of goals, values, and practices." (Transferred; Huang, 2002:275-276). As it can be understood from the definition, public policy is a whole formed by a combination of many parts. All parts are important to form this whole. This whole includes instructions, decisions, laws, regulations, and other symbolic systems which are constituted by government.

Dye (1972:1) defined public policy as “whatever governments choose to do or not to do”. It can be said that the most general definition of public policy is made by Dye. While this definition causes to understand lots of thing about the concept, it is also insufficient to be able to understand the concept deeply. Because this definition can cause all actions taken by governments to be evaluated as public policy (Çevik, 1998: 104). According to Dye, public policies are about what governments do, why they do it and what difference it makes (Dye, 2004: 1). Public policy analysis is carried out in order to define the policies that governments decide, to learn the causes of these policies and to determine the effects and consequences of the policies (Dye, 2004: 5). The main task of the governments, which are officially coming to power for carry out the administration, is to act in line with demands of citizens and to maintain order within the society. One of the main outcomes of this primary goal is public policy (Yıldız and Sobacı, 2013: 17).

Anderson (1990: 3), who evaluates public policy together with public institutions and organizations, defines public policy "as an entire of purposeful movements that a number of organizations or individuals follow to solve a problem." According to Anderson, public polices developed by governmental bodies, officials, nongovernmental actors and factors. After that definition, Anderson again defined the concept in his other book as the whole activities or inaction of an actor or a group of actors' conducting related for a determined problem (Anderson, 1994: 5). In this definition, Anderson mentions the inactivity situation of governments which was seen in the definition of Dye.

Public policies include a diversity because of meeting needs of the society and, coming to existence with the developments. Public policy is developed and implemented by various actors or individuals in many areas, education, health, transportation, technology, housing, national defense, foreign policy, foreign trade, tax policies, social security, justice etc. As stated by Frohock (1979:11-15), public policy can be regulator, dispersive, shaping ethical issues and encouraging production. Another definition of concept is made by R. Eyestone who defined public policy as the relationship between government bodies and their environment, he was influenced by the ecological management science (Huang, 2002: 276).

Many public policy definitions can be listed but public policy is an intuitive concept which is hard to define precisely (Smith and Larimer, 2009: 3). Although this situation, public policy has many characteristics that make up these definitions. It can be said that governments are the focal point of the public policy, decision making and policy implementation process regarding the needs of the society with the help of various actors (Stewart et all, 2008: 6). Public policy is done by public authorities; it contains of models of activities taken over time; is the result of a request for action opposite the government in response to pressure on a perceived issue and, it can be positive or negative. (Smith and Larimer, 2009: 3-4).

Based on all definitions made by the authors, public policy is an important term and, has different descriptions with its different kinds of features. The concept itself contains the word "public" and public means that the part of human activity which the society and/or the state should take responsibility or regulate it. Public policy is the process which the decision-makers and the influencers' making necessary decisions, implementing and evaluating them for to produce solutions to the social problems and needs. Decision-makers and influencers to the decisions are the government in power in a state, the various actors that forms the government, and the different groups that influence these actors.

2.6. Types of Public Policy

The initial efforts to classify public policies have driven from a subject-based approach. For example, foreign policy, education policy, health policy, transportation policy etc. However, Birkland (2011: 210) argues that such a simple classification has made it difficult to generalize different types of policy. Contemporary approaches to developing a classification of public policies began in 1964 with Lowi. He studies on the relationship between politics and government policies and explains it with the following argument: “policies determine politics”. Lowi (1964: 689) mentions about three major categories of public policies: distribution, regulation, and redistribution. **Distributive policies**: to distribute a goods, interest, or benefit to certain segments of society. Those are the policies that cause the least political conflict, and the most important tool of them is the budget drafts in the budget process. **Regulatory policies:** to aim to manage the functioning of the private sector and consists of competitive regulatory policy and protective regulatory policy.

Redistributive policy, which lead to intense political conflict, provide with advantages to a group while the other group has particularly important costs. These policies comprise classic social welfare policies and policies on political and social rights and freedoms.

Some authors criticize or add something new to the Lowi's typologies in the literature. Steinberger (1980: 186) argues that policy analysis continues its noncumulative criterion, he speaks about an analyzer need to choose any type of policy, but the uncertainty of the criteria for selecting a policy. Steinberger thinks that the meaning of a specific policy should be formed by the various participants in the policy process. The importance of the classification of policy is uncertain and dependent various interpretations and disagreements. Steinberger presents a phenomenological approach to policy analysis and, criticizes Lowi's three types of policy classifications while focusing on the uncertainty characters and understanding of policies as different from various perspective. Anderson (1997: 267) claims that Lowi's typologies can be visualized as relations between power, action, and outcomes, and that "suasion techniques" must be considered. He defines suasion as a moderate form of power which is a modern and persuasive, based on the ability of the state to force and convince individuals to complete certain requests.

2.7. Actors of Public Policy and Relation with AI

While examining public policy from past to present, the behavior of the actors in the institutions and interaction between institutions continues to be examined. The definition of institutions does not always stay the same, it undergoes changes. As B. D. Wood said that, "a series of studies [has examined] the presidency, the Congress, and the courts to make clear that institutions do make a difference when explaining public policy outcomes." (Transferred; Birkland, 2011: 93). Birkland (2011: 93) states that there are two types of participant categories in policy making and they are: official actors and unofficial actors. However, Yıldız and Sobacı (2013: 19) added another category: international actors. In this study, actors that are effective in making policy are examined under three headings: official actors, unofficial actors and international actors. Government actors contain elected and appointed officials and civil servants at the national and subnational levels. Nongovernmental actors include political parties, interest groups, foundations and think tanks, and the mass media (Vergari, 2015).

2.7.1. Official Actors and AI

There is no doubt that the official actors are the legislative, executive, and judicial branches specified in the constitution. The reason why official actors are involved in public policies is that their responsibilities are approved by laws or by the constitution. Therefore, they have the power to make and implement policies (Birkland, 2011: 93). According to Yıldız and Sobacı (2013: 20), official actors in public policies are parliament, public administration (authors mentions about bureaucracy in there) and independent courts.

Official policy actors play a significant role for AI policies. Official policy actors that play a role in the enactment of a policy are also at the forefront of the enactment of AI policies. Among the official policy actors, the decisive actor in AI policies are the parliaments.

2.7.1.1. Parliament

Parliaments consisting of elected representatives are the most important actors of the public policy process. In these democratic platforms, all kinds of issues in the country are discussed, and a consensus is sought between different ideas and different needs of the society. The fact that parliament is one of the actors at the center of public policy process originated from its power to exercise its sovereignty on behalf of the people (Yıldız and Sobacı, 2013: 20). The role of parliament in the public policy process is to establish the legal framework of all programs and projects related to policies as a legislative body.

For example, the responsible legislative bodies of the USA are Senate and House of Representatives. Dove (1997) mentioned that "A bill is a legislative proposal of a general nature. Senate and House bills and joint resolutions, when passed by both Houses in identical form and confirmed by the President, become public or private law–public laws affect the Nation as a whole; private laws benefit only an individual or a class thereof." For this reason, the parliament, which is one of the official policy actors in many countries, as seen in the USA, has an important role in the emergence and enactment of AI policies.

2.7.1.2. Public Administration (Bureaucracy)

The bureaucracy, which means the fulfillment of public services by specialized officials, is an important actor in determining and implementing public policies. In the determination of public policies discussed by the politicians in the parliament is benefited from the expertise and professionalism of the bureaucracy (Göküş, 2000: 37-38). The public policy process can provide much more useful results with the joint effort of bureaucrats and politicians who have different skills and priorities but whose final goals are similar (Bhat and Sharma, 2016: 5). According to Bhat and Sharma (2016: 6), the traditional policy role for the civil service is to give advice to political leaders, but they said, this role is changing and, bureaucrats have an impact on public policies with different contributions like: permanency of bureaucrats rather than politicians, adopting rational approach in policy making and, bureaucracy as a key for improving policy management skills. The main point here is that the process of implementing public policy causes the bureaucracy to become a mandatory actor for public policies (Yıldız and Sobacı, 2013: 20).

2.7.1.3. Independent Courts

The basic principle of a state of law, the obligation of the legislative and executive bodies to act in accordance with the rules of law, makes the independent courts a decisive actor in policy making and implementation. As stated by Birkland, the jurisdiction allows the courts to say the last word in terms of the applicability of the laws (Transferred; Yıldız and Sobacı, 2013: 20). Therefore, it can be said that the legislators and administrators started public policy and the courts reacted to the practical effects of these policies (Birkland, 2011: 122).

2.7.2. Unofficial Actors and AI

Unofficial actors are actors who do not take any power from the law or the constitution but have a significant impact on public policies. They are as decisive and influential as the official actors. Therefore, interest groups are engaged in public policies, not because they are approved by law, but because they are an effective way for many people to express their policy demands collectively (Birkland, 2011: 93).

2.7.2.1. Citizens

Public policies are made in accordance with the needs and preferences of citizens. Citizens are reason for being of the state and public administration in democratic political regimes (Yıldız, Sobacı, 2013: 21). In line with changing needs, governments are exploring alternative participation mechanisms that will enable and encourage citizens to participate in decision-making and policy-making processes. Technologic developments facilitate governments to realizing those aims.

As in every public policy, the first goal in the emergence of AI public policies is to put forward policies in line with the needs and preferences of citizens. Public policies have been made in sectors such as transportation, health, education and agriculture primarily include regulations for the needs of citizens.

2.7.2.2. Policy Entrepreneurs

Policy entrepreneurs are people who starts policy alterations (Mintrom, 1997: 739) and are public policy actors who develop, promote and support policy ideas (Yıldız and Sobacı, 2013: 21). These actors, who play a key role in defining policy problems, use various activities to support their ideas, such as networking in policy cycles, shaping the conditions for political debates and building coalitions (Mintrom, 1997: 739).

2.7.2.3. Political Parties

Political parties are the important actors for public policy. They are perpetual and steady political communities who determine the policies in line with the needs and desires of the people and transfer them to the political system.

Political parties' ideas and strategic goals are often decisive for AI public policy. Especially the ruling party, that is the government party, are amazingly effective actors in the emergence of these policies. For example, looking at the national AI document of the People's Republic of China, the importance of the principles determined by the political party in the based on AI is mentioned in the document.

2.7.2.4. Pressure Groups

The pressure groups are organizations that try to ensure the realization of the interests of certain parts by influencing the results of the public policy process and policies (Yıldız and Sobacı, 2013: 21). The most important objective of the interest groups is to influence the political process to protect and expand their common interests. For example, they try to put pressure on the actors such as government, parliament, members of judicial bodies and bureaucrats in the political decision-making process with their lobbying activities (Aktan et all, 2007: 215-216).

2.7.2.5. Advisors

With the rise of the New Public Management, policymakers start to act for bringing consultants from the private sector for reform in management and bureaucracy (Saint-Martin, 1998: 319). Looking at the literature, many authors agree on this argument. These actors, who convey their knowledge and skills in the private sector as advisors to decision-makers, are highly influential in decision making in public policy. The suggestions of these counselors to the political leaders are not independent of the values and beliefs of their consultant firms or of the international organizations (Yıldız and Sobacı, 2013: 22).

2.7.2.6. Think Tanks

Think Tanks are the thought production institutions. Rich (2004: 11) defined think tanks as "independent, non-interested based, non-profit organizations that produce and principally rely on expertise and ideas to obtain support to influence the policy making process." They are non-profit organizations that referenced to execute and radiate research and ideas on public policy. Those institutions born in the USA in the first few decades of the 20th century. According to the last census, the USA has close to 2000 think tanks. American think tanks are frequently examining solutions to diverse problems of the world and then discussing, advocating, and lobbying for policy changes at local, state and federal levels (Chance, 2016: 4).

Think tanks are public policy research institutes that want to play a key role in making and influencing global, regional, and national policies. While each think tank serves a certain goal, they all share a common vision to develop their respective spectrums, as well as being sources of new ideas and research.

2.7.2.7. Press Broadcasting Organizations (Media)

Thanks to the developing technology, the communication power of the media is increasing day by day. With many social media networks (Twitter, Facebook etc.), it became easier for the public to be aware of the policies and programs of the government. While it was ensured that the television and newspapers informed the public in past, the transmission and propagation speed of the news increased with the technology. Thus, the media is considered as an unofficial actor, which is more interested of the public preferences and demands in public policy process.

2.7.3. International Actors and AI

The last group of actors who are influential in the creation and implementation of public policies are international actors. International actors are influential on the powerful states or international institutions and organizations, because of the globalization's effects. In the literature on public policy, international actors are not included. This is mainly since the USA, UK, Germany, and other developed countries, which produce the relevant literature, generally direct international organizations and therefore the developing countries rather than the developed countries are more affected by these institutions.

International actors play a role in all areas, from socially qualified public policies to economic policies, from foreign policy to security policies. With the increase in globalization, solidarity and cooperation between countries and the increase of joint policy-making efforts have increased the contribution of international actors in policy process (Çevik, 2019: 12). It is important to examine the impact of international organizations on public policies, especially to examine the public policies of developing countries.

International actors have an extreme effective role in determining AI policies and in the creation and implementation of universal AI policy principles. OECD is the most important organization that focus the AI related issues especially on the ethical, legal, and societal considerations in AI (ABD- National-AI-RD-Strategy-2019 UPDATE, P. 23: 193). There are significant examples of international policy actors of AI. For example, In Europe, European AI Alliance is a significant actor that has established an overarching approach to AI and an agreement to cooperate among European countries. Also, ministers from the Nordic-Baltic region issued a declaration of collaboration on AI. The UN has innumerable ongoing initiatives related to AI containing providing guidance on data privacy and on autonomous weapons. There is an AI Agreement Between UAE and India. There have been also established an International Study Group of Artificial Intelligence between France and Canada (FLI, 2020).

2.7.3.1. International Organizations

International organizations formed by a combination of nation-states are the leading international actors. The states that create these organizations impose some responsibilities on the member states. Member states try to realize those responsibilities with their public policies. The IMF or the EU are typical examples of granting credit to developing countries or adopting the normative order they form on member and candidate states, in the context of a conditionality mechanism (Yıldız and Sobacı, 2013: 23). In addition, researches of experts, consultants and academicians who are working in these organizations, have an important contribution to policy making and development process. Through these investigations, the best practice or model for a policy area can emerge and spread all over the world.

International actors have an extreme effective role in determining AI policies. For example, The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) have convened a joint technical subcommittee on AI (ISO/IEC Joint Technical Committee 1, Subcommittee 42 on Artificial Intelligence) to develop standards for AI systems and incorporated considerations. It is critical that Federal, industry, and academic researchers continue to inform these activities, particularly as AI advances and systems reach into areas such as transportation, health care, and food that align with the missions of government agencies (ABD- National-AI-RD-Strategy-2019 UPDATE, P. 36: 1251).

2.7.3.2. Multinational Companies

Multinational corporations establish in the context of conditionality transfer, which is the subheading of coercive policy transfer, force states to adopt specific policies and programs despite their consent (Sobacı, 2011: 196). These international actors are transferring their investments to other countries, trying to change and at least direct a lot of public policies from a country's tax policy to environmental policy (Yıldız and Sobacı, 2013: 23).

2.7.4. National and International Policy Networks

Governments and international organizations may not always be successful in designing and / or implementing effective public policies. The global public policy networks - consisted of NGOs, government and international organizations are helping governments and international organizations in some areas to overcome these problems (Stone, 2001: 12). Networks can provide information bringing together representatives from different institutions and organizations, for example, from international organizations, state institutions, politicians, media, business groups, trade unions and sometimes base organizations. They are organizations that can reflect their ideas individually or collectively in policy thinking and in global or regional areas.

2.8. Public Policy Analysis

In every aspect of life, change and development continues unceasingly. In this process of change and development, people's desire, need and living conditions become also different day by day. Governments are trying to develop policies that can respond to these changing and diversifying conditions. Lasswell (1971: 1) defined policy analysis as the process of producing knowledge of and in policy processes. In this definition knowledge of refers to systematic, empirical studies on how policies are made and implemented and, knowledge in refers to the realism of a decision depends in part on access to the stock of available information (Lasswell, 1971:2).

Policy analysis is used to refer to examine of existing- present day policies, or to examine interpreting the effects of policies after they have been applied (Thissen and Walker, 2013: 3). As Bukowski (1983: 20) said there are important factors which shaped the public policies of countries especially domestic political, social, and economic factors. For this reason, to understand public policy process of a country, it is necessary to attempt to consider for both external and internal policy determinants.

According to Guess and Farnham (2011: 8); analysis of policy is politicized. Policy analysis is to reveal what the government is doing and what the results are. This area can be studied through practical considerations, such as contributing to problem solving processes or developing policy recommendations, as well as to satisfy a theoretical need to learn the causes and consequences of policy decisions and to increase our knowledge of society. Perhaps the most important point of policy analysis is the way to shed light on the policy making process (Demir, 2011: 118). In this context, it is important to develop both theoretical and practical knowledge about the process of policy analysis such as agenda setting, policy formulation, policy implementation and policy evaluation.

According to Jreisat (2011: 111), policy analysis is a systematic research that aims to select one of the different actions in line with the requirements. An analysis can implement complex quantitative and qualitative research and assessment methods to facilitate the selection of various alternative policies.

Public policy analysis is not only about what policies governments follow, but why they follow these policies and what the consequences of these policies are (Dye, 2002:3). The field of public policy is broad and diverse. These areas include defense, energy, environment, foreign affairs, education, welfare, security, motorways, taxes, housing, social security, health, economic opportunities, urban development, inflation and recession. (Demir, 2011:108). Which issues and areas are considered as public services in a country is determinant in talking about public policy?

In recent years, new developments have emerged that change the direction and implementation of public services. As a result of the widespread use of big data sources, changes occur in the provision of public services. By big data is meant data created because of government, business, or citizenship activities. Big data is often said to be defined by four Vs: volume, velocity, variety, and veracity (Jarmin & O'Hara: 2015: 715).

2.8.1. Public Policy Process Model and AI Policies

Until 1950s, the field of public policy analysis has been closely interested with a perspective that considers the policy process as developing through a series of separate stages or phases. The simplified model of policy process is accepted as a policy cycle. Lasswell is the first author suggested the idea of modeling the policy process in terms of stages (Jan & Wegrich, 2007: 43). He presented (1956) a model of the policy process contained of seven stages: "intelligence, promotion, prescription, invocation, application, termination, and appraisal." Because of the growth of the field of policy studies during the 1960s and 1970s, there have been emerged some differentiations of stages models in a growing body of literature and research. There have been emerged some different stages which most adopted by the field of policy process, developed by Brewer and deLeon (1983), May and Wildavsky (1978), Anderson (1975), and Jenkins (1978). After all these stages of policy process, there have been an accepted policy process model which includes the stages of ***agenda-setting, policy formulation, policy legitimation, policy implementation, and policy evaluation***. This policy process became the traditional way of policy analysis process in public policy literature.

In this study, it is desired to benefit from the policy process model in comparing AI policies of countries. Because in this way, it is thought that it can be seen more clearly what similarities and differences are in the determination, implementation, and enactment of AI public policies of both countries. For this reason, first of all, all stages of the public policy process model should be well understood, and these stages should be evaluated in the examination of AI public policies.

2.8.1.1. Agenda Setting

Agenda setting is a process of recognition a problem and selection of a topic. Firstly, it requires to a problem and then there should be a state intervention for solving this problem. According to Jan & Wegrich (2007: 45): "The second step would be that the accepted problem is essentially put on the agenda for serious consideration of public action (agenda-setting)."As it is understood numerous studies made since the 1960s, problem recognition and agenda-setting are naturally political processes in which political attention is connected to a subset of all possibly relevant policy problems.

Birkland (2017: 63) remarked that "agenda setting is the process by which problems and alternative solutions gain or lose public and elite attention. Each group and each body of government— Congress, a state legislature, a county commission—has a collection of topics that are convenient for discussion and disposition, or that are being actively considered." Agendas exist at all levels of government. All issues that can be categorized based on the scope of which an institution is prepared to make a final decision to legislate and enforce or to reject certain policies.

2.8.1.2. Policy Formulation

Policy formulation is "a part of the pre-decision stage of policy making process" (Sidney, 2017: 79). This stage includes specifying and/or preparing a set of policy alternatives to address a problem, and narrowing that set of solutions in preparation for the final policy decision. As Cochran and Malone mentioned (1999: 46), policy formulation comprises of the "what" questions: "What is the plan for dealing with the problem? What are the goals and priorities? What options are available to achieve those goals? What are the costs and benefits of each of the options? What externalities, positive or negative, are associated with each alternative?" This is the policy phase where specific concrete actions, about how to address an issue are brainstormed, discussed, and debated. According to Dye (2002: 40–41), "Policy formulation take place in government bureaucracies, in interest group offices, in legislative committee rooms, in meetings of special commissions, in think tanks—with details frequently prepared by staff."

2.8.1.3. Policy Legitimation

The policy process where a policy decided and enacted. The stage that a bill becomes a law (SAGE, 2019). The legitimation process begins after the issues and problems on the agenda are formulated as bills or proposals. The legitimation of public policies takes place after certain processes. That may differ among countries. For example, in the USA, for a policy to gain legitimacy, it must move through a legislative process. According to the USA constitution, "All Legislative Powers herein granted shall be vested in a Congress of the U.S., which shall consist of a Senate and House of Representatives."(Article I, Section 1, of the United States Constitution).

2.8.1.4. Policy Implementation

The stage of implementation of a public policy is "execution or enforcement of a policy by the responsible institutions and organizations that are often, but not always, part of the public sector" (Jan & Wegrich, 2007: 51). Policy implementation is the fourth stage of the policy process, which is performing the decided policy, the execution of decisions to bring about change to address a problem. This stage is obviously defined as "what happens between the establishment of an apparent intention on the part of the government to do something, or to stop doing something, and the ultimate impact in the world of action" (O'Toole, 2000: 266).

2.8.1.5. Policy Evaluation

The stage of policy evaluation is the stage of presenting outcomes of policies. However, it is not an exact final stage because of there may be the termination stage of the policy or redesign process which based on modified problem perception and agenda-setting. Dye and Anderson claimed that the key variables in the evaluations stage are politics and the political culture. Anderson thought that the evaluation is about prediction, consideration and, appraisal of a policy containing its content, implementation and effects (Broadnax, 2019: 702). Dye on the other hand focus on the effects of the policy. The evaluation of public policy, scientifically, must take into consideration all the costs and benefits, both symbolic and concrete, both current and future.

2.9. Comparative Public Policy and Analysis, The Importance of Comparing Public Policies in Terms of Artificial Intelligence

With the expansion of public policy as a discipline primarily in the United States and developed Western countries, another field of study -comparative public policy (CPA) - was born from inside of public policy. CPA has developed as a different topic of study rather than an integrated component (Jresiat, 2015: 231). CPA, as an interdisciplinary field of study, is the examination of state actions from a transnational perspective (Çiner, 2013: 287). The authors, who examined public policy, have given importance to comparative studies since the 1970s, investigated the reason for differences in policies under different or similar conditions and emphasized the significance of the comparison method. In his article "Studying Public Policy", Simeon (1976: 550) argued that policy studies should be comparative in terms of space and time. Examining the ways in which policy patterns deal with similar problems over long periods in countries, provinces and other units will be the first step in identifying and explaining differences among them.

The starting point of comparative public policies is that after the World War II, the United States accepted that the problems experienced in public policies were not specific to itself, but like developed European countries. The first book entitled Comparative Public Policy in the field was written in 1975 by Heidenheimer, Heclo, Adams (Çiner, 2013: 292). In the book, the public policies of the USA and some developed countries of Europe are compared, and comparative public policy defines as a field of study to explain why, how and with which effects different countries do a specific action or inaction (Heidenheimer et all, 1983: 2). The authors states that policy analysis can be done in two different ways: deductive and inductive (Heidenheimer et all, 1983: 3-4). According to authors of this book, providing students comparative policy courses at universities help them gain experience in policy making by learning the impacts of policies in different countries as well as cause to analyze of various policy areas in different countries.

According to Jreisat (2011: 113), comparison of public policies helps to identify the kind of preferences, achievements, problems, limitations, and solutions present to policy makers in one or in different states. CPA focuses more on the process or function rather than on administrative and organizational structures and roles; therefore, it does not replace comparative public administration. Rose (2005: 4) in his book "Learning from Comparative Public Policy" emphasizes the reasons for comparing policies, how policymakers can

understand different policies are made in different countries and how they are applicable in their own country. The author focuses on two basic concepts of comparative public policy: understanding what a program is and understanding what a lesson is and is not. These two concepts refer to two tools that need to be developed in order to form and find the right policies. Describing the program as a stock in policy analysis trade, the author sees programs as a specific precaution that determines how public employees should allow them to spend money to achieve their goals (Rose, 2005: 16). In order to be successful as a policy maker, it is necessary to design a program, as well as to gain the political support needed to adopt and sustain it. A lesson is a special type of program, because it causes foreign experience to suggest a program that can deal with a problem resist national policy makers in their home environment. The intention of the author here is to create a lesson by extracting knowledge from the experience of other countries, so that a lesson removed is different from the normal practice of learning from its own experience (Rose, 2005: 22).

In this thesis, understanding of comparative public administration and comparative public policy analysis is significant because of different public policy practices arising from different public administration structures in different countries are important in terms of analyzing the AI public policies of two different countries.

2.10. Public Policies on AI

AI is an area that have great economic, social, political, security, and environmental benefits. It can be seen in a different technology which help people obtain new services in every aspects of the human life. For all these reasons, countries around the world are preparing and presenting national and international strategies and initiatives to direct the development of AI. A screening of information in this direction will provide a better understanding of the national AI strategy, AI public policy issues, which will be featured in the following sections of the study. In this section, firstly, the subject of national AI strategy is discussed, and then the development of AI public policies, developments in the use of AI in the public sector are examined. Then, examples are given to show the importance of AI in terms of public policies of countries.

Public policies arise primarily under the responsibility of governments, can also occur with the involvement of non-governmental actors in this process. Each problem that needs to be solved; each area that needs to be improved - needs to be changed is a field of public policy. The first Oxford Insights research on the issue of relationship between AI and government prepared in 2018 with information belong to year of 2017. This research is created the world's first Government AI Readiness Index. This research looks for an answer the question (Stirling, et all., 2018): "how well placed are national governments to take advantage of the benefits of AI in their operations and delivery of public services?" Also, it prepared for determining readiness situation of countries to AI in the provision of public service delivery. It includes nine input standards, from in-country digital skills and government innovation to existing data capabilities. The index provides recommendations for the path that countries will take before they are ready for AI. The first way for governments to develop AI is to be innovative. Governments should be open to change and develop and be able to use AI in public services. It is important to have the necessary skills in the AI workforce to know where AI should and should not be used and to help build effective tools and systems. Increasing investments by the government will be facilitate with providing these skills in the economy and increasing the demands of the firms in the private sector.

Another significant research institute, Future of Life Institute (FLI), which investigate on AI policies, presents many researches about AI and policy issues. This institute works on the current technologies and AI one of them. It looks for answers to question of "How countries and organizations around the world are approaching the benefits and risks of AI". It presents some researches such as AI Policy Overviews and Recommendations, AI Principles, Framing the AI Debate, Promoting Beneficial AI, Social Impacts of AI Safety, Security, and Existential Risks of AI and AI Technological Landscape (FLI, 2020).

Apart from these examples, many institutes, institutions, and organizations have started to research on AI policies. With these researches, AI policy frameworks, goals, and objectives, as well as implementation methods of countries have been emerged. It is a fact that AI public policies increase day by day and take their place in the world agenda. Many countries contribute to the AI public policy literature with national and international plans, laws, and regulations, they have created in this field.

2.10.1. Development of Public Policies on AI in the World

Many governments take an active role on AI policies in the world. Most of countries, primarily the United States and China, European countries, India, South Korea, Japan governments take steps in the direction to follow the developments in the field of AI. Governments have been started to prepare a roadmap by setting up a National AI Strategy Plan in order to implement their own priorities and interests. In addition to the countries that prepare and present national AI strategies, many countries are currently in the process of preparing their strategic documents. By preparing national AI strategic documents, governments reveal their strategic visions and goals for AI. Approximately 50 countries around the world have prepared and published or are in the process of preparing a national AI strategy. 37 of them have (or are planning to have) separate strategies for public sector AI or a specific focus embedded in an overall strategy (OECD, 2019).

Figure 1 indicates that status of countries' national AI strategic documents. With this regard, the developed countries like the USA and China have completed their strategic plans for AI while developing countries are on in process of preparation of their related documents.

In this context, first strategic document has been completed by Canada. Belgium, UK, Netherlands are among the countries which embedded in broader strategy. Many countries, primarily the United States and China, such as European countries, India, South Korea, Japan, see development in the field of AI as their main goals. In addition to the developments in the private sector, these countries prepare a road map for themselves by determining their national AI strategies. In addition to the countries that prepare and present national AI strategies, many countries are already in the process of preparing their strategic documents (Önder, et all, 2020: 16).

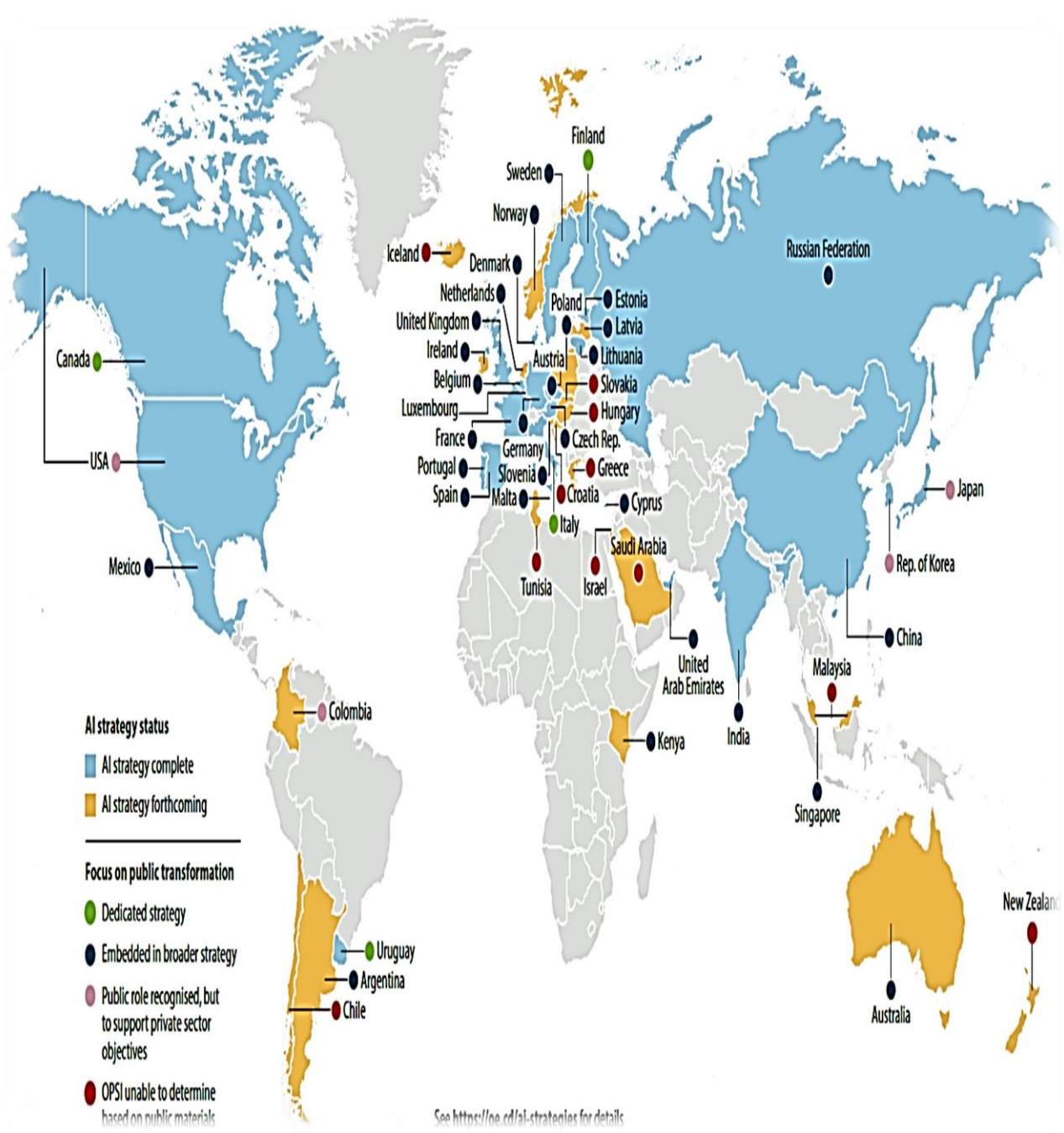


Figure 1. AI Strategies and The Extent to which They Include Public Transformation

Source: OPSI analysis of national strategies as of 15 November 2019 (see https://oe.cd/aistrategies); Ubaldi, B. et al. (2019), "State of the art in the use of emerging technologies in the public sector", OECD Working Papers on Public Governance, No. 31, OECD Publishing, Paris, https://doi.org/10.1787/932780bc-en .

Figure 2 shows that the year that countries published their national AI strategic documents and the names of these documents. Some of those countries are (FLI, 2020); Australia Australia's budget for the development of AI is approximately $ 29.9 million. The Australian Government presented a new Digital Economy Strategy on September 19, 2017, in preparation for the AI strategy it aims to publish in 2018. The government's AI strategy has provided a roadmap for the government, private sector, and society to work together to explore new sources of growth. At the same time, AI is seen as one of the emerging technologies in the plan that it has prepared to develop digital business, support lifelong learning, and address the 'digital divide' in skills and trust. ***Brazil***'s Minister of Science, Technology, Innovations, and Communications Marcos Pontes noticed the establishing of eight AI laboratories throughout the country in November 2019. This step is significant for increasing AI development initiatives across the country. In January 2018, government of ***Denmark*** also published the "Strategy for Denmark's Digital Growth," which contains a focus on AI among other digital technological advances. In May 2019, the Ministry of Economic Affairs and Communications of ***Estonia*** together with the Government Office published a national strategy for AI, which focuses on developing AI in private and public sectors throughout the country.

France published a national strategy for AI titled "AI for Humanity". France Prime minister was tasked Cédric Villani, mathematician, and winner of the Fields Medal in 2010, examining France's strategy on AI within Europe, and an AI Policy Initiative was started in 2017. On November 15, 2018, the ***German*** Government accepted a national AI strategy and assigned €3 billion for investment in AI research and development. The strategy is based on the Federal Cabinet's Key Points for a Strategy on AI, and was advanced by the Economic Affairs Ministry, the Research Ministry, and the Labour Ministry. In June 2018, the ***Indian*** government published a national AI policy document titled, "National Strategy for Artificial Intelligence #AIforAll." This paper contains five focus areas as: healthcare, agriculture, education, urban-/smart-city infrastructure, and transportation and mobility. In ***Japan***, Artificial Intelligence Technology Strategy Council prepared the "Artificial Intelligence Technology Strategy" in March 2017. In June 2018, the Japanese government noticed that AI would also become an official part of its "integrated innovation strategy."



Figure 2. Global AI Landscape

Source: HolonIQ, Government Publications and Announcements, 2019

2.10.2. AI Policy Areas

Countries are entering a race to apply AI in public sectors. Most countries determine and implement strategic moves in this competition. AI is a transition process for governments. Governments around the world are faced with guiding the AI transition, and providing that AI is developed and distributed across economies and societies in a sense that is responsible and human-centered, and that develop individual and societal beneficence. AI technologies have been started to be used in many different policy areas. Some areas draw attention where AI is used intensely today (Figure 3). OECD has determined the policy areas that can benefit from AI as: agriculture, employment, public governance, competition, environment, science and technology, corporate governance, finance and insurance, social and welfare issues, development, health, tax, digital economy, industry and entrepreneurship, trade, economy, innovation, transportation, education, investment. There are some other field could be add to the list such as national security, defense, and manufacturing. Various public policies emerge in these areas.

The use of AI in the fight against coronavirus, which affected the whole world in 2020 and is still effective, can be considered one of the most important examples in the field of health. AI can be shown as one of the most important weapons of human beings, whose means of combating the COVID-19 virus that brought the global system to a halt. In this context, AI technology is tried to be used effectively in the fight against COVID-19. AI tools have begun to be used in various areas of the fight against the virus, such as predicting the spread of the coronavirus, mapping the genetic evolution while transmitting from person to person, accelerating diagnosis, and using it in the development of potential treatments. On the other hand, it offers important optimization options to policy makers within the framework of food consumption, supply chain and logistics (Uzun, 2020: 45).

It is expected that AI will show a great impact on the workforce and the change of future jobs. While the idea that the need for human beings may decrease in some business lines with the development of robots, which are one of the AI technologies, is a concern, new workforce deficits may arise in many new areas. Rapid progress in the ability of machines and AI to automate an ever-widening number of job tasks implemented by humans has the potential to increase the shift of labor with capital and to cause significant productivity gains, entailing less labor input into the production process (OECD, 2019: 44).

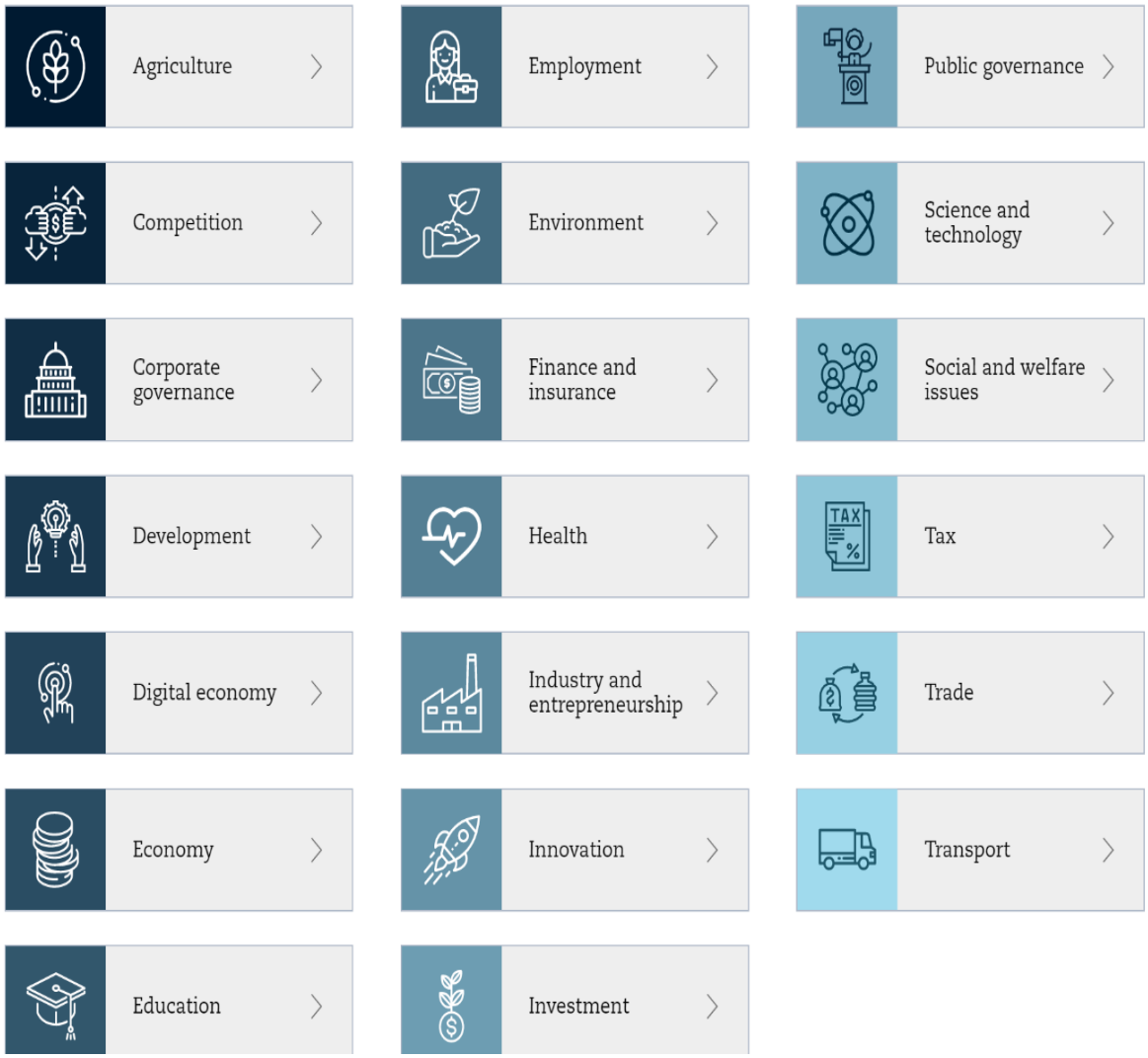


Figure 3. AI Policy Areas

Source: OECD 2020.AI Policy Observatory.

The use of AI technologies such as image recognition, machine learning and robotics in agriculture is a development that will transform agriculture in many ways. Data from "harvesting" robots equipped with AI technologies and cameras and sensors can now make real-time decisions made by humans. This type of robot is increasingly capable of performing tasks that previously required human effort and knowledge (OECD, 2019: 52).

In the financial sector, large companies such as “JPMorgan, Citibank, State Farm and Liberty Mutual” are rapidly implementing AI. The same is true for start-ups such as “Zest Finance, Insurify, WeCash, CreditVidya and Aire.” Financial service companies are combining different machine learning practices. For example, French start-up QuantCube Technology analyses several billion data points gathered from over 40 countries. It uses AI technologies such as language processing, deep learning, graph theory. Those technologies develop AI solutions for decision making in financial corporates (OECD, 2019: 55).

While the use of AI technologies in different policy areas benefits people in many ways, there is still a group of people approaching these technologies with uneasiness. However, as can be seen from the examples, the use of AI applications in different policy areas offers convenience that people can benefit from in many ways (time, efficiency, effectiveness).

2.10.3. Government Readiness for AI

AI technologies have made great contributions to the world economy and continue to do so. The estimated number of those contributions is to add US$15 trillion to the global economy by 2030 (Oxford Insights, 2019). Some countries, especially America and China, have a great role in this contributor (Figure 4). While some governments are already implementing AI in their operations and citizen services, to increase efficiency, save time and money, and provide better quality public services, many governments still ongoing to developing process.

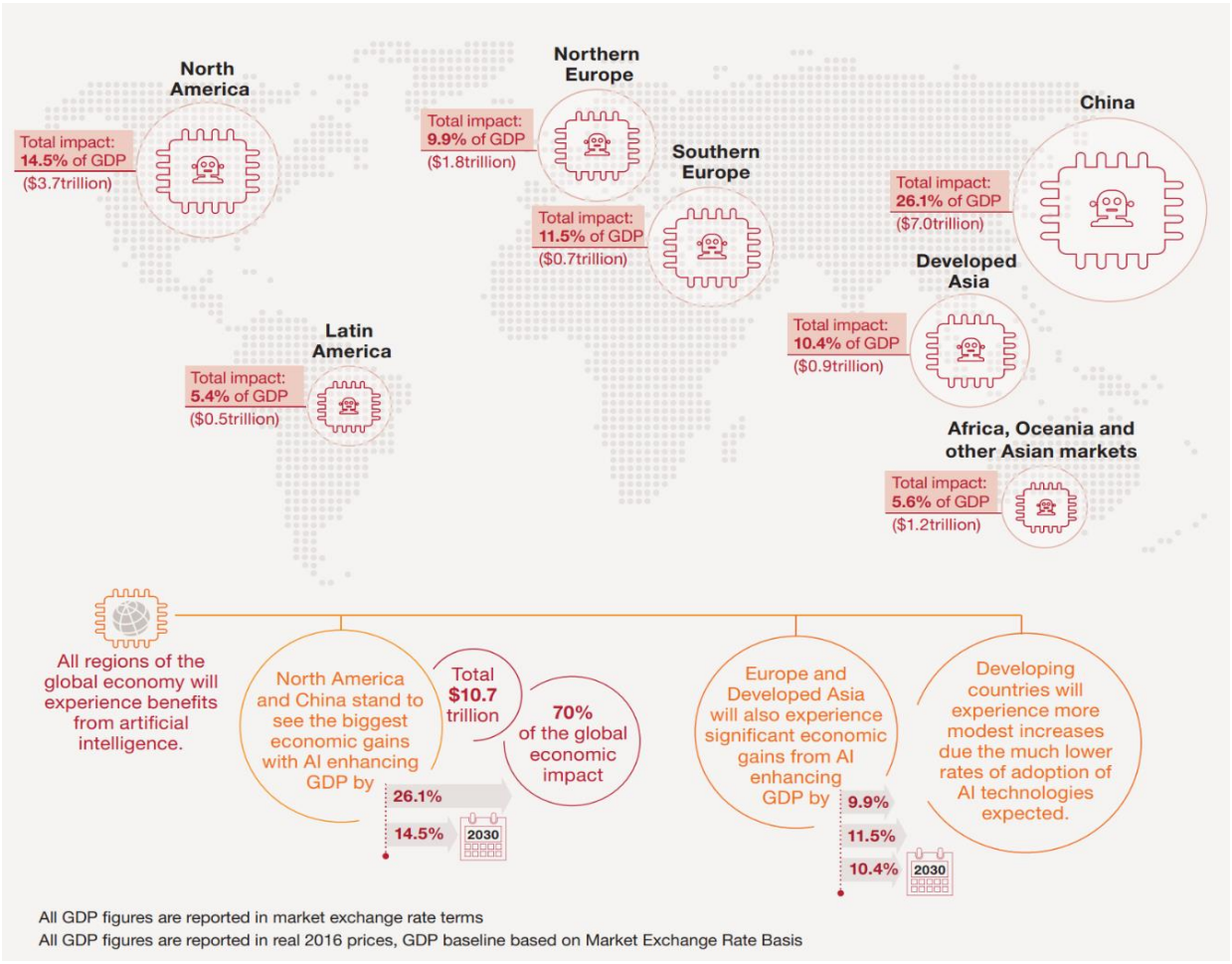


Figure 4. Contribution of AI to Global Economy

Source: PwC analysis, 2019: 7.

According to study of Oxford Insights with supports of International Development Research Centre (IDRC) and grade the governments of 194 countries and territories according to their readiness to use AI in the delivery of public services. The entire grade is contains of 11 input metrics, grouped under four high-level clusters: (1) Governance (the existence of a coherent and sufficient AI strategy); (2) Infrastructure and data (adequate and quality data and its effective use); (3) Skills and training (overall quality of training, AI training, number and success of startup); (4) Government public services (innovation in digital public services, generally the level of government activity) (Oxford Insights, 2019: 5).

In the study entitled "Government Artificial Intelligence Readiness Index" prepared by Oxford Insights in 2019, it consists of 11 input scales in which a total of 194 countries are grouped in four high-level clusters: governance; infrastructure and data; skills and education; government and public services; and an evaluation has been made by looking at these data. These data were obtained from various sources ranging from desk research to AI strategies, databases such as the number of registered AI initiatives in Crunchbase, indices such as the UN e-Government Development Index, and a number of points were given to countries (Oxford Insisghts, 2019: 5).

According to this study, it is seen that the highest score belongs to Singapore. One of the remarkable countries is China. Although China is one of the countries considered as superpower in the field of AI, it is seen that it lags behind European countries when it comes to public and management (Table.1). It is thought that China's approach to openness and impartiality, including open data policies, and some issues related to the effectiveness of the government have brought about this situation (Robbins, 2019).

Table 1. Top 20 Rankings for Government AI Readiness 2018/19

Rank (of 20)	**Country**	**Score**
1	Singapore	9.186
2	United Kingdom	9.069
3	Germany	8.810
4	United States of America	8.804
5	Finland	8.772
6	Sweden	8.674
7	Canada	8.674
8	France	8.608
9	Denmark	8.601
10	Japan	8.582
11	Australia	8.126
12	Norway	8.079
13	New Zealand	7.876
14	Netherlands	7.659
15	Italy	7.533
16	Austria	7.527
17	India	7.515
18	Switzerland	7.461
19	United Arab Emirates	7.445
20	China	7.370

Source: Oxford Insights, 2019: 7.

Countries has their own policy standards which changeable according to their own administrative culture and conditions. One of the important changing after the technological development is ***changing the nature of work.*** Improvements of AI technologies in a country changes the nature of work. Thus, governments should focus on that situation for keep in step with ***AI developments in all around the society***. World Bank Group prepared a report, the name is Changing Nature of Work. In this report, some policy recommendations are given for governments.

The first policy advice is creating formal jobs for increasing the benefits of technological change (World Development Report, 2019: 4). With the increasing of platform-based businesses like Alibaba in China, IKEA in Sweden, Flipkart in India and Jumia in Nigeria, new policy areas emerged such as privacy, competition, and taxation (World Development Report, 2019: 6).

Governments around the world are beginning to see AI's great potential: for their economies, communities, and their own public services (Stirling, et all., 2018). AI, which has been referred to more than its technical applications so far, is seen as an important development for public policies. Many developed countries prepared and published their own National AI Strategy documents and, many of developing countries started to prepare their documents. These countries determined or try to determine their own strategic plans for developing around AI. They determined their AI policy standards, AI principles, AI initiatives, AI priorities and a roadmap for achieving them.

3. PUBLIC POLICIES OF THE USA ON ARTIFICIAL INTELLIGENCE

The USA is one of the most important country on the field of AI. Significant institutions that make the USA national government are Congress, the president, the courts, and federal administrative agencies ("the bureaucracy"). The USA Constitution constituted three policymaking institutions: The Congress, the presidency, and the courts. However most political scientists see the bureaucracy is the fourth institution. A public policy is defined as all decisions that government makes, all law it passes, budget is constituted, and managing it hand down (Edwards III, et all., 2008:7,11).

AI policies in the USA have an important place in the agenda of the country with different plans and laws during the Obama and Trump governments. It is important to examine the AI policies that emerged during both governments for understanding the USA strategy in AI policies in general, determining and interpreting its objectives. In the USA, White House, approving the expanding role of AI for the future, put into practice three reports in 2016: "Artificial Intelligence, Automation, and the Economy; Preparing for the Future of Artificial Intelligence; and The National Artificial Intelligence Research and Development Strategic Plan" (WIPO, 2019: 126). In May 2018, Select Committee on AI was established for consulting the White House on interagency AI R&D priorities and to support the Government in reaching its aim of protecting U.S. leadership in AI.

After determination of principles which the USA adopt them for its AI policies, it is important to determine the actors who play an important role for AI policies in the USA. It is seen that think tanks in the USA are effective for AI policies. For example, CSIS (Center for Strategic and International Studies) is a think tank that in 2017 admitted 34 percent of its funding from collective grants, 24 percent from the government, 23 percent from foundation grants and 12 percent from individuals (Moss, 2019).

Another important step for AI innovations of government is establishing NSTC Select Committee on AI back in May 2018. The practice of the last executive order has been coordinated by NSTC Select Committee. This presidential order will be examined in order to understand the targets and plans that the USA wants to achieve with AI policies and a general evaluation will be made by comparing them with the plans prepared during the Obama period.

It is said that the United States lags the leading countries behind in developing a national AI strategy. However, since 2016, the government has been working to improve its development and adoption in AI-related R&D and policymaking, particularly with the introduction of the National Artificial Research and Development Strategic Plan (Oxford Insights, 2019).

This chapter presents a general view of AI situation of United States. Chapter contains of historical background of AI in the USA, national AI strategy of the USA: including important strategy documents published by the USA Government, investments, public policies/regulations and Important Actors, Institutions and Agencies on AI Policies.

3.1. Historical Background of AI in the USA

Historical background of AI policies in the US dates back to 1950s. In this context, following table 2 illustrates the evolution of AI in the USA. It begins with the Dartmouth Conference in 1956 in the USA and AI emerged as an academic discipline in 1956 by this way. In the following years, the USA has an important place in the world with its research and development studies and AI applications carried out by important institutions like DARPA. The AI journey of the USA continued with development of AI Technologies and its implementation which widened across the country. Table 2 presents that some significant points of development process of AI in the USA during the period of 1950-1990s.

Table 2. History of AI in the USA During the Period of 1950s-1990s

Date	History of AI in US
1950s	• Some sort of scientists from different fields came together in Dartmouth Conference in 1956 and, AI emerged as an academic discipline in 1956 by this way.
1960s	• Over its 60-year history, DARPA has played a leading role in the formation and improvement of AI technologies that have produced game-changing capabilities for the Department of Defense. DARPA research shaped the first wave of AI technologies, which focused on handcrafted knowledge, or rule-based systems capable of narrowly defined tasks. • The Unimate was the first industrial robot which revolutionizing manufacturing the world over, patented in 1954 (granted in 1961) by American inventor George Devol, the Unimate was developed as a result of the foresight and business acumen of Joseph Engelberger - the Father of Robotics. • ELIZA which is the computer program based on natural language processing, created from 1964 to 1966 at the MIT Artificial Intelligence Laboratory by Joseph Weizenbaum
1970s-1980s	• In 1974, AI progress slowed and U.S. government cut off exploratory research in AI. • Deep Blue was a chess-playing computer developed by IBM in 1985. Computer won its first game against world champion Garry Kasparov in a game one of a six-game match on 10 February 1996. It is the important step for a machine-AI competition. • First National Conference of the American Association for Artificial Intelligence (AAAI) held at Stanford in 1980. AAAI aims to increase public understanding of AI.
1990s	• In 1991, The Dynamic Analysis and Replanning Tool (DART), is an AI program used by the U.S. military to optimize and time the transportation of materals or personnel and solve other logistical problems. It had by 1995 offset the monetary equivalent of all funds DARPA had channeled into AI research for the previous 30 years combined. • In 1992, high-impact, community-based, AI-relevant benchmark program is the Text Retrieval Conference (TREC),104 which was started by NIST to provide the infrastructure necessary for large-scale evaluation of information retrieval methodologies. • More than 250 groups have participated in TREC, including academic and commercial organizations both large and small. (ABD- National-AI-RD-Strategy-2019 UPDATE, P. 39: 2905)

Source: Author's compilation.

The period of 2000s, when AI developed without slowing down, is the period when the USA government focused more on AI and put forward policies in this field. The period of Obama administration is the main starting point for AI policies in the USA. Because first steps towards AI policies were seen under the Obama administration (Future of Life Institute, 2019). (AI Policy – United States, 2019). In 2016, the former President and the White House OSTP presented significant studies on AI. "The National Artificial Intelligence Research and Development Strategic Plan", the updated version of AI strategy published in 2019, was originally published during the Obama government with two different strategic documents in 2016 and 2017.

The main aim of the USA is continuing the position of global leader in the era of AI during the Trump Administration. Nation's primary goal is establishing the AI ecosystem which is important for realizing the full potential of AI for the combined efforts of industry, academia, and government. The Administration has been effective in developing policies and implementing strategies that speed up AI innovation in the U.S. for the benefit of the American people. These activities are supported with several areas of emphasis: AI for American Innovation, AI for American Industry, AI for the American Worker, and AI with American Values.

President Trump formed an Executive Order which is named “Executive Order on Maintaining American Leadership in Artificial Intelligence”, starting the American AI Initiative on February 11, 2019. Main aim of American AI Initiative is to provide continuity of scientific, technologic, and economic leadership position of the USA. In this order, the definition of AI is stated as follows (Section 9) ; it means full scope of federal investments in AI and comprise R&D of core AI techniques and technologies; AI prototype systems; application and adaptation of AI techniques; architectural and systems support for AI; and cyberinfrastructure, data sets, and standards for AI.

On March 19, 2019, the USA federal government started AI.gov to perform it easier to accession all the governmental AI initiatives currently underway. The site is the best resource from which to obtain a better understanding of the USA AI strategy. As of February 2020, there is also broad information, data, and graphics about AI policy in the USA available at the OECD AI Policy Observatory (Future of Life Institute, 2020).

3.2. National AI Strategy

The USA has built its AI strategy on solid foundations, crowned its success in this field for many years with a national strategy and has put forward a national AI strategy that will set an example for all countries.

3.2.1. Preparing for the Future of Artificial Intelligence (October 12, 2016)

The report was prepared by the "NSTC's Subcommittee on Machine Learning and AI", which was approved in May 2016. In this document, different definitions of AI are mentioned, but it is emphasized that the main purpose of AI research and applications is to automate or replicate intelligent behavior (Preparing For The Future of Artificial Intelligence, 2016, p. 7)

The main purpose of the document is "to encourage interagency coordination and maintain technical and policy recommendation on issues related to AI, and to observe the improvement of AI technologies across industry, the research community, and the Federal Government" (Preparing For The Future of Artificial Intelligence, 2016, p. 12).

Office of Science and Technology Policy (OSTP) prepared a series of public service activities, to assistance government officials thinking about these issues to learn from experts and from the public. Those services on AI contain five public workshops: AI, Law, and Governance; AI for Social Good; Future of AI: Emerging Topics and Societal Benefit at the Global Entrepreneurship Summit; AI Technology, Safety, and Control; Social and Economic Impacts of AI.

AI technologies are also mentioned in the document like machine learning. It is emphasized that machine learning is based on statistical methods to find a well-functioning decision procedure in practice. Machine learning is an effective approach to find solutions to many different problems by providing a lot of data input. A positive approach is seen for AI in living areas and said that it will beneficial for human lives. The areas such as education, healthcare, transportation, environment, criminal justice, and economy. In the area of health care, AI is seen beneficial to better estimate medical complications and improve treatment of vigorous combat injuries, provide to better patient outcomes, faster healing, and lower costs.

The important recommendation given to the public and private institutions in the text which is to benefit from experiences of AI researchers and practitioners on the issues of AI and machine learning. Thus, they will be able to serve the benefit of society. Another important advice is accessing data without trouble. At this point, a concrete proposal is presented which government should develop "Open Data for AI" to speed up AI research and revive the use of open data standards and best practices across government, academia, and the private sector.

The advices to AI policies of administration are determined as improving research and development investments; firstly serving as a customer-oriented for AI technologies and their applications; promoting pilot projects and forming testbeds in real-world settings; provide available data sets for public; sponsoring encouraging prizes; identifying all challenges for available and valid policies; good funding of AI applications; establishing a policy, legal and regulatory environment that protects the public from harm and promotes innovation (Preparing For The Future of Artificial Intelligence, 2016, p. 15)

The first recommendation is made in the section on the Federal Government and AI is The Federal Government should investigate ways to develop the capacity of key agencies to implement AI to their missions. The second one is The NSTC Machine Learning and Artificial Intelligence (MLAI) subcommittee should develop a community of practice for AI practitioners across the government.

This report emphasizes that is necessary to determine policies by considering the effects of AI. So, for effective regulations of AI, decision making is the important step and, entails technical expertise in agencies. Government employees should benefit from experiences and knowledges of employees who work in different jobs and programs about AI for technical expertise. At the same time, they should prefer assignments and exchange of personnel with more perspectives on the current state of technology.

3.2.2. The National Artificial Intelligence Research and Development Strategic Plan

The National Artificial Intelligence Research and Development Strategic Plan was submitted on the issue of AI during the Obama administration. In June 2016, the new NSTC Subcommittee on Machine Learning and Artificial Intelligence - which is recognized to follow developments on AI within the Federal government, the private sector, and internationally, and to help coordinate Federal activities in AI- assigned to the NITRD National Coordination Office (NCO) to form this plan (National Artificial Intelligence Research and Development Strategic Plan, 2016: 6). It was developed by AI Task Force - an interagency working group tasked by the NITRD Subcommittee of the NSTC-.

The main purposes of this report are to determine the priorities of federal government for investments in AI, to find out beneficial parts of AI to both society and economy and, to minimize the potential risks of AI. As a result of the implementation of this strategic plan, it is foreseen to benefit the whole society. For this reason, a roadmap is presented for achieving national priorities in this document (Figure 5). Firstly, the priorities are determined and after some recommendations are presented for realizing those targets. It is emphasized that progress in AI can potentially improve prosperity in almost all sectors of society and will potentially guide developments in national priorities such as increased economic prosperity, improved quality of life and enhanced national security.

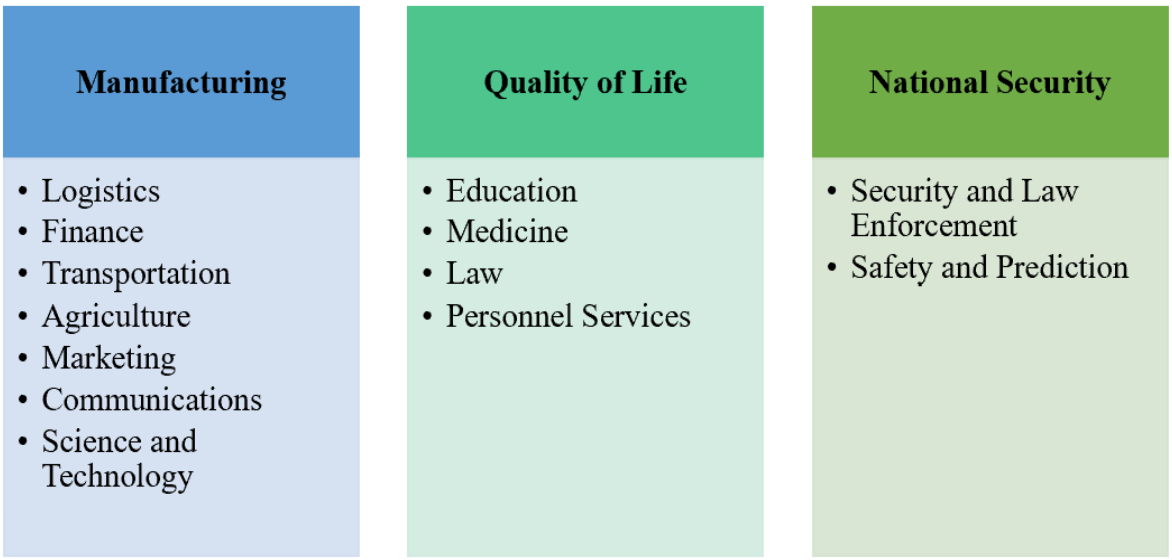


Figure 5. AI National Priorities of the USA

Source: Author's Compilation.

Recommendations for increasing economic prosperity are as follows:

Manufacturing: Increased use of robotics could cause increase in manufacturing. AI can speed up production capabilities with making demand forecasts more reliably, better predict the impact of increased flexibility in operations and supply chain and change in production operations. AI can improve worker productivity with more effective production processes. The programming of manufacturing processes and decrease inventory necessities could be providable by means of various AI technologies like machine learning.

Logistics: AI could be used by private-sector producers and carriers to develop supply-chain management through adaptive programming and routing and those supply chains can become more powerful to deterioration by automatically adjusting to foresee effects of weather, traffic, and unexpected events.

Finance: AI can be used by industry and government to ensure estimating unusual financial risks timely so, the automation in financial systems can reduce opportunities for malicious behavior.

Transportation: AI can provide security for all types of travel; it can also reduce infrastructural expenditures by supervision of structural health and infrastructure asset management. It can be useful security of vehicles by enhancing situational awareness, by use of different AI applications can increase network-level mobility and reduce overall system energy use and transport-related emissions.

Agriculture: Sustainable agriculture which is an important modern term for agricultural life. By use of AI technologies for this aim can increase effective techniques and productivity in agriculture.

Marketing: AI approaches can balance the supply and demand situations of commercial assets and increase revenue that finances ongoing private sector development. Those approaches also foresee and identify consumer needs, enable them to find better products and services at lower cost.

Communications: AI technologies can maximize the effective use of digital communication, which positively affects trade and how we live.

Recommendations for improving educational opportunity and quality of life:

Education: Lifelong learning is seen possible with AI technologies such as virtual tutors. In addition, thanks to such technologies, every individual in the society has the opportunity to receive an education appropriate to their abilities and needs.

Medicine: The possible contribution of AI technologies to the field of medicine is quite high. These technologies may include bioinformatic systems, multidimensional data for investigate public health issues and personalization of drugs for people. High quality of life is also possible with AI technologies such as personalized health information.

Law: The positive impact of AI systems in the field of law; With legal discovery tools, it is stated that the evidence is to identify and clear evidence up the evidence by increasing the extensity during the discovery.

The USA gives high priority to AI investments because of the benefits of AI in various areas of the life. In this direction, there are several policy recommendations of Federally- funded AI Research Strategies (figure 4). There are seven strategies presented in the documents, including subjects of Federal research priorities, methods for human-AI interaction and collaboration, investments in research for better understanding of AI technologies because of enhancing AI systems proper to society's ethic, legal and social aims, methodologies are developed for explainable and transparent AI systems that should be confidential for users, training, testing and data sharing are significant for advancement of AI research, determining standards and criteria for the subjects to be focused on in the R&D process and understanding national AI R&D workforce needs because of creating new ideas for developing AI technologies across all sectors of society (p.15). These strategies will be explained separately to better understand their content.

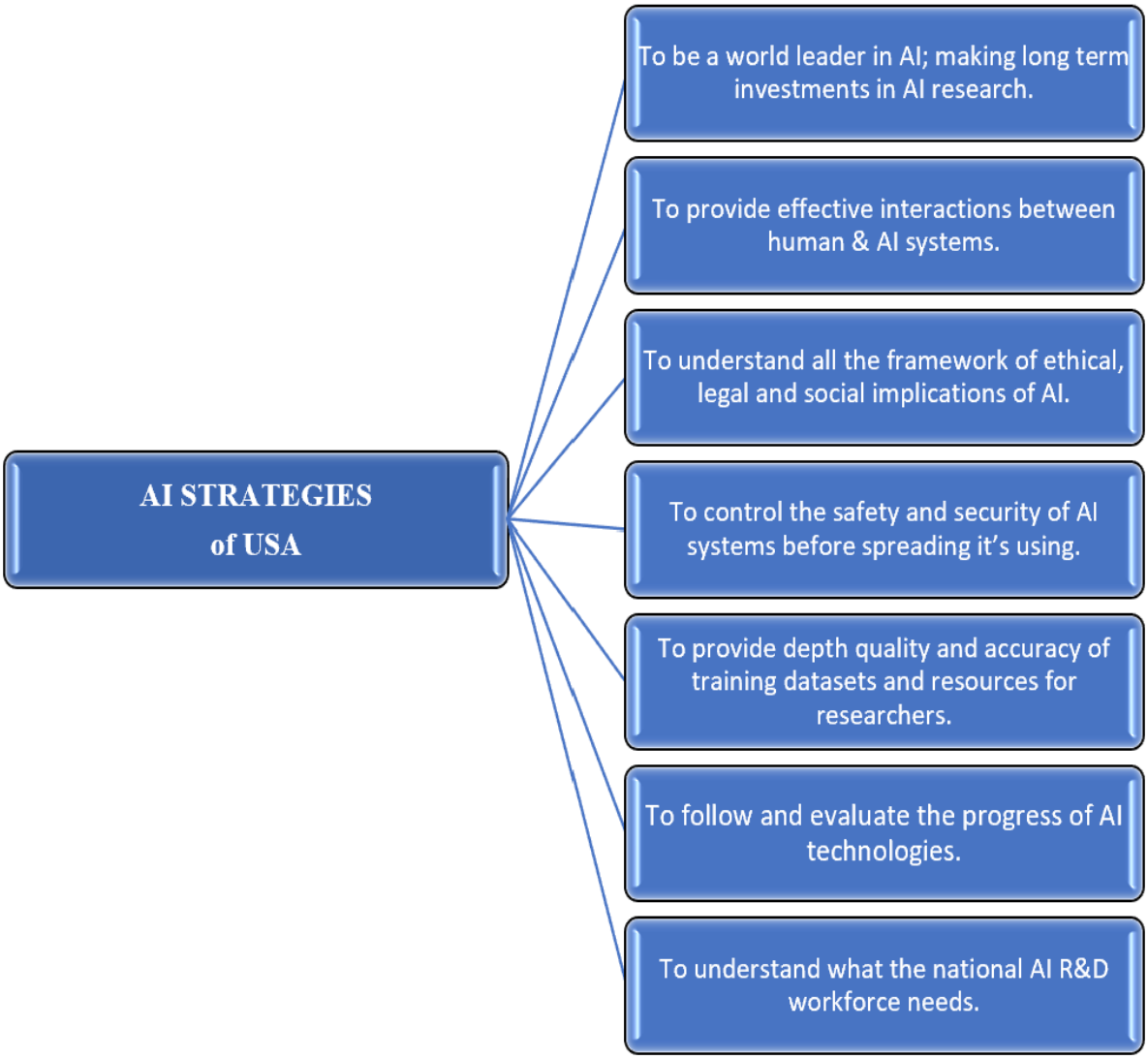


Figure 6. AI Strategies of the USA

Source: Author's Compilation. Information from The National Artificial Intelligence Research and Development Strategic Plan, 2016

Long Term Investments; the first aim of the USA about AI development is long terms investments to AI research. These research investments should be about (p. 16); Thanks to the advanced AI research, possible to reach true information among lots of data with techniques of clear data. For this reason, new models should be developed to discover discrepancies and abnormalities in data. In order to better adapt to the world, perceptual capabilities of AI systems should be increased.

By using information from the environment and algorithms, human perception methods can be developed and better interaction with people can be provided. Research can be made on understanding the theoretical capacity and limitations of AI. In this way, researchers can find solutions to problems that cannot be solved theoretically. Research should be conducted to follow investigations on the general purpose of AI. In this part of the document, approaches to AI are examined in two categories. These are narrow AI and general AI.

Scalable techniques should be developed in order to increase cooperation between multiple AI systems and human and, to prevent difficulties in planning, coordination, control and scalability that may arise from the use of these systems. Developing research on human-like AI. For example, intelligent tutoring systems and intelligent assistants can help people perform many tasks more effectively and quickly. Scientists should investigate on developing more reliable, capable and easy-to-use robots. Another thing that is as important as developing software for AI systems is hardware development. Neuromorphic features including human learning, adaptation and physical reshaping should be developed for AI systems. AI methods should be developed appropriate to the improved hardware. With the developed methods, the use of high-performance programming can be increased and along with that these systems can operate effectively without human intervention.

Collaboration Between Human and AI; effective methods should be developed for increasing collaboration between human and AI. There are three categories that include functional role divisions between human and AI systems. Firstly, AI systems help to human decision maker for some environmental tasks. Secondly, AI systems help human when they encounter high cognitive load. Thirdly, AI systems perform tasks where people have very limited abilities. For example, automated systems in harmful and toxic environments or nuclear reactor control rooms (p. 22).

Human-aware intelligent systems should be developed to ensure the smooth operation of human-machine collaboration and the intuitive interaction of users. Interruption models should be developed that enable intelligent systems to intervene human when necessary. Intelligent systems of the future should take into consideration the social norms and behaviors of human and invest R&D according to this aim.

Intelligent systems that can be increase human capabilities should be developed. Thanks to the human augmentation research, lots of systems could increase human cognition in many area of expertise. For example, the data reading method can be used as a good medical assistant in medicine.

Visualization and user interfaces are another areas that need improvement for human understanding of huge modern datasets and information. The communication issue is another area where human-AI collaboration is restricted. Therefore, R & D studies of user interfaces are important for the necessary communication requirements and constraints. Another research area is language processing system that provide communication between human and AI systems.

Importance of Ethical, Legal, Societal and Privacy of AI systems; Third strategy of NITRD is about ethical, legal, societal and privacy concern dimensions of AI (p.26). AI systems should be equipped with features such as being fair, honest, transparent and accountable. However, it is not clear how to put value and belief systems into an AI system. For this reason, researchers should conduct studies in this field. Although it is a philosophical issue, moral frameworks should be developed for AI systems. A multi-disciplinary approach is proposed to create datasets for training that reflect a convenient value system to cope with difficult ethical issues or contradictory values. To determine how best to design architectures for AI systems that require moral judgment, these issues need to be taken into account in basic research. Thus, researchers should focus on how to best direct the overall design of AI systems that order with ethical, legal, and societal goals.

Safety and Security AI Systems; This strategy includes the need AI systems to provide safety and security. AI systems confront some complications such as to encounter complex and uncertain conditions that are not in the system, difficult to know how the system will behave in new and sudden situations, misspecification of the aims of the system contrary to what people want to do and human intervention to the system in many cases (p. 28).

AI techniques should be explainable and transparent because of preventing incomprehensible results for users. Thus, researchers should improve researches for making more explainable and transparent AI systems. In order for AI systems to be safe, system designers need to pay attention to trust conditions. These conditions can be achieved by creating correct and reliable systems, developing informative and user-friendly interfaces and providing sufficient training to understand the system. The requirements for the

reliability of AI systems are the development of assessment, diagnostic and repair tools. The realization of these stages by the systems will reduce human intervention and a more reliable and powerful system will emerge. AI enclosed in critical systems must be powerful in order to overcome accidents, it should also be safe to a broad range of deliberate cyber attacks. The USA's organization, DARPA's Cyber Grand Challange is one of the examples of implementation of AI in cybersecurity systems.

AI Training; It is important to develop AI training and testing to improve the performance of AI systems. To diversify and develop AI applications, research on training datasets and testing needs to be replicated (p. 30). It is necessary to develop accessible and a wide variety of datasets that can respond to the evolving diversity of AI applications and procuring scientifically confidential results. Those datasets should have corrospond to the real applications in the world. In order to benefit quick from datasets, attention should be given first to access the existing data sets held by the government, those that can be developed with Federal funds, and, as far as possible, those obtained by industry.

Current, dynamic data sets that are compatible with commercial and public interests should be established. Programs should be developed at international level by using these datasets. Through these programs, AI R&D will benefit from all these programs. For example; the IMPACT program of Department of Homeland Security which is established for providing global cyber security risk research. Another strategic recommendation of document is developing open AI technologies such as software libraries. Thanks to easily accessible information from those open sytems, there can be established lots of repositories and, software producers can benefit from those. This strategy also includes the recommendation to the U.S. government should use open AI technologies, that the applications of AI should be distributed among government departments and in this way the information can be accessed more easily.

Determining Standards and Benchmarks of AI Technologies; AI technologies should be measured and evaluated with standards and benchmarks (p. 32). AI technologies must have certain standards for performing their performance safely and reliably. Those standards comprise of software engineering for managing and controlling all situations related with system; being accurate, reliable, achievable and measurable; measuring factors that affect standards and performance; to assess risk management and danger analysis of systems, human computer interactions, control systems, and compliance with laws; to provide that

interfaces and controls are effective, efficient, and intuitive; to ensure interoperability of interchangeable components, data and process models; information should be confidential, complete and appropriate; to protect information; provide data recording; to define data lexicons and the framework of information.

A data-driven standard metrics to identify AI technologies should be developed. Test environments should be developed in order to carry out researchers' work in suitable environments. With appropriate AI can easily access data. AI community -users, industry, academia and government- should work in collaboration and develop standards and benchmarks. The community should have benchmarks for developing R&D for solution of specific problems. The development of a simulation or analysis tool that makes benchmarks will accelerate the development of AI.

AI R&D Workfoce; The basis for implementing all the strategies presented in this document is to have a strong AI R & D workforce. Countries that will have this power will be the pioneers in managing the automation of the future. The way of that is countries should determine the AI R&D workforce needs of academia, industry, and government.

3.2.3. The National Artificial Intelligence Research and Development Strategic Plan: 2019 (Revised Version)

National AI R&D Strategic Plan: 2019 updated version of the first National AI R&D Strategic Plan which published in 2016, defines the priority areas for Federal investments in AI R&D in support of the American AI Initiative. New research, technical innovations, and real-world deployments have increased rapidly. This plan is related with addressing the R&D priorities associated with advancing AI technologies. It does not explain or commit policy or regulatory actions concerned to the governance or deployment of AI.

In 2019 version of Plan, there have been mentioned about subcommittees of NSTC; these are The Select Committee on AI, The NSTC Subcommittee on Machine Learning and Artificial Intelligence (MLAI) and, The AI R&D Interagency Working Group. The Select Committee on AI is the responsible body of government' AI R&D, it consists of the heads of departments and agencies related with this issue. This committee advices the Administration on interagency AI R&D priorities of the country.

MLAI is the executional and serves as the operational and implementing part of the Select Committee, responsible for tasks given from the Select Committee. The significant mission of The AI R&D Interagency Working Group is informing government-wide AI R&D spending through the NITRD Subcommittee's annual Supplement to the President's Budget.

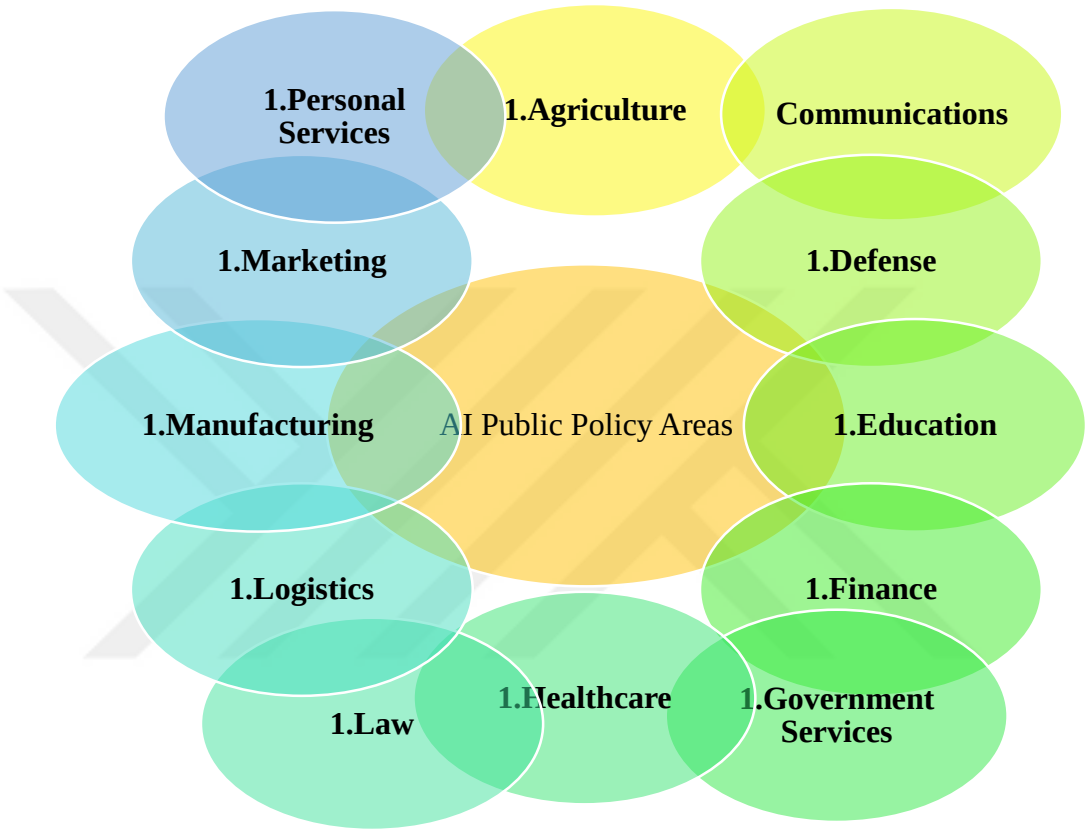


Figure 7. Al Policy Areas Mentioned in the Strategic Document of the USA

Source: Author's Compilation; Information from the related strategic document.

The strategies explained in the 2016 version of National AI R&D Strategic Plan are updated in the 2019; A new strategy added to the 2019 version of strategic document. The added "Strategy 8" contains the new aim of the USA with AI. It emphasizes, "the expand public-private partnerships to accelerate advances in AI. Promote opportunities for sustained investment in AI R&D and for transitioning advances into practical capabilities, in collaboration with academia, industry, international partners, and other non-Federal entities."

Table 3. Strategies updated in National AI R&D Strategic Plan: 2019

	Strategies updated in National AI R&D Strategic Plan: 2019
Strategy 1	Make long-term investments in AI research;
Strategy 2	Develop effective methods for human-AI collaboration;
Strategy 3	Understand and address the ethical, legal, and societal implications of AI;
Strategy 4	Ensure the safety and security of AI systems;
Strategy 5	Develop shared public datasets and environments for AI training and testing;
Strategy 6	Measure and evaluate AI technologies through standards and benchmarks; and
Strategy 7	Better understand the national AI R&D workforce needs.
Strategy 8	Expand public-private partnerships to accelerate advances in AI.

Source: Author's Compilation from the Related Document

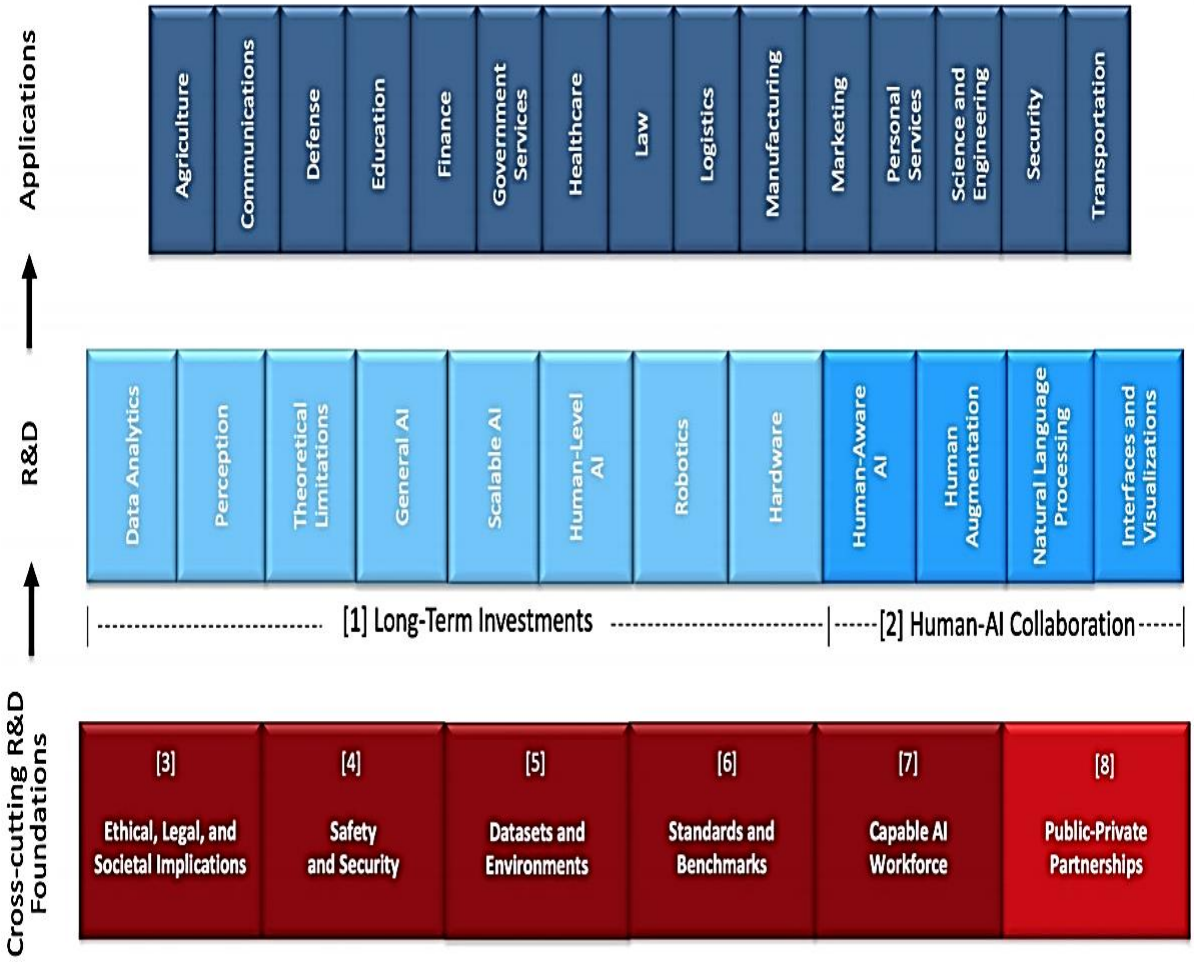


Figure 8. Organization of the AI R&D Strategic Plan

Source: The National Artificial Intelligence Research and Development Strategic Plan: 2019

Updated version of the USA national AI strategic documents more focus on the long-term investments to R&D on AI and importance of human-AI collaboration. Also, the document presents some information about policy areas and examples applications of AI in the USA.

3.2.4. Artificial Intelligence, Automation and the Economy

Artificial Intelligence, Automation and the Economy is one of the strategic documents of the USA on the issue of AI and the effects of AI to the economy of the USA. It was prepared in December 2016, after the previous reports published in October 2016, developed by a team in the Executive Office of the President. This report includes important points to effects of AI- driven automation on workers, jobs, the economy of the USA and so on. Main aim of preparing this report is to observe effects of AI- driven automation on American economy. Main argument of the paper is AI- driven automation and new technologies related with this, cause to increase necessity for workers who have certain skills (p.2). For this reason, it is important to determine economic encouragements and public policy for directing effects of technological changes more properly. This report presents strategies to train and prepare new workers to participate the workforce, alleviate workers who lose jobs, keep them connected to the labor force, and prevent inequality. In the report, the areas where AI can be utilized are, health, education, energy, economic inclusion, social welfare and transportation and the environment.

Three extensive strategies which the report put in order, are; 1) Invest in and develop AI for its many benefits, 2) Educate and train Americans for jobs of the future, 3) Aid workers in the transition and empower workers to ensure broadly shared growth.

Investment to AI : It is important to investment in policies and AI, supporting the AI workforce in the USA' s policies to accelerate productivity and take advantage of strategic advantages in sustaining AI leadership. The government play an important role in AI R&D. For this purpose, the proposal for increasing Federal funding for AI research is presented in the report. Another advise is developing AI for cyber-defense and fraud detection. AI can be used to respond quickly to cyber threats that require rapid intervention. In future, it is possible to see AI systems which could apply estimated analytics to foresee cyberattacks by creating dynamic threat models from available data sources that are very big, ever-changing, and often uncompleted.

There is one example that apply this approach for years in the USA; The Defense Advanced Research Projects Agency (DARPA) is an advanced-technology branch of the U.S. Department of Defense. The main duty of DARPA is making fundamental investments in new technologies for national security. DARPA take an important step with the Cyber Grand Challenge which is a competition to form automatic defensive systems capable of reasoning about defects, repairing patches and implementing them on a network in real time (DARPA, 2019). DARPA done the honours the world's first all-machine cyber hacking tournament under the name of Cyber Grand Challenge Final Event, was held on August 4, 2016 in Las Vegas. The competition includes 100 teams and each of them have a Cyber Reasoning System (CRS) which automatically identified software defects, and scanned a purpose-built, air-gapped network to identify affected hosts.

Another issue that can benefit from AI is to prevent fraudulent transactions and messages. AI is widely used in the industry to uncover fraudulent financial transactions and unauthorized attempts to log in to systems by imitating a user (p.28). To avoid such false and dangerous attempts, it is necessary to make use of AI by using more accurate methods.

As a result of advanced AI technologies by day by, a well-trained and skilled workforce is needed. In the report, three categories are noticed as *AI researchers* who are masters on the issues of computer science, statistics, mathematical logic and information theory, *AI specialists who are* educated in software engineering especially in the application area and *users* who are mingle with AI technologies. One of the remarkable features mentioned in the report about AI and workforce is that there is no gender discrimination in the field of AI workforce, thus there is no gender inequality in the labor force.

Training Society about AI: The second strategy of the report includes issues which are related with training Americans on some career- ready skills in match, reading, computer science and critical thinking which help workers and preparing them to the new rising jobs with AI. There is some self- criticism on the issue falling behind in terms of available, free and publically- provided prep, secondary and high school education. Therefore, it is mentioned that should be given importance to early education of youth and preparing them for the jobs of the future. It is stated that the students must complete all these school stages with the necessary skills in AI.

Another suggestion presented in the report is Federal and State policymakers should establish Administration initiatives for collecting and examining data on employment and gaining outcomes to provide accountable programs and direct funding to strategies producing results. Examples of in practice of this suggestion is College Scorecard and Workforce Innovation Act (p.34). Apprenticeships is presented as an alternative to the growth of the economy and preparing workers for AI-driven automation, that can help bring the necessary backgrounds and skills to workers. It can be said that the US government invests in apprenticeships in periods of Obama and Trump administrations. For example, in 2018, the Labor Department has invested approximately $ 16.3 million in digital apprenticeship services to track new technologies that include AI, mobile applications, data sharing, and so on (U.S Department of Labor).

Empowering Workers: Last strategy of the report includes the topic of empowering workers. At this stage, it is proposed to create a modern and strong social safety net for workers who may become unemployed or be affected negatively by the change of labor force as a result of automation. Job displacement is seen as the major problem of results of AI-driven automation. The report suggest that unemployment insurance is the strongest tool for preventing a job loss. Policy makers should create correct and functional policies by considering such problems that may arise because of automation.

The common aim of those strategies is shaping workers' needs because of changing types of jobs after developing technologies and transforming to the AI- driven automation. Also, it presents policy recommendations for workers and their families who may lost their jobs. There are some examples of job sectors which may cause to decrease number of workers: driving jobs and housecleaning jobs. Those sectors also require less education to carry out requirements of jobs. This report suggests that less- educated workers are most probably to be replaced by automation than educated workers (p.14). Also suggests that humans maintain comparative advantage over AI and robotics in many areas because of their social and general intelligence, inventiveness or human judgement. The White House Council of Economic Advisor (CEA) has suggested that the possible occupations that AI technologies may emerge in the future in the following areas: engagement, development, supervision, and response to paradigm shifts (p.18-19).

This report includes an assessment of labor force participation and inequality levels in some OECD countries. When these evaluations are examined, it is seen that inequality and participation rates cannot be explained by technological development rate, and the factors that cause differences in these countries are the differences of policies and institutions. With the help of AI- driven automation, advanced labor force, more advanced automation and high levels of productivity can be achieved, making a significant contribution to the economy. However Federal policies have an important role in this point because of helping Americans to direct transitions in labor market requests occasioned by changes in technology over time (p. 25).

In conclusion, this report looks on the bride side of AI- driven automation. Thanks to the AI- driven automation, there may be new jobs emerge on the contrary of speculative scenarios which suggest AI cause to decrease need of human. In this point, institutions and policies have an important place because of increasing benefits of AI-driven automation and reducing its damages. To sum up, AI- driven automation causes to lose jobs of some worker but emerging new occupations because of technological advancements. All of results in displacements of workers, the main issue is providing solutions from private sector and public policies. They should purpose to provide smooth and rapid transitions to new opportunities for these workers.

3.2.5. Executive Order on Maintaining American Leadership in Artificial Intelligence (February 11, 2019)

This order is about targets of the USA with developments on AI. The desire of the USA is to continue its world leader position in AI research and development. Based on this goal, making policies considering the privacy, rights, freedoms, values, and priorities of the American people. Federal Government has an important duty for Economic and National Security Research and development (R&D) and deployment: **"**to promote advancements in technology and innovation, while protecting American technology, economic and national security, civil liberties, privacy, and American values and enhancing international and industry collaboration with foreign partners and allies" (Presidential Documents, 2019: 3967).

There are five main principles which are summarized for the American AI Initiative (Section 1);

a) Development of AI in different areas: Federal Government, industry, academia.
b) To pave the way for all kinds of developments related to AI, removing obstacles of AI technologies and developments in order to establish the form of new AI related industries.
c) To train American workers to all technologies of AI for preparing them to innovations which came with AI based jobs.
d) To comprehend risks and benefits of AI technologies on American people and, to protect their rights and liberties, privacy and values of them.
e) To provide technological advantage in AI and protecting critical AI technologies for competition at international level.

The Executive Order involve the main targets of the USA with AI policies: to support AI investment in AI Research and Development, to increase access to superior quality and completely observable Federal data, models, and computing resources. Security and privacy will be protected while adapting to laws and policies in this way. One of the targets of the USA which wants to provide success with AI policies is training. In the field of science and technology, the United States is committed to providing computer science courses, technological courses, engineering, mathematics to both AI researchers and workers, as well as to federal workers Section 2).

NSTC Select Committee on Artificial Intelligence (Committee Selection) is the responsible body of the actions to be implemented by the institutions regulating all developments and innovations related to AI (Section 3).

The determination of the budget to be devoted to the research and development of AI is another issue that is emphasized in this document. There are some agencies like Office of Management and Budget (OMB) and Office of Science and Technology Policy (OSTP) which shall consider the AI researches and technologies as a priority. The heads of such institutions will take this priority into account when developing budget proposals and financing planning and, will also consider appropriate administrative actions to increase the focus on AI for current and future years (Section 4).

The procedure which is followed for the protection and improvement of federal data and models; some arrangements are envisaged by the OMB to assist in the identification of datasets to facilitate non-federal AI R&D and testing. These arrangements; The OMB Director invites the public to submit new requests and proposals within 90 days, and within 90 days, together with the OMB's Selection Committee, investigate the obstacles on access to limitation of quality data to models that interfere with Federal data and AI R & D and testing. Within 120 days, the OMB will update the implementation guide for Enterprise Data Stocks and Source Code Stocks to support exploration and availability in AI R & D, including interagency councils and the Selection Committee. After final controls of the methods by which agencies improve the quality, availability and appropriate access to the data, they are also required to identify relevant resource impacts. After this stage, it is emphasized that precautions should be taken against the dangers that may arise from the excessive public use of data and models. This protection shall apply according to arrangements of Senior Agency Officials for Privacy established pursuant to Executive Order 13719 of February 9, 2016 (Establishment of the Federal Privacy Council)

This order gives priority to the allocation of high-performance computing resources for AI-related practices, consistent with applicable laws, with the help of different departments of the government (Section 5).

For the regulation of AI applications, the OMB Director prepares a memorandum to the heads of all agencies, in coordination with the OSTP Director, the Director of the Domestic Policy Council, and the Director of the National Economic Council, and in consultation with any other appropriate agencies and key stakeholders (Section 6).

One of the important issues in this order is the effects of AI on the American workforce. The importance of AI training in all areas is emphasized in this section of the order. Within 90 days from the date of this order, the Selection Committee makes suggestions to the NSTC Committee on STEM Education related to training and workforce development of AI, which focuses on American citizens (Section 7).

In this order, it is also mentioned to draw up an action plan for to benefit from the advantages of the AI, in accordance with the USA economy and international security interests. Within 120 days, this action plan is submitted to the President and he may make different classifications on it. When the President confirm that plan, it should be implemented by all agencies who are acceptors of the NSPM, for all AI-related activities, including those directed appropriate to this order (Section 8).

There are also departments of government's own strategic plans on AI. For example, the USA Department of Defense has its own AI Strategy and, it is published after the Executive Order.

3.3. Investments

AI investments carries quite significant role in the sense that it shows the importance given to the AI by the related country. The following figure shows the funding investments in the USA from 2011 to 2019. According to it, investments in the USA found its peak in 2018 with a gradual increase beginning from 2011 lasting 2019. Venture capital funding in the U.S. attained its highest level since the turn of the millennium in the first half of 2019. According to PwC and CB Insights' quarterly MoneyTree Report: "U.S. venture capital funding increased to $55 billion in the first six months of 2019, the second highest recorded total since the peak of the dot-com boom in 2000. By the way, the number of completed deals removed to the lowest level since 2013, a trend that was offset by an increase in $100+ million mega-rounds, of which a record number of 112 were completed in the first half the year." With 64 such deals completed between April and June alone, the second quarter set an all-time record in terms of $100+ million rounds (Richter, 2019). Internet companies profited most from the surge in VC funding, drawing a total of $22.6 billion in the first half of 2019. Healthcare and Mobile & Telecommunication startups were the other main beneficiaries, increasing to $8.8 and $5.9 billion in venture capital, separately. Meanwhile, the number of venture capital backed companies valued at $1+ billion, reached a new high. According to PwC and CB Insights, the population of those companies climbed to 167 by the end of the second quarter of 2019, despite several large-scale exits in recent months.

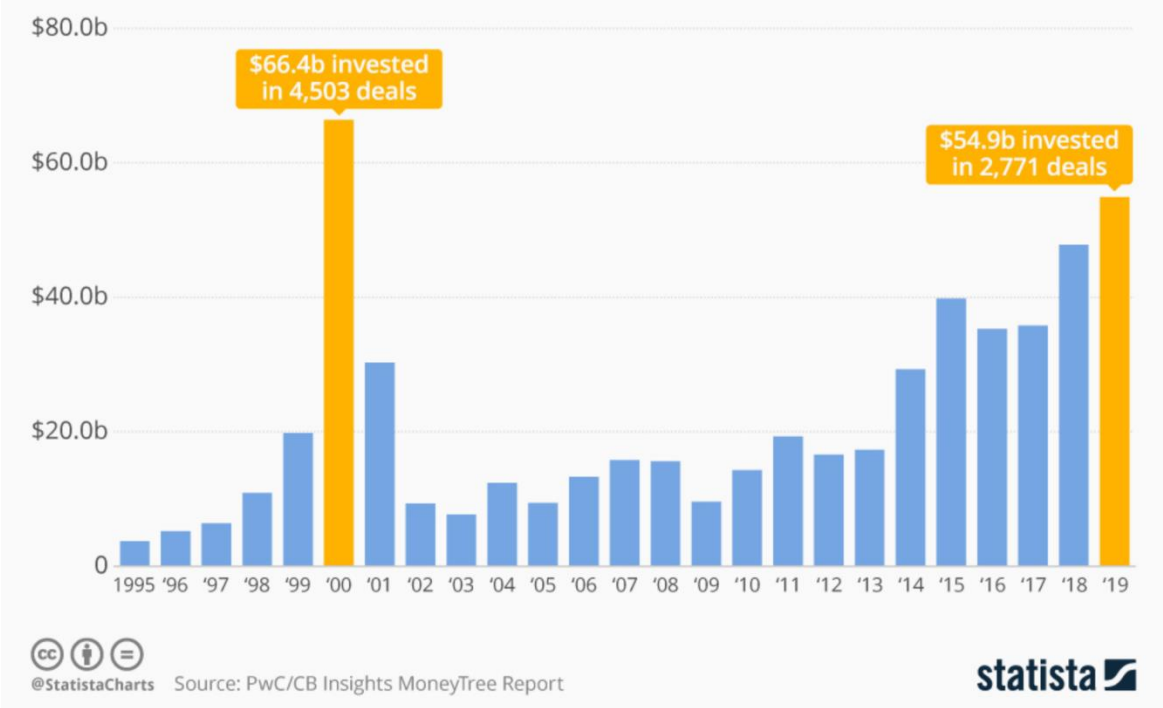


Figure 9. Total Venture Capital Investment in the USA

According to data from the National Venture Capital Association in 2019, 1,356 AI-related companies in the U.S. raised $18.457 billion. That exceeded the 1,281 companies that raised $16.8 billion in 2018, according to the Q4 2019 PitchBook-NVCA Venture Monitor (O'Brien, 2020). NVCA had planned that AI startups were on speed to set a record after Q3 funding surged. They managed to set the new high after $4 billion was raised by 267 AI-related startups during the last three months of 2019. That was a slight dip from the $4.4 billion raised in Q3 2019.

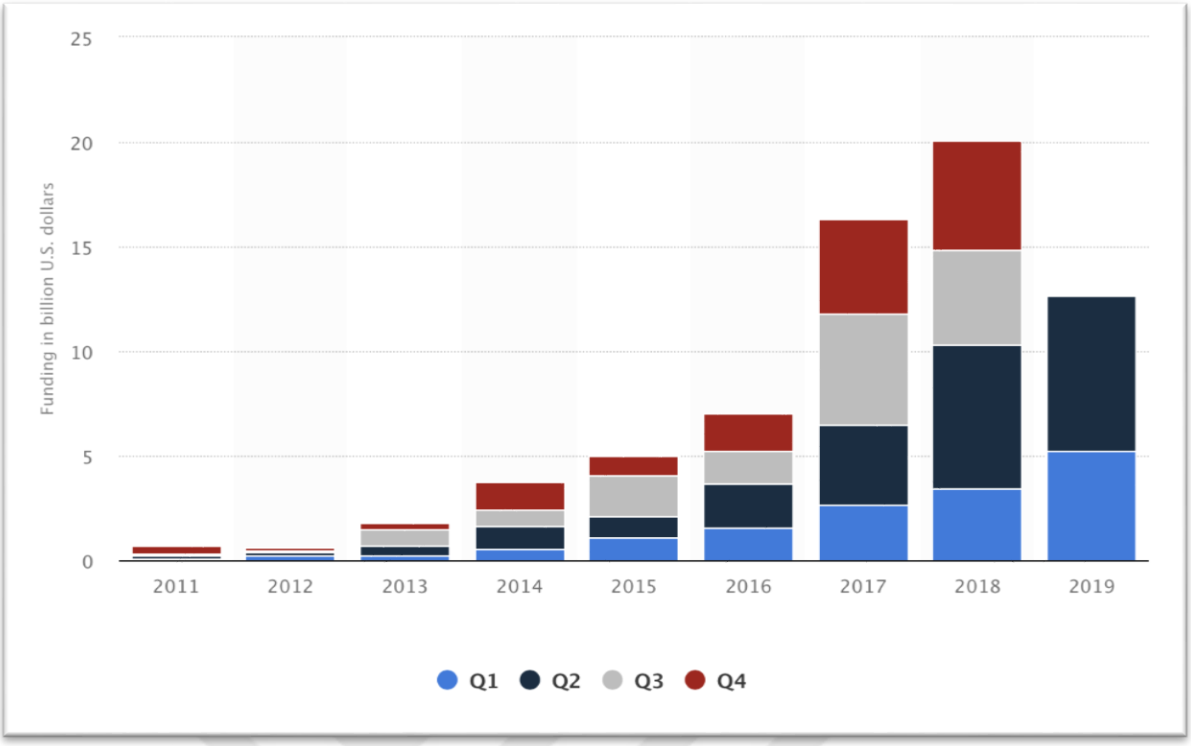


Figure 10. (AI) funding investment in the USA (2011 – 2019)

Source: Statista, 2019.

Companies in the space raised $6.62 billion so far in 2019, which puts us on pace to slightly top the 2018 total of $8.67 billion. Global funding, meanwhile, is holding strong but has seen some pullback amid a broader decline in Chinese startup investment.

Brightfield; is a New York City-based AI and Big Data analytics company which optimizes compromise labor spend and program performance for employers, MSPs, and staffing firms made US$53 million in early-stage funding round. By this fund, the company plans to fuel its market growth and the continuing development of its platform, Talent Data Exchange (TDX).

Aurora Insight; is a company which centered in Washington, DC. It is a startup that help firms to deploy, optimize, and increase next-generation wireless with the first dynamic map of connectivity and the radio spectrum using AI along with data from sensors on satellites, vehicles, buildings, aircraft, and other objects. With securing US$18 million in series A funding, a total amount that reach back to its establishing in 2016 and maintains both a core round and Series A.

Besides to funds from the private sector, basic research procures funding owing to a key part of the government's annual AI R&D budget (1.3 billion Euro). The USA gives priority to AI especially in specific sectors such as medical diagnostics and precision agriculture, autonomous transportation and national defense. So, in the federal budget, it allocates a very important place for institutions related to these sectors. It makes a budget approximately $850 million at the Department of Energy (DOE), National Institutes of Health (NIH), National Institute of Standards and Technology (NIST), and National Science Foundation (NSF) (FY Budget of the USA, 2020).

3.4. Public Policies/Regulations

National Strategic Research and Development Plan for Artificial Intelligence, which is the main strategic document of the USA, determine the framework of the regulation of AI in the USA. On January 7, 2019, following an "Executive Order on Maintaining American Leadership in Artificial Intelligence", the White House's Office of Science and Technology Policy presented a draft Guidance for Regulation of AI Applications, which contains ten principles for United States agencies when assigning whether and how to regulate AI. Thirty-nine draft laws with the expression "artificial intelligence" were introduced in the draft text presented at the 115th Congress. Only four of these bills have been passed into law. In order to fulfill its duties, the Commission is allocated a resource not exceeding $10,000,000 for the Ministry of Defense (*H. r. 5356*, 2018: 6).

115th Congress;

- **National Security Commission Artificial Intelligence Act of 2018**

This act includes the establishment of the National Security Commission on Artificial Intelligence which is an independent establishment of the Federal Government (*H. r. 5356*, 2018: 1). In this act, the competitiveness and technological advantage of AI for the USA are mentioned. This commission has been assigned the task of evaluating the development and trends of AI especially at the international level, the methods that the United States has in order to improve its competitiveness in this field, and to gain advantage in this field, and to evaluate its situation in all departments of the United States (education, military, etc.).

- **John S. McCain National Defense Authorization Act for Fiscal Year 2019**
  Sec. 238. of John S. McCain National Defense Authorization Act for Fiscal Year 2019,

is related with the fields of AI research, development, and transition activities. The Secretary of Defense be tasked with establish a set of activities within the Department of Defense to organize the attempts of the Department to improve, mature, and transition AI into operational use (Public Law, 2018: 132).

- **Federal Automated Vehicles Policy**

A transportation policy that was established by U.S. Department of Transportation (DOT) through the National Highway Traffic Safety Administration (NHTSA) in September 2016 (Federal Automated Vehicles Policy, 2016: 5). Firstly, it was developed in the private sector and after with NHTSA's security programs and regulatory authority to maintain the public. The main aim of the policy is saving the lives of people.

- **Future of Artificial Intelligence Act of 2017**

The main aims of this act is to understand the development and requirements of AI for economic welfare and social stability of the USA; to determine the benefits of AI for society; to support conditions of investment and innovation to provide the global competitiveness of the U.S.; to optimize and regulate the changing United States workforce that results from the development of AI.

A Federal advisory committee is established by the Secretary of Commerce to advise the Secretary on issues relevant to the development of AI. It gives advice on the issues like international competitiveness of the USA with international industries, including topics relating to the increasing of public and private sector investment and innovation into the development of AI; issues related to the training of workers on the subjects of science, technology, engineering and mathematics education for the changing workforce arising from the development of AI; to give importance to the ethic training and, open share data and research; accountability and legal rights against any liability for violations of law arising from the AI system.

The Future of AI Act names the Department of Commerce responsible for executing government policy on AI and leads the Department to form an consultative committee runned with offering recommendations within 18 months on how the government and business can work together to address concerns in four key areas (The USA Congressional Artificial Intelligence Caucus, 2017):

- Potential growth, restructuring, and other changes for the U.S. workforce that result from adoption of AI, including potential actions to train and skill workers for an AI workplace
- Protecting the privacy rights of individuals as AI continues to grow
- Promoting a climate of innovation to ensure global competitiveness for American companies developing AI technologies
- Supporting the development and application of unbiased AI.

116th Congress;

- **AI in Government Act of 2019**

There has been an agency under the name of "AI Center of Excellence (AI CoE)" established within this act (*H. r. 2575*, 2019: 1). This agency has various duties, but main duty of the agency is to offer suggestions to Federal government for innovative use of AI in government services. There is an Administrator who is responsible for providing staff, resources and administrative support for AI systems. The Administrator is also liable to submit an annual report to Congress about agency's activities such as projects, collaborations etc. AI CoE puts in order some Agency Governance Plans which are prepared for following AI systems' application situations and recent situations. The agency has also an Advisory Board which comprise of people from several institutions like The Office of Science and Technology Policy and The Department of Commerce. It can be said that the theme of this act is to provide AI systems for benefit of the USA Citizens via a government agency.

- **Artificial Intelligence Initiative Act (AI-IA)**

Aim of this act is providing a national AI initiative with an extensive strategies and coordination with institutions on R&D on AI (*S.1558*, 2019: 2). This act gives to The President some rights for establishing and implementing an initiative about AI to be known as the ‘‘National Artificial Intelligence Research and Development Initiative’’. The establishment of an office which is known as the ‘‘National Artificial Intelligence Coordination Office’’ is mentioned in the act.

The Director of the OSTP, in advise with the Director of the National Science Foundation, the Secretary of Energy, and the Secretary of Commerce, shall establish or appoint a director of for this office *(S.1558,* 2019: 10). The important point of duty of this office is serving as connection on Federal AI activities for government organizations, academia, industry, professional societies, State AI programs, interested citizen groups, and others to inform about technical and programmatic information.

The OSTP is also responsible for establishing an Interagency Committee on AI. This Committee contains of representatives from; “The National Institute of Standards and Technology, The National Science Foundation, The Department of Energy, The National Aeronautics and Space Administration, The Department of Defense, The Office of the Director of National Intelligence, The Office of Management and Budget, The Office of Science and Technology Policy, The National Institutes of Health and, any other Federal agency the Director of the Office of Science and Technology Policy takes into account convenient” (S.1558, 2019: 12-13).

3.5. The USA Institutions Working on AI Policies

There are some institutions which are responsible for the AI policy issues in USA. While some institutions are specially focus on AI issues, some are major the U.S. institutions dealing with science and technology.

3.5.1. The National Science and Technology Council (NSTC)

National Science and Technology Council (NSTC) is -a Cabinet-level council- the main tool of the Executive Branch for coordinating science and technology (S&T) policy through the various entities that compose the Federal research and development establishment. The main duty of the NSTC is to convene Federal leaders of S&T and entities for determining national targets of national science and technology and investment. The Council prepares research and development strategies that are coordinated among Federal institutions to achieve national objectives. There are six primary committees that organizes the NSTC's strategies and goals; S&T Enterprise, Environment, Homeland and National Security, Science, STEM Education, and Technology.

Also, it has two other committee which are The Select Committee on AI and the Joint Committee on Research Environments (Whitehouse.gov, 2019).

3.5.2. The Select Committee on AI

The Select Committee on AI is one of the committees that is encountered when examining AI policies in the United States. The Select Committee on AI, created in June 2018, it commends to The White House on interagency AI R&D priorities and developing the coordination of Federal AI initiatives to provide sustained the U.S. leadership in this field. The aim of the Select Committee is to notice and help the NSTC to develop the entire effectiveness and productivity of Federal research and development (R&D) initiatives related to AI. This committee ensures interagency coordination on key national and international policy issues and provides a formal mechanism for the development of Federal AI activities. In the official document, the main functions of the Select Committee on AI are as follows: to ensure AI R & D planning, facilitate coordination and communication between federal departments and agencies, to advise the NSTC about AI priorities, to provide partnerships with academia and industry by encouraging agency AI-related programs and initiatives, to reduce the barriers of federal data and improving fastest access for both Federal and non-Federal AI R&D, to work in coordinated with other NSTC committees and allow of NSTC openness of documents formed by interagency groups that are founded under its protection.

3.5.3. The White House Office of Science and Technology Policy (OSTP) -2016

The Office of Science and Technology Policy (OSTP) was constituted by the National Science and Technology Policy, Organization, and Priorities Act of 1976. The three aims of OSTP are to provide scientific and technical recommendations to President and his senior staff, to ensure that the policies of the Executive Branch informed reliably and to provide the greatest benefit to society. OSTP has built a team that consists of scientists, engineers, policymakers, and academicians for advising the President about science and technology issues. Policy advisors of OSTP inform and give advice to president on such issues: "advanced manufacturing, AI, autonomous systems, biotechnology, cybersecurity, digital economy, disaster preparedness, healthcare, infectious diseases, information technology, medicine, nanotechnology, nuclear energy, ocean science, quantum information sciences, space and aeronautics, and telecommunications" (Executive Office of the President of the USA, 2017: 3). In this document, OSTP mentions the steps taken in the name of science and technology in the Trump Administration process. One of these steps is the developments in the field of AI. According to document, main aims for reaching the achievement in AI area (Executive Office of the President of the USA, 2017: 4);

- Removing regulatory barriers to commercializing autonomous systems.
- Integrating drones into the National Airspace System.
- Enabling the safe deployment of automated vehicles onto American roads.
- Using machine learning to improve patient health outcomes.

To summarize, The USA is an important country that contributes greatly to the AI literature with its long AI research and development process and invented AI systems. Since 2016, AI has become an important example for other countries with the emergence of AI policies and more on the agenda of the USA. It is also the leading country in the world in terms of investments in AI. In addition, the USA federal state structure and strong public institutions have a very strong foundation for AI policies.

4. PUBLIC POLICIES OF CHINA on ARTIFICIAL INTELLIGENCE

The Chinese government started to determine strategies for developing the country into the world's major innovation center in the field of AI by 2030 (Kewalramani, 2018: 3). China started to prepare its national strategic plan in 2016. The government has determined several policies to support the improvement of AI, covering capital, IP protection, human resources development and international cooperation. China gives importance to both theoretical studies and integration of Al into the real economy. For this reason, it gives priority to increasing resources for policies (WIPO, 2019: 124).

The State Council of China published the Next Generation AI Development Plan in 2017, setting as an aim for the country "to become the world's primary innovation center by 2030, with the output of AI industries passing RNB 1 trillion." This is completed by local government policies intended to support varied regions and ensure encouragements to AI companies to base themselves in respective provinces (p.127).

It can be said that China has taken the USA as a reference when determining AI strategies. It appears in the documents examined that China considers the AI strategy as bilateral competition (Ding, 2018: 4). The turning point of China's AI strategies is victory of Google DeepMind's AlphaGo over Lee Sedol in March 2016. After this situation, Chinese government more focus on AI (Ding, 2018: 7). For example, in June 2017, before the State Council issued the AI document (New Generation AI Development Plan), the government of Tianjin City announced that it had invested USD 5 billion to the AI industry (Mozur, 2017). The primary AI-related development support of China's government was seen on **smart manufacturing** especially consists of **robotics** and **domestic innovation**. After that, State Council of China has activated 15 agencies with applying their AI plan and those bureaucratic agencies started to compete for authority over AI policy (Ding, 2018: 10).

4.1. History of AI in China

Current policies, technological developments, future potentials of AI in all countries like China, are mostly draw attention in researches. However, the history of AI in China is important to understand how the current state came to be like that and, why it decided to develop in this field. Most studies on the history of AI concentrate on the western world, especially the United States (Jieshu, 2018). There are determinant issues like becoming one of the world's leaders of AI, Chinese scientists' viewpoints at AI in the 1950s and 1960s when AI was just born, the importance effects of the political ideology effects of AI in China.

It is believed that during the years when AI emerged, Chinese researchers were influenced by the ideas and studies of Russian cybernetics researchers. There are an accepted idea is that AI emerged from cybernetics, the "study of control and communication in the animal and the machine," as defined by N. Wiener in his book "Cybernetics: Or Control and Communication in the Animal and the Machine" in 1948 (Jieshu, 2018). While in the West in the 1950s, there were studies on the issue of computing, relations between computer and human intelligence, and many new ideas, it seems that the history of research on these issues in China is not the same. For example, some of researchers in the west and some of studies they have mentioned are as follows: Alan Turing's Turing Test, Isaac Asimov's "Three Rules of Robotics," Allen Newell and Herbert Simon's Logic Theory Machine, John McCarthy's the language of LISP and Arthur Samuel's Checkers-playing Program (Jieshu, 2018).

There are two main reasons why research on cybernetics or AI has not been seen in the past of China; these are ***economic damage*** caused by the Second World War and ***political ideology*** under the influence of the Soviet Union. Therefore, to understand the origins of AI in China, it is necessary to investigate the history of cybernetics in the Soviet Union. When PRC was established in 1949, China and Soviet Union signed the Sino-Soviet Treaty of Friendship, Alliance and Mutual Assistance, or Sino-Soviet Treaty of Friendship and Alliance, in 1950. The treaty designed to include a series of issues such as military and diplomacy to buy Soviet equipment by China, an initial 300USD million loan and another 520RUB million in 1954 (Jieshu, 2018). Beginning with those issues lived between China and Soviet Union, China was affected from Soviet's scientific and technological developments and policies during 1950s.

The Soviet Union also provided China with a large amount of assistance in the 1950s. For all that, the Chinese government preferred to implement the Soviet model of a planned economy and quickly adopted the First Five-Year Plan in 1953. In this year, The Chinese Academy of Sciences (CAS) - is a fundamental scientific consultation institution in China-delegation of 26 scientists went to the Soviet Union to know its experience on the improving of science and technology (Li, et. al.,2016: 2).

In 1956, the State Planning Committee and other related government departments prepared the "The Twelve-Year National Long-term Outline for Science and Technology Development (1956–1967)" which is the important step for the long-term plan for science and technology development in PRC (Li, et. al.,2016: 2). Then the State Planning Committee of Science with 35 members was established for preparing "The Twelve-Year Plan". This plan is the first long-term plan that supports the progress of science and technology in New China. However, during 1950s, there is no research on cybernetics, let alone AI. Two reasons of this consequences are damage of the WWII on China and to affect from Soviet political ideology, which, under Stalin, noted cybernetics as a bourgeois and reactionary pseudoscience. Some scientists understand the importance of cybernetics and support it for including into the "The Twelve-Year Plan" in 1956, but the plan was incomplete and was not very efficient (Jieshu, 2018).

In 1960s, China were not embraced Cybernetics and AI because Soviet scientists, philosophers, and the general public were use those technologies for realizing the aim of Marxism-Leninism. However, after a certain point, China decided to use cybernetics and AI because of to attack Soviet ideology with those technologies. Before the end of 1970s, China saw the AI and Cybernetics are the tools of attacking political ideology of Soviet Union.

The year 1978 was a milestone for improving science and technology especially cybernetics and AI in China. The first step in this period is holding a conference - National Science Conference- by the Central Committee of the CPC and the State Council to repair and simplify science and technology in China (Jieshu, 2018). In the 1980s, expert systems became widespread in AI research and applications. In those years, were witnessed a quick improvement in AI research in China. In China, establishment of Chinese Association for Artificial Intelligence (CAAI) is an important step for improving AI. Because, it was the first official research institute in China committed to particularly on AI.

After that, in 1982, the first academic journal was published in China on the topic of AI, which was named The Journal of Artificial Intelligence.

In 1988, the first Chinese original book on robotics was published. In 1989, the first China Joint Conference on Artificial Intelligence (CJCAI) was held. In the same year, the journal of Pattern Recognition and Artificial Intelligence was launched (Jieshu, 2018).

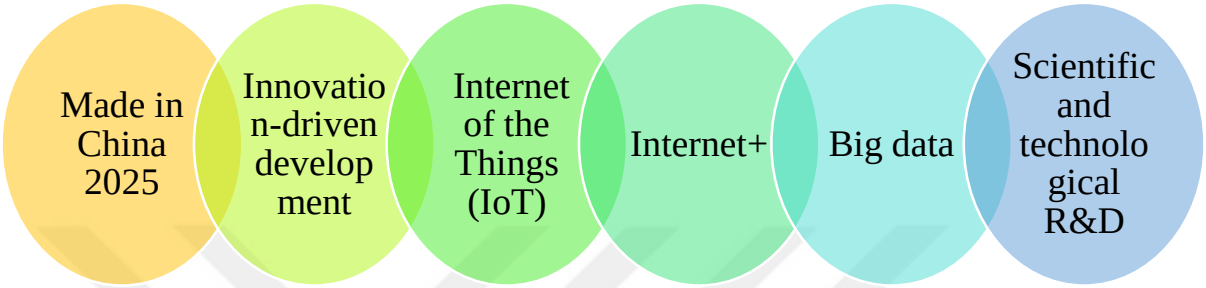


Figure 11. Categories of China's AI policy fields

Since 2009, China's AI policy may comprise of five phases within the three-time period: early period, middle period and the after 2017 period. The early period involves "IoT, information security and database, the middle period comprises to big data and infrastructure and, after 2017 period contains to AI itself and intellectual property protection." Overall, China's AI policy mainly focuses on six categories: "made in China", innovation-driven development, IoT, Internet+, big data, and scientific and technological R&D."

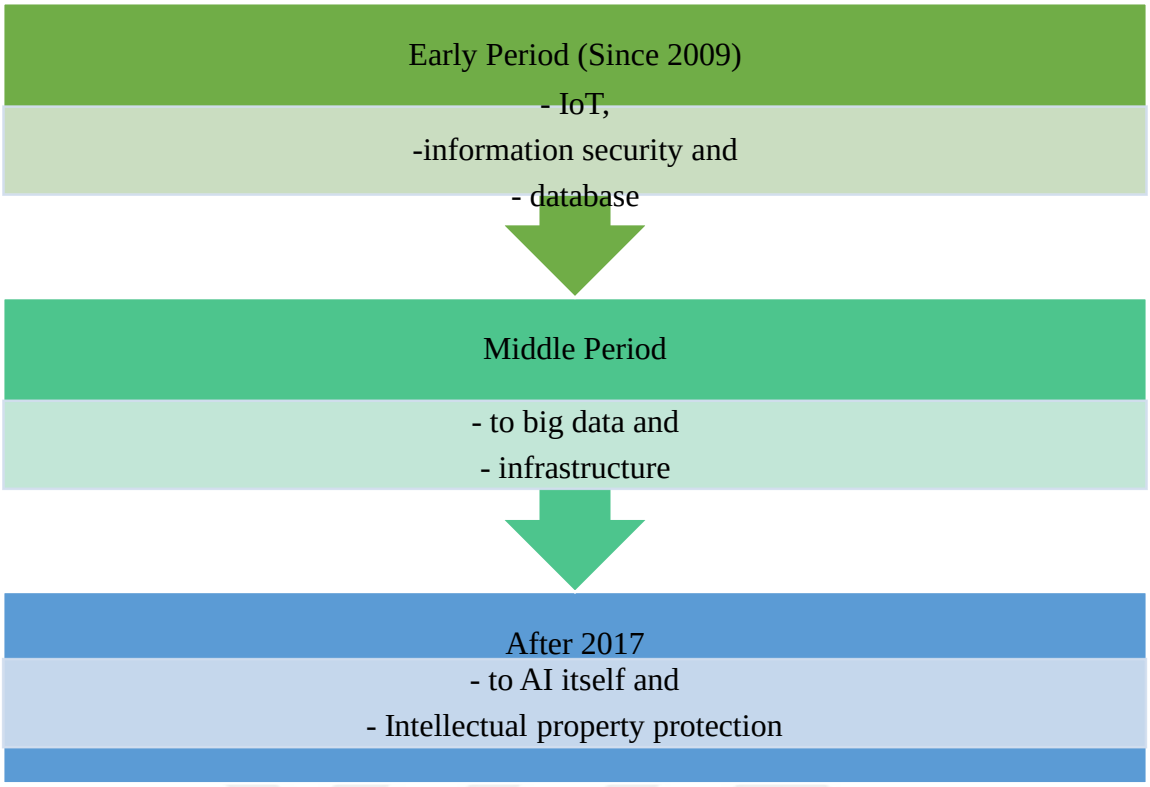


Figure 12. AI History of China (2009-2017)

Source: Author's Compilation.

AI is an important political and military power of China and, as a significant technologic strength to increase China's economy, enabling China to be a world- power. Chinese government is investing extremely in all aspects of AI research, including knowledge computing, swarm intelligence, autonomous unmanned systems, and natural language processing (Sagramsingh, 2019: 36). Regardless of the resources of other nations and their expertise in AI, the Chinese government determines its aim to be a world power on the issue of AI and, gives precedence the use of AI in the military field beyond all other strategic fields (Sagramsingh, 2019: 37).

Next Generation of AI is the best movement in the history of science and technology (S&T) progress in China and the first systematic and strategic plan in AI field (China Association for International Science and Technology Cooperation, 2017). The Plan is an important turning point of China's AI strategy. However, it was not start with this document of State Council. For example, before published this document, the government of the Chinese city of Tianjin had announced a USD 5 billion fund to support the AI industry (Mozur, 2017).

In 2016, the Chinese “Three-Year Guidance for Internet Plus Artificial Intelligence Plan (2016-2018)” signified the attempt to make AI a strong motivational force in socioeconomic and cultural development. The Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018–2020) supported this attempt. These three-year plans are more directed towards provision of immediate guidelines to countries. The latest plan outlines four major tasks for this time period, including the creation of targets for the development of “smart products” like networked vehicles, intelligent service robots, and video image identification systems; achieving breakthroughs in “core foundations” like neural network chips; fostering the development of “intelligent manufacturing”; and building a public support system, for instance, by accelerating the development of an “intelligent next-generation internet”. This work will be overseen by the Ministry of Industry and Information Technology (MIIT). (Triolo, Kania, Webster, 2018.)

As Triolo and others (2018) underlined, there are also local government AI policy initiatives throughout China. For example, the Shanghai government issued its own implementation plan for new generation AI in November 2017; Beijing announced a major new AI-focused industrial park to be constructed in Mentougou District in January 2018; Guangzhou launched an International Institute of AI; and many other districts have promised funds for AI research.

4.2. National AI Strategy

AI have been seen a new focus of international competition by China. For leading the future, China thought that the AI is a strategic technology. So, the country focus on the determining its national AI strategy. There have been significant strategy documents and plans published by Chinese government. AI strategy of China fundamentally concentrates on six categories: “made in China”, innovation-driven development, IoT, Internet+, big data, and scientific and technological R&D (CISTP, 2018: 5).

Table 4. Important AI Plans of Chinese Government

Plans	Description	Key Elements	Importance
Made in China 2025 (MIC 2025)	This plan recommends a "three-step" strategy of transforming China into a leading manufacturing power by the year 2049	The strategy mainly focuses on intelligent manufacturing in 10 strategic sectors	China aims with this plan to secure its position as a global powerhouse in high-tech industries such as robotics, aviation, and new energy vehicles such as electric and biogas
13th Five Year Plan for Developing National Strategic and Emerging Industries (2016-2020	The document specifies implementation measures for the 13th Five-Year Plan and focused on strategic industries.	Highlighted development of AI as a significant tasks for the central government to maintain; Identified five agencies responsible for developing central government policies in AI in the next five years	Links AI to the current Five-Year Plan through this guiding plan
New Generation Artificial Intelligence Development Plan (AIDP) (July 2017)	The document explains the main principles of Chinese AI policies. Its main responsible actors which shaped the document are State Council - is the first institution that prepare the document related with AI- and CPC Central Committee.	China sees AI as the new focus of international competition and strategic technology guide of the future. For this reason, while determining the AI strategy, it forms its policies and plans within the framework of national competition, national security, and economic development.	Primary aim on preparing this document is to benefit from the first- mover advantage, to accelerate the construction of innovative countries and to be a science and technology power of the world

Three Year Guidance for Internet Plus Artificial Intelligence Plan (May 18, 2016)	The plan coordinates China's ambitious goals in point of AI focusing on 4 key areas.	Those areas are intelligent and connected vehicles (ICV); intelligent sensors; smart manufacturing; AI ecosystem	The plan determines the strategic aims of China with AI.
Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018-2020)	MIIT action plan for implementing tasks related to State Council's AI Plan and "Made in China 2025"	Sets out specific benchmarks for 2020 in a range of AI products and services, including smart, inter-connected cars, and intelligent service robots	To aim showing government's strong guiding role in developing the AI industry

Source: Author Compilation.

4.2.1. Made in China 2025 (MIC 2025)

"Made in China 2025" is a State Council plan that issued on May 8, 2015. It aims to transform China a world manufacturing power. The plan is the country's first action plan focusing on promoting manufacturing, supported by Premier Li Keqiang. This plan recommend a "three-step" strategy of transforming China into a leading manufacturing power by the year 2049 in line with the basic principle of "innovation driven, quality first, green development, structurally optimizes and human-oriented" and the basic principle of "market orientation, government guidance, focus on the present, look into the future, overall promotion, key breakthroughs, independent development, opening and cooperation" (Liu, 2016; Li, 2017; Zhang, Peek, Pikas, & Lee, 2016). The main ten target areas are determined as including next generation information technology, aviation, rail, new energy vehicles, and agricultural machinery.

This plan focuses on reforming and modernizing China's manufacturing sector. It presents a roadmap of intelligent manufacturing in 10 strategic sectors (Figure 11) and to aim of securing China’s position as a global powerhouse in high-tech industries such as robotics, aviation, and new energy vehicles such as electric and biogas (Institute for Security& Development Policy, 2018: 1). China emphases to give priority to next-generation information technologies such as AI, cybersecurity services, integrated circuits and network equipment and software.



Figure 13. The key sectors that will benefit from MIC 2025

Source: MIC 2025.

China created this plan, inspired by Germany's "Industry 4.0" plan. This shows us that China contributes to the development of the country by following the developments in other countries very closely and developing these developments with a different approach and innovation effort.

4.2.2. 13th Five Year Plan (2016)

The 13th Five-Year Plan (2016–2020) is approved by the National People's Congress in March 2016. It established by Chinese President and General Secretary of the Chinese Communist Party (CCP) and emphises Xi Jinping's vision for China's development over five years period. The plan created a blueprint for China's future development based around five key themes: "innovation, coordinated development, green growth, openness, inclusive growth." 13th Five Year Plan for Developing National Strategic and Emerging Industries, is a state council policy document which specifies implementation measures for the 13th Five-Year Plan, focused on strategic industries (The 13th Five- Year Plan, 2016).

The plan also includes some issues and plans about AI under the headings of "Develop China into a Manufacturing Powerhouse" (Chapter 22)-"Lower Business Costs in the Real Economy" (section 6), "Develop Strategic Emerging Industries" (Chapter 23)- "A Better Environment for Developing Emerging Industries" (Section 4) "Build Ubiquitous, Efficient Information Networks" (Chapter 25)- "New Information Network Technology" (Section 3), "Strengthen Information Security" (Chapter 28)- "Full Protection of Important Information Systems":

There are some strategic aims for promoting AI: "to develop industrial, service, surgical, and military robots, to promote independence in the design and production of high-precision retarders, high-speed high-performance controllers, high-performance servo motors and drives, and other key parts and components, to facilitate the commercial application of AI technologies in all sectors, to foster AI, intelligent hardware, new display technologies, smart mobile terminals, 5G mobile communications, advanced sensors, and wearable devices into becoming new areas of growth, to focus on making breakthroughs in key big data and cloud computing technologies, independently controllable operating systems, high-end industrial software and large management software, and AI technologies for emerging areas, to promote "Internet +" in starting up businesses, innovation, collaborative manufacturing, smart energy, inclusive finance, public-interest services, high-efficiency logistics, e-commerce, convenient transportation, ecological conservation, AI, e-taxation, convenient judicial services, education, training, scientific popularization, geographical information, credit, and cultural tourism." (Section 3) (The 13th Five- Year Plan, 2016: 64-67-72-77);

The plan also contains some other development plans like: **“**Robotics Industry Development Plan” which is established to develop robotics industry released by the NDRC, the MIIT, and the Ministry of Finance (MOF). The plan sets specific targets for advancing the robotics industry; the second of two development plans containing a focus on AI released by central agencies with a policy planning mandate and, goal of manufacturing 100,000 industrial robots annually by 2020, making China the world’s leading robot-maker.

4.2.3. New Generation Artificial Intelligence Development Plan (AIDP) (July 2017)

This document explains the main principles of Chinese AI policies. Its main responsible actors which shaped the document are State Council - is the first institution that prepare the document related with AI- and CPC Central Committee. The document established by those two, on July 8, 2017. Primary aim on preparing this document is to benefit from the first- mover advantage, to accelerate the construction of innovative countries and to be a science and technology power of the world (p. 1). China regards AI as a tool for national competitiveness, national security, and economic development.

To be effective in China's economic development, the aim is to put AI into practice rapidly. The application of AI in education, health, environmental protection, urban process, legal services, and many other areas makes significant contributions to the social structure.

The main issues examined in this document are to understand the transition from digitalization and computer networks to the automation process and, to determine disciplines, theoretical modeling, technological development, hardware, and software for a new generation of AI.

China sees AI as the new focus of international competition and strategic technology guide of the future. For this reason, while determining the AI strategy, it forms its policies and plans within the framework of national competition, national security, and economic development. Considering that AI will affect government management, economic security and social stability, China thinks that security risk should be given great importance.

One of the different discourses observed in China's strategic documents is that a party spirit should be practiced. This part goes as follows (p.3-4):

> "*We shall comprehensively implement the spirit of the 18th CPC National Congress, as well as the third, fourth, fifth and sixth plenary sessions of the 18th CPC Central Committee, and thoroughly study and implement the new spirit of the speeches delivered by Xi Jinping and his new series of ideas. In accordance with the overall plan to seek economic, political, cultural, social, and ecological progress and the Four-pronged Strategy, we shall conscientiously implement the decision-making arrangements by CPC Central Committee and State Council and the in-depth innovation-driven development strategy to accelerate the integration of artificial intelligence and economy, society and defense and enhance a new generation of artificial intelligence scientific and technological innovation capacity as the main direction."*

As can be seen in this paragraph, it is stated that the ideas of president Xi Jinping and party should be emphasized. (In the strategic documents of the USA, such a situation was not encountered.

- **Basic Principles**

Basic principles of the New Generation of AI are; **1)To be the leader of technology**: The aim of being a leader by closely following all kinds of developments in AI, R&D deployment, and the prominent areas., systematic layouts, market- oriented, open source. **2)To provide systematic layouts:** The principle of making use of all the advantages of the socialist system when determining systematic regulations. **3)To follow the rules of the market:** the principle of managing the relationship between the government and the market and providing government support in guidance, policy support, security, market order, environmental structure, and ethical regulations. **4) To support the concept of open source and sharing:** The principle of promoting the sharing of the production, research, and innovation. The important point of this principle is the aim of promoting the new style of military and civilian integration of all elements. This is also one of the different sides of the Chinese strategic document from the USA.

- **Strategic Goals**

In this document, China sets out a three-step AI strategic goal.

The first step, by 2020, includes the aim of establishing new generation of AI theory and technology. Improving AI industry competitiveness is another first step goal. To achieve this goal, it is stated that it is necessary to raise the world's leading AI enterprises and, to render scale of AI core industry to more than 150 billion yuan and to increase the scale of the related industries by more than 1 trillion yuan. The other aim in this step is to give importance to the innovation and application, to establish AI ethic norms, policies and regulations while optimizing AI improvement environment.

The second step, by 2025, the primary aim in this step is establishing the construction of AI society with developing more advance theory. A new generation of AI for using technologies like “intelligent manufacturing, intelligent medical care, intelligent cities, intelligent agriculture and, national defense construction.” The scale of the core industry scale of AI will be worth than 400 billion yuan, implementing the scale of related industries to be more than 5 trillion yuan.

The third step, by 2030, the main aim is to provide conditions which lead the China to be the major AI innovation center of the world with its AI theory, technology, and application standards. To develop brain intelligence, independent intelligence, mixed intelligence, and group intelligence and to give priority to the field of international AI. It aims to further increase the competitiveness of the AI industry internationally. It aims “to foster widely and deeply AI in production and life, social governance, national defense construction and all aspects. To make core industry scale of AI be more than 1 Trillion yuan, driving the scale of related industries be more than 10 trillion yuan.”

China has implemented the conditions, it has determined on the path to reach its short and long term goals related to AI as **"Three-in-one"** rule, These three target paths are as follows: promotion of R&D, product applications and industry training an AI.

- **Key Tasks**

State Council and the CPC Central Committee of China have determined primary six key tasks for catching the development trend of global AI. These six tasks are showed on figure 11. In this document primary aims and tasks of Chinese government are presented under these issues; technology system of AI, intelligent economy, intelligent society, military- civilian integration with AI, intelligent infrastructure system and major science and technology projects with AI.

Build open and cooperative technology system of AI

For maximizing AI technology of China, it is necessary to provide more contributions to AI improvement via the deployment of the frontier **basic theory**, the **key common technology system**, the **basic platform**, **personnel** and **other conditions** and the presentation of open source sharing and the capability of the permanent system innovation progress.

- **Basic Theory**

Basic theory comprises of the large data intelligence theory, Cross- media perceptual computing theory, The theory of mixed enhancement and intelligence, The theory of group intelligence, Autonomous collaborative control and optimization decision theory, Brain intelligent computing theory, Quantum Intelligence Computing Theory and, Advanced machine learning theory. Targets of the basic theory are leading AI technology, large data intelligent, computing, human-machine hybrid intelligence, group intelligence, autonomous collaboration, decision-making.

- **Key Common Technology System**

China aims that the new generation of AI should adopt the key common technology. Those technology examined under eight sub technology heading. It comprises of the some proposals which are knowledge computing machine and knowledge service technology, cross-media analysis reasoning technology, key technologies of group intelligence, new architecture and new technology of hybrid enhanced intelligence, independent unmanned system of intelligent technology, virtual reality intelligent modeling technology, intelligent computing chip and system and, natural language processing technology.

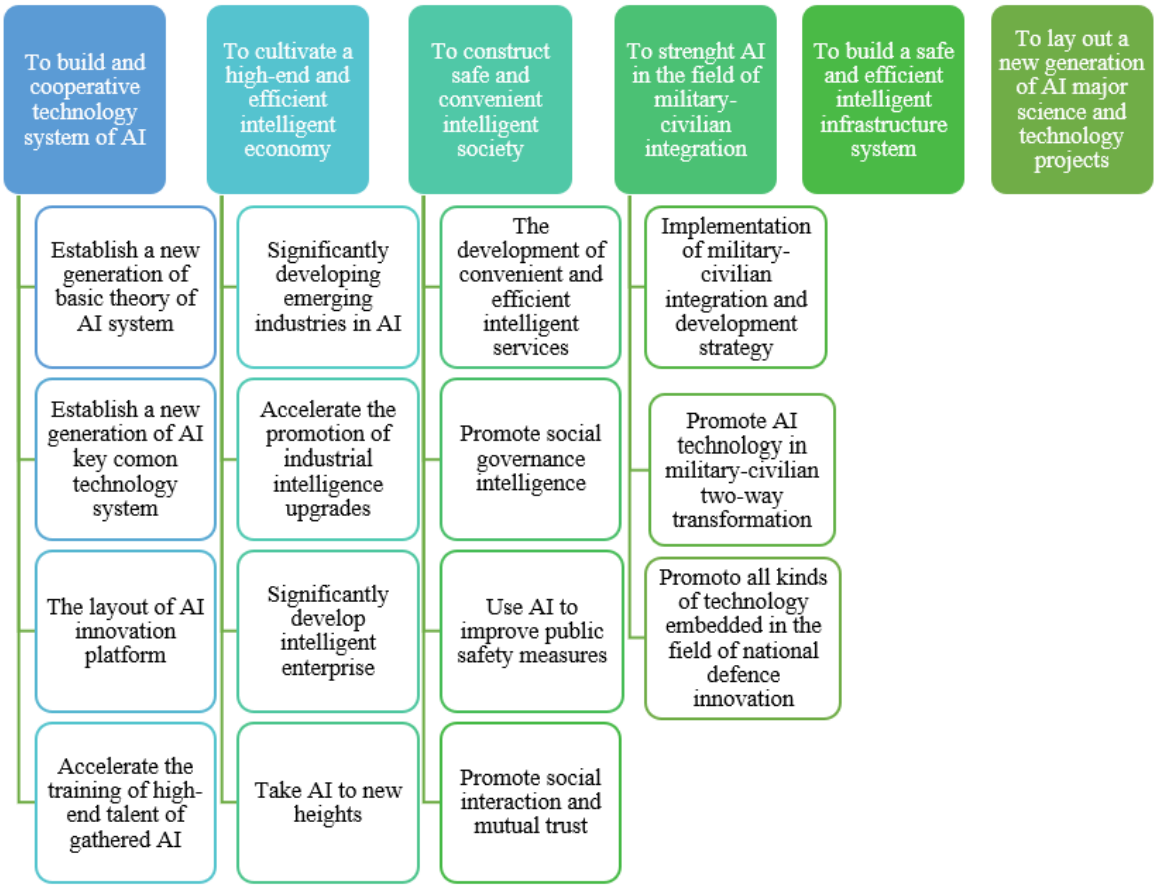


Figure 14. Key Tasks in New Generation of AI

Source: Author's Compilation.

- **Establishment of AI innovation platform**

The main aim of establishing this platform is construct a structure which support the application, R&D of AI. There are several platforms mentioned in the document; The hardware and software infrastructure platform, the group intelligence service platform, the hybrid enhanced intelligent support platform, Autonomous unmanned system support platform, AI basic data and security detection platforms. It is important for Chinese AI strategy, to give priority supporting all kinds of open source of common software and technology platform.

- **Accelerate the training of high-end talent of collected AI**

The aim of China with establishing the high-end talent team is shaping China's talent highland of AI with determining the world's top talent and young talent and, to be the best one of the AI in all areas. The main reason of that aim to be a master of AI in every aspects of life; in economy, society, management standards, law, and other talents. China thought that it can be possible with implementing special policies for achieving high attention AI introduction.

Cultivate a high-end and efficient intelligent economy

The development of intelligence economy is one of the important goals of China with AI technologies. It supports that can be possible with innovation, integration between AI and other industries, increasing data driven economic growth, man-machine collaborated production and services, cross-border integrated economic model and collective personalized demands and customization. China emphases that data and knowledge are the first element of economic growth.

- **Building internationally competitive AI industry**

To develop emerging industries in AI is one of the significant tasks of China. For realizing this task, innovations should be increase in certain areas. These areas are stated in the documents: intelligent hardware and software, smart robot technologies, intelligent autonomous vehicles, virtual reality and augmented reality technologies, accelerating smart terminal's core technology and developing a new generation of primary elements of the Internet of Things (IoT).

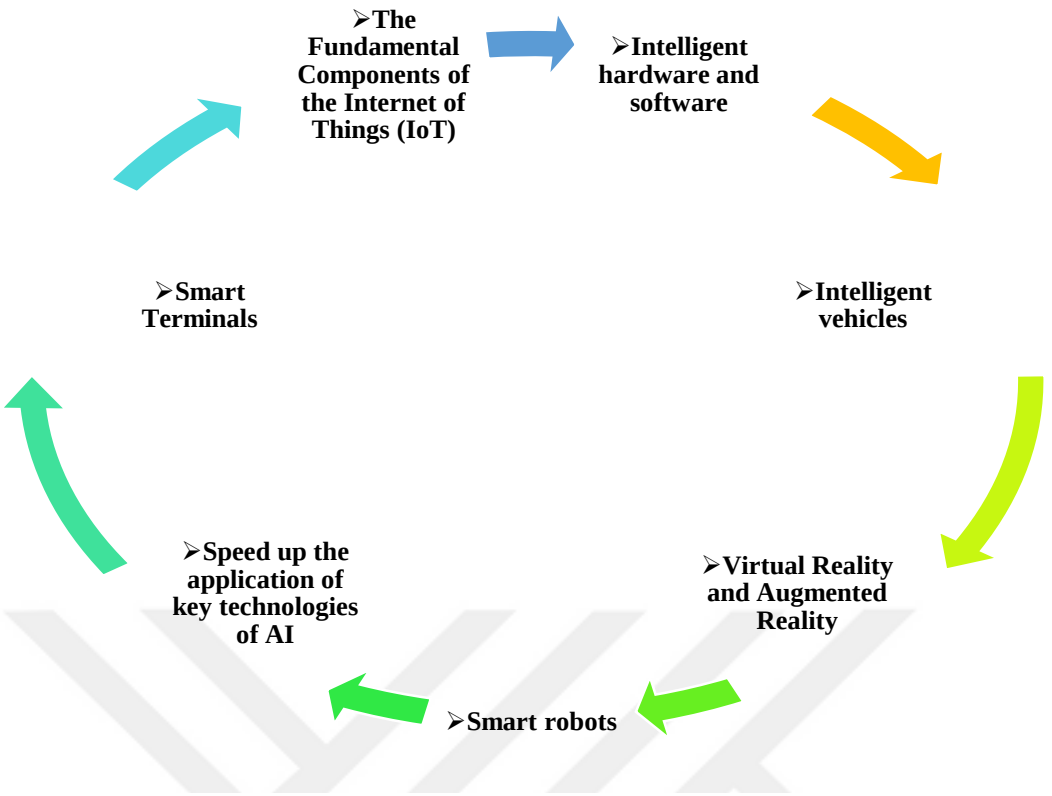


Figure 15. Developing Emerging Industries In AI

Source: Author's Compilation.

- **Speeding up the recognition of industrial intelligence upgrades**

AI and industrial innovations should be integrated with the areas like manufacturing, agriculture, logistics, finance, business, home, and other key industries. Pilot applications of AI technologies should be increase and succeeded. So, it is important to develop intelligent manufacturing, intelligent agriculture, intelligent logistics, establishing huge financial data and providing smart finance, improving business intelligence and implement knowledge services and new technologies in the field of business, developing smart home technologies.

- **Developing intelligent enterprises**

Promoting and guiding enterprises in every need, for instance in the envisagement, production, management, logistics and marketing and other determining areas, AI technology applications should be used. Increasing the development of smart factories and providing innovations in all industry areas and making AI as the industry leader and brand and constructing national AI industrial park.

- **Construct safe and convenient intelligent society**

Constructing out of danger and proper intelligence society providing the conditions like intelligent services, social governance intelligence and public safety measures. The main aim in this part; increasing society is living standards, improving new jobs which more high quality and comforts, enhancing numbers of intelligent public services and providing social governance with more secure and efficient social operations.

- **Developing intelligence services**

Thanks to the innovative AI technologies, public services in education, health care, retirement and other immediate needs in society could be more personalized, diversified, high quality. The aim of China with this strategy establishing a more innovator intelligent education system which includes interactive learning and intelligent learning. The other point is providing intelligent medical care with using new AI technologies for a quick and exact intelligent medical system. Constructing smart- intelligent hospitals. For these improvements in medical area, man- machine collaboration is the important point. As a result of these developments in the field of health, it is thought that smart health management will also be strengthened. Establishing smart old age communities and institution will be possible.

- **Providing social governance intelligence**

The other essential goal of Chinese government is forming social governance modernization. This goal comprises of improvement of intelligent government which includes government services and decision making with AI technologies. One example is given in the text: developing decision making engine for the open and transparent environment.

Establishing wisdom courts for ensuring AI in evidence collection, case analysis, legal document analysis. Constructing infrastructure for smart cities and providing more intelligent city management. And then, establishing intelligent transportation system with self- driving vehicles and vehicle infrastructure integration. The last condition for providing social governance intelligence is intelligent environmental protection.

- **Improving public safety measures**

Using AI for “building public safety intelligent monitoring and early warning and control systems for determining earthquake disasters, geological disasters, meteorological disasters, floods, marine disasters, and other major natural disasters” more quickly. This document claim that an intelligent monitoring platform should be established with providing the intelligence of security equipment in key public areas. Using AI for food safety protection is the other aim of new generation of AI. For this aim an intelligent food safety early warning system for food classification, warning levels, and food safety risks and assessment should be formed.

- **Promoting social interaction and mutual trust**

It is important “to expediting innovation in virtual reality and other technologies to support the integration between the virtual environment and physical environment, for supplying individual senses, analysis, judgment, decision-making, and other real-time visceral needs.” Also, important **“**to support the integration of block chain technology and AI, set up a new social credit system, and reducing the cost and risk of interpersonal communication” is the other way for promoting social interaction and trust.

- **Strengthen AI in the field of military- civilian integration**

Implementation of military-civilian integration and development strategy profoundly for providing; “the creation of multi-element, multi-field, highly efficient AI integration of military and civilian pattern” is emphasized in the text. The document mentions that AI technology should be in military-civilian two-way transformation. Establishing a new generation of AI technology in: “command-and judgment, military deduction, defense equipment, strong support, and guide AI in the field of defense technology to civilian applications.”

- **Build a safe and efficient intelligent infrastructure system**

Another important goal of the Chinese government mentioned in this document is the development of all kinds of intelligent infrastructure conditions. It also focuses on providing regular research and development for the fifth- generation mobile communication (5G) system. The intelligent infrastructure aim comprises of network infrastructure, big data infrastructure, high performance computing infrastructure.

- **Carry out a wide range of AI science and technology activities**

The last one of the tasks presented in the document is on the creation of a new generation of huge scientific and technological projects in AI. The recommendation for this purpose is determining China's weaknesses and strengths sides well about AI and then to focus on appropriate projects. It remarks that the current R&D scheme should support an AI Program designated as "1 + N".

1 means: “A new generation of major scientific and technological projects in AI. It focusses some theories which belong to the basic theory and key common technology forward-looking layout, involving the study of big data intelligence, cross-media perception computing, hybrid enhanced intelligence, group intelligence, autonomous collaborative control and decision- making theory. Also includes some other technologies including estimate engine and knowledge service technology, cross-media analysis reasoning technology, group intelligent key technology, hybrid enhanced intelligent new architecture and new technology, autonomous unmanned control technology, open source sharing AI basic theory and common technology.”

N means: “The national planning and spreading of AI R&D projects. The main issue in this part is establishing and conducting new generation of major scientific and technological projects. Information is provided that the National Natural Sciences Foundation will strengthen interdisciplinary research and discovery support in the field of AI.”

- **Allocation of Resources**

There are three manner are presented for allocation of resources in the text. ***Firstly, establishing financial guidance and market-led financial support systems*** with providing collaboration between government and market.

Secondly, providing a foundation for innovation in AI. In addition to the AI innovations introduced at the national level, innovations should be made for international arena.

The last one is providing collaboration between international and domestic innovative resources. It is important to promote domestic AI enterprises and primary international universities, research institutes and teamwork which have a significant place in the world. At the same time main recommendation for this research allocation aim is following and applying the “One Belt, One Road” strategy to provide the establishment of international AI scientific and technological collaboration with construction of research centers, and to increase international applicability.

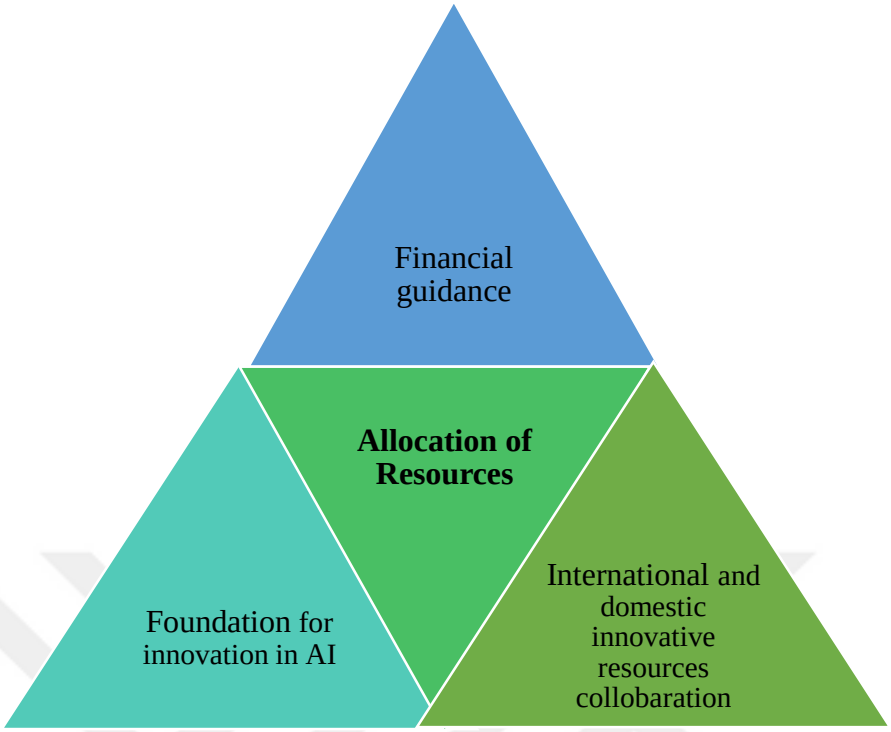


Figure 16. Allocation of Resources in New Generation of AI

Source: Author's Compilation.

- **Assurance Measures**

There are some institutional arrangements presented, for adapting the development of AI, in new generation of AI (Figure 16). These are ***developing laws and regulations and ethical norms*** with providing researches on the issues related AI like legal, ethical, and social. ***Developing AI in the key policies*** for example in the fields of education, medical care, insurance and, social assistance. ***Establishing all sides of technical standards and intellectual property system*** for AI technology such as interoperability, industry applications, network security, privacy protection.

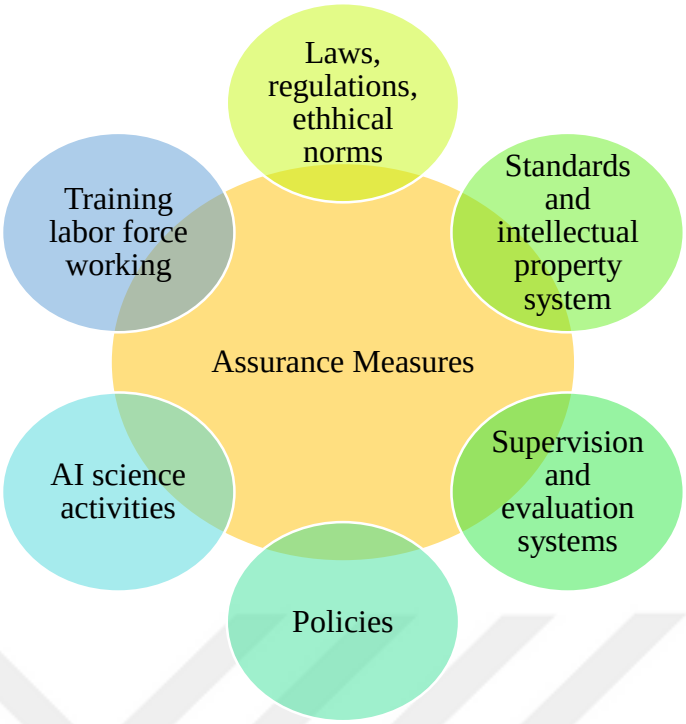


Figure 17. Assurance Measures in New Generation of AI

Source: Author's Compilation.

Giving importance to safety supervision and evaluation systems of AI for national security. It is important "to develop the safety protection system of human, technology and building the early warning system in AI safety monitoring." ***Supporting training for the labor force working in AI.*** Determining effects of AI to the employment structure and catching up the new employment methods and skills demands for the changing labor force. ***Realizing a broad range of AI science activities.*** Supporting the wide masses of scientific and technological workers to participate the AI of popular science and rise.

4.2.4. Three Year Guidance for Internet Plus Artificial Intelligence Plan (May 18, 2016)

The plan coordinates China's ambitious goals in point of AI focusing on 4 key areas.

- ***Intelligent and connected vehicles (ICV);*** The plan seeks to support and R&D of critical technologies and innovative product and services development, with a special emphasis on intelligent and connected vehicles (ICV).
- ***Intelligent sensors:*** it seeks to support R&D in intelligent sensors to advance low-cost, high-precision sensing technologies.
- ***Smart manufacturing:*** there is an emphasis on smart manufacturing.
- ***AI ecosystem:*** the infrastructure that needs to be in place to support an advanced AI support ecosystem, especially emphasizing the role of standards.

Internet Plus and AI Three Year Implementation Plan, is jointly issued by the National Development and Reform Commission (NDRC), the Most, MIIT, and the Cyberspace Administration of China. It was established a goal to grow the scale of the AI industry's market size to the "hundreds of billions" (RMB)s. It connects AI development to highly touted "Internet Plus" policy which aims to catapult China to becoming a digital powerhouse.

4.2.5. Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018–2020)

The plan launched by Science and Technology Department of MIIT on December 12, 2017. It focuses to accelerate the development of advanced manufacturing, support the in-depth integration of AI and the real economy, and implement the plans of "Made in China 2025" and "New Generation of Artificial Intelligence Development Plan," the MIIT has issued the "Three-Year Action Plan for Promoting the Development of a New Generation of Artificial Intelligence Industry (2018-2020)"

The plan mainly focus onf the integration of two technology: "information technology and manufacturing technology." In this context, the main focus point is the industrialization and integration of the new generation of AI technology application. So, the country aim to support the in-depth integration of AI and the manufacturing industry and accelareting the building of China into a manufacturing superpower and a cyber superpower (MIIT, 2017).

4.3.Investments

China increased its total venture capital investment in AI from 2013 to the first quarter of 2018. China supplied 60% of the world's total VC investment. However, in terms of the number of VC investments supply, the U.S. continue the most active country in VC investment in AI (CISTP, 2018: 4). In China, there are some active cities like Beijing which led other regions by a big margin in the amount and rounds of VC investment. Shanghai and Guangdong are significant cities which have been quite effective in AI investment as well. In 2017, China's AI market achieved RMB 23.7 billion, up 67%, with the top three sections: "Being computer vision (34.9%), voice (24.8%) and natural language processing (21%), and hardware and algorithm combining to account for less than 20% of the market."

The market is expected to grow 75% in 2018. In 2017, the global robotics market attained US$23.2 billion, of which the Chinese market existed 27%. There also other AI-related markets such as drone, smart home, smart grid, smart security, smart healthcare, and smart finance have also seen rapid development in China (CISTP, 2018: 4). In 2017, global AI investment reached US $39.5 billion, including 1,208 investment transactions, with China alone investing US $27.71 billion of investment and 369 investment transactions. AI enterprises of China represented 70% of the global AI investment and 31% of global AI investment transactions (CISTP, 2018: 50).

4.4.Public Policies/ Regulations

The regulation of AI in China is mainly directed by the State Council of the PRC's July 8, 2017 "A Next Generation Artificial Intelligence Development Plan" (State Council Document No. 35). The Central Committee of the PRC and the State Council of the PRC support the directing bodies of China to support the advancement of AI. Regulation of the issues of ethical and legal support for the development of AI is rising, but policy provide state control of Chinese companies and over valuable data, including storage of data on Chinese users within the country and the compulsory use of People's Republic of China's national standards for AI, including over big data, cloud computing, and industrial software. There are some regulations for providing AI development in China, some of them are explaining in the below;

- **Autonomous Vehicles**

In current Chinese regulations, while testing autonomous vehicles, there must be a person who will control the system in them and requires trials on private roads outside of public places. The Chinese government has also announced that it attaches importance to improving communication systems and smart roads to ensure the safety and security of autonomous vehicles (Sagramsingh, 2019: 39).

- **Data Privacy**

In China, The Chinese Personal Information Security Specification- it is like determining standards about whether companies are following China's data protection rules, not a law or regulation that get to compulsory obedience- coordinates data confidentiality of Chinese citizens as an obligation of national security (Sagramsingh, 2019: 39).

- **Cybersecurity**

The 2017 Chinese Cybersecurity Law of the People's Republic of China purposes to provide cybersecurity and maintain the rights and interest of Chinese citizens. The law implements to "network operators" and "operators of crucial information infrastructure."(Webster, Graham, Creemers Rogier, Triolo Paul, 2017) These operators are needed to maintain procedures to preserve their networks based on cybersecurity standards detailed in the law. The State also controls cybersecurity and takes early warning of incidents (Sagramsingh, 2019: 39).

4.5. Chinese Institutions Working on AI Policies

There are some government institutions are responsible for AI policies in China. The Ministry of Science and Technology (MOST) as well as a new office called the AI Plan Promotion Office are responsible for the implementation and coordination of the emergent AI-related projects, which are driven primarily by government-led subsidies. An AI Strategy Advisory Committee was also established in November 2017.

4.5.1. The Ministry of Science and Technology (MOST)

The Ministry of Science and Technology (MOST) together with a new office called the ***AI Plan Promotion Office*** are responsible for the execution and coordination of the generated AI-related projects, which are driven mostly by government-led subventions (Future of Life, 2019).

4.5.2. AI Strategy Advisory Committee

This committee established in November 2017 to direct research on strategic issues related to AI and to make recommendations. After publishing China's AI strategic plan, the Advisory committee pay attention to China's commitment to supporting innovative applications of AI on a large scale, optimizing its systematic developments of AI, and returning AI into a major driver of China's industry upgrade and economic transformation (China AI Development Report, 2018: 69).

4.5.3. China Association for Artificial Intelligence (CAAI).

CAAI is the only state-level science and technology institution in the field of AI under the Ministry of Civil Affairs. It was founded in 1981. CAAI mostly focus on to academic activities in science and technology in the PRC. It is very comprehensive association in the issues of AI, science, and technology. It has 40 branches, inclusive 34 professional committees and six working committees, including the fields of science and smart technology. CAAI is concertedly with the academic activities in science and technology in the People's Republic of China. The aim of the association is to combine AI science and technology professionals through academic research, academic exchange, science popularization, academic education, science and technology exhibition, scholarly publishing, talent recommendation, academic evaluation, academic advising, technology assessment activities and other incentives (CAAI, 2020).

4.5.4. AI Industry Development Alliance

It is a unity established for integrating leading companies and institutes to support of AI resources. More than 200 enterprises and agencies across the country and focuses on constructing ***a public service platform*** for the improvement of China's AI industry (Future of Life, 2019).

To summarize, although China does not have a long AI research and development process, it is a country that has made a great contribution to the development of artificial intelligence in the world with its rapid success in the field of artificial intelligence and the AI systems it invented. Under the leadership of Xi Jinping, the emergence of AI policies and AI, which often occupies China's agenda, has become an important policy area for other countries. China is one of the two countries that come to mind when it comes to artificial intelligence investments.

5. COMPARISON of THE USA and CHINESE ARTIFICIAL INTELLIGENCE PUBLIC POLICIES

This chapter covers the comparison of both countries AI policies by using systematic of the research, data collection and analysis technique, analyses of the data obtained by policy process model and MAXQDA, and predefined titles subtitles.

5.1. Documents Used for Analysis

Strategic plans, policy documents, laws and many other documents from both countries that could form the basis of the study have been analyzed for this thesis. Some of the documents that seem more important to answer the research questions. Therefore, these documents have been used in examining and obtaining information related with the research questions.

Three national policy documents on the subject of AI, current strategy document, an executive order, an institution policy document and six laws of the USA and four national policy documents on AI and the current national strategy document of China were examined and evaluated in this chapter. The documents mentioned in this part are briefly mentioned in the Table 8.

Table 5. Documents Used in Analysis for Both Countries

The United States			
	Document	**Year**	**Responsible Institution**
National-level policy documents	Preparing for the Future of Artificial Intelligence	**2016**	Executive Office of the President NSTC on Technology
	The National Artificial Intelligence Research and Development Strategic Plan	**2016**	NITRD National Coordination Office (NCO
	Artificial Intelligence, Automation, and the Economy	**2016**	A team in the Executive Office of the President
Current strategic plan document	The National Artificial Intelligence Research and Development Strategic Plan– American AI Initiative	**2019**	NSTC Select Committee on Artificial Intelligence (Committee Selection)
Executive Order	Executive Order on Maintaining American Leadership in Artificial Intelligence	**2019**	NSTC Select Committee on Artificial Intelligence (Committee Selection)
Policy	Federal Automated Vehicles Policy	**2016**	U.S. Department of Transportation (DOT)
Acts	Future of Artificial Intelligence Act of 2017	**2017**	Department of Commerce
	National Security Commission Artificial Intelligence Act	**2018**	House - Armed Services; Education and the Workforce; Foreign Affairs; Science, Space, and Technology; Energy and Commerce
	John S. McCain National Defense Authorization Act for Fiscal Year 2019	**2019**	Department of Defense
	AI in Government Act of 2019	**2019**	In the House of Representatives
	Artificial Intelligence Initiative Act (AI-IA)	**2019**	Senate - Commerce, Science, and Transportation

CHINA			
National-level policy documents	Made in China 2025 (MIC 2025)	**2015**	State Council
	13th Five Year Plan for Developing National Strategic and Emerging Industries	**2016**	State Council
	Three Year Guidance for Internet Plus Artificial Intelligence Plan	**2016**	National Development and Reform Commission (NDRC), the MoST, MIIT, and the Cyberspace Administration of China
	Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry	**2017**	Science and Technology Department of Ministry of Industry and Information Technology (MIIT)
Current strategic plan document	New Generation Artificial Intelligence Development Plan (AIDP)	**2017**	State Council and CPC Central Committee

Source: Author's compilation

In 2016, with the ***"Preparing for the Future of Artificial Intelligence",*** the USA Government started an initiative to plan and investigate the current state of AI, its existing and potential applications, and the questions that are raised for society and public policy by progress in AI. The document also includes recommendations for specific further actions by Federal agencies and other actors on AI. This initiative was led by Executive Office of the President NSTC Committee on Technology, the principal institution by which the Executive Branch coordinates science and technology policy across the diverse entities that make up the Federal research and development (R&D) enterprise. R&D investments continued and built upon an ongoing snowball effect of other investigations into what AI could.

In June 2016, ***"The National Artificial Intelligence Research and Development Strategic Plan"*** was submitted on the issue of AI during the Obama administration. The new NSTC Subcommittee on Machine Learning and Artificial Intelligence - which is recognized to follow developments on AI within the Federal government, the private sector, and internationally, and to help coordinate Federal activities in AI- assigned to

the NITRD National Coordination Office (NCO) to form this plan. It was developed by AI Task Force - an interagency working group tasked by the NITRD Subcommittee of the NSTC.

In December 2016, ***"Artificial Intelligence, Automation and the Economy"*** is one of the strategic documents of the USA on the issue of AI and the effects of AI to the USA economy. It was developed by a team in the Executive Office of the President. This report includes important topics on the effects of AI- driven automation on workers, jobs, and the economy of the USA.

In 2019, ***The National Artificial Intelligence Research and Development Strategic Plan*** is the updated version of the first National AI R&D Strategic Plan which published in 2016, defines the priority areas for Federal investments in AI R&D in support of the American AI Initiative. This plan is related with addressing the R&D priorities associated with advancing AI technologies. There have been mentioned about subcommittees of NSTC; these are The Select Committee on AI, The NSTC Subcommittee on Machine Learning and Artificial Intelligence (MLAI) and, The AI R&D Interagency Working Group. The Select Committee on AI is the responsible body of government's AI R&D.

February 11, 2019, The *"**Executive Order on Maintaining American Leadership in Artificial Intelligence"*** involve the main targets of the USA with AI policies: to support AI investment in AI Research and Development, to increase access to superior quality and completely observable Federal data, models, and computing resources. NSTC Select Committee on Artificial Intelligence (Committee Selection) is the responsible body of the actions to be implemented by the institutions regulating all developments and innovations related to AI.

Federal Automated Vehicles Policy is a transportation policy that was established by U.S. Department of Transportation (DOT) through the National Highway Traffic Safety Administration (NHTSA) in September 2016 (Federal Automated Vehicles Policy, 2016: 5). Firstly, it was developed in the private sector and after with NHTSA's security programs and regulatory authority to maintain the public. The main aim of the policy is saving the lives of people.

Future of Artificial Intelligence Act of 2017 aims to determine the benefits of AI for society; to support conditions of investment and innovation to provide the global competitiveness of the United States; to optimize and regulate the changing United States workforce that results from the development of AI. The Future of AI Act assigns the Department of Commerce as a responsible agent for executing government policy on AI and leads the Department to form an consultative committee runner with offering recommendations within 18 months on how the government and business can work together to address concerns in four key areas.

In 2018, ***National Security Commission AI Act*** was accepted. This act includes the establishment of the NSC on AI which is an independent establishment of the Federal Government (*H. r. 5356*, 2018: 1). This commission has been assigned the task of evaluating the development and trends of AI especially at the international level, the methods that the United States has in order to improve its competitiveness in this field, and to gain advantage in this field, and to evaluate its situation in all departments of the United States (education, military, etc.).

John S. McCain National Defense Authorization Act for Fiscal Year 2019 was accepted. The act is related with the fields of AI research, development, and transition activities. The Secretary of Defense be tasked with establish a set of activities within the Department of Defense to organize the attempts of the Department to improve, mature, and transition AI into operational use (Public Law, 2018: 132).

AI in Government Act of 2019 leads to establish "AI Center of Excellence (AI CoE)". The importance of the establishment of this center is to provide an environment where experts from different organizations such as agencies, industry, Federal laboratories, non-profit organizations, higher education institutions can come together to discuss the latest developments in the field of AI and support the efforts of the Federal Government on this issue. The main duty of the agency is to offer suggestions to Federal government for innovative use of AI in government services.

Artificial Intelligence Initiative Act (AI-IA) was emerged to provide a national AI initiative with an extensive strategies and coordination with institutions on R&D on AI (*S.1558*, 2019: 2). This act delegates the President some rights for establishing and implementing an initiative about AI to be known as the "National Artificial Intelligence

Research and Development Initiative". The establishment of an office, known as the "National Artificial Intelligence Coordination Office" was mentioned in the act.

Made in China 2025 was issued by The State Council on May 8, 2015 to transform China from a manufacturing giant into a world manufacturing power. The plan, supported by Premier Li Keqiang, is the country's first action plan focusing on promoting manufacturing. This plan recommend a "three-step" strategy of transforming China into a leading manufacturing power by the year 2049.The main ten target areas are determined as including next generation information technology, aviation, rail, new energy vehicles, and agricultural machinery.

13th Five Year Plan for Developing National Strategic and Emerging Industries is an important policy document of China and, a state council policy document which specifies implementation measures for the 13th Five-Year Plan, focused on strategic industries. The 13th FYP created a blueprint for China's future development based around five key themes: innovation, coordinated development, green growth, openness, inclusive growth.

Internet Plus and AI Three Year Implementation Plan, is jointly issued by the NDRC, the MoST, MIIT, and the Cyberspace Administration of China. The aim of the plan is to grow the scale of the AI industry's market size to the "hundreds of billions" (RMB). It connects AI development to highly routed "Internet Plus" policy which aims to provide China to becoming a digital powerhouse.

Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry is a Ministry of Industry and Information Technology (MIIT) action plan for implementing tasks related to State Council's AI Plan and "Made in China 2025". It sets out specific benchmarks for 2020 in a range of AI products and services, including smart, inter-connected cars, and intelligent service robots. Also, it shows government's strong guiding role in developing the AI industry (convened top 30 companies to develop indicators).

New Generation Artificial Intelligence Development Plan (AIDP) explains the main principles of Chinese AI policies. Main responsible actor shaped the document are State Council - the first institution that prepare the document related with AI- and CPC Central Committee. The document established by those institutions, on July 8, 2017. Primary aim on preparing this document is to benefit from the first- mover advantage, to accelerate the construction of innovative countries and to be a science and technology power of the world.

5.2. Method of Analysis: MAXQDA

To strengthen the comparison of two countries AI policies with qualitative research method, case studies of China and the USA was employed. Research design benefited from data such as policy documents, laws, regulations, strategic plans, and other research reports. Content analysis of these documents was performed by using data analysis program of MAXQDA 2020. Most recent and updated comprehensive policy documents of both countries were examined by MAXQDA. The policy document of the USA is "The National Artificial Intelligence Research and Development Strategic Plan of 2019" and Chinese policy document is "New Generation Artificial Intelligence Development Plan (AIDP) of 2017".

In the content analysis of the USA strategic plan, 8 main variables related to the strategic objectives of AI were determined: public-private partnership, AI R&D workforce need, AI technology standards and benchmarks, AI training, secure AI systems, moral, legal and social impacts of AI, human-AI cooperation, long-term AI investments. 13 variables are identified in China's strategic document: AI in military-civilian integration, social governance intelligence, national AI industrial park, intelligent economy, AI training, AI innovation platform, AI key common technology, AI society, industry training on AI, increasing AI R&D, AI investments, AI basic theory, AI industry development for economic growth.

Main idea of every paragraph and unique sentences of policy documents for each country were coded separately and according to a pre-defined topic used in the literature. In the program, 363 coding was carried out with content analysis. One of the data analysis types of the national strategic documents of the USA and China, which were selected as a case study. 196 of these encodings were made in the USA strategic document and 167 in China's strategic document. Among these codes strategic goals and priority policy areas emerged as a significant topic. Therefore, these two topics for both countries was analyzed by Two-Cases Model. The outputs were explained and illustrated visually.

5.3. Limitations of the Research

The most important limitation in the research is that although China's AI plans are frequently mentioned in the literature, it is difficult to reach the plans directly. For this reason, it was not easy to do research on China comparative to the high attainability of strategic plans, laws and regulations that were available for America. In this thesis, it was not easy to reach the policy documents for China and the lack of reliable information on Chinese government expenditures on AI research and development (R&D) weakened robust comparisons between Chinese and U.S. expenditures on AI, which in some cases have procure alarm among U.S. policy makers and observers (Colvin, et all., 2020: 1). Most challenging limitation is the difficulty of reaching the originals of Chinese resources because of language barrier and closed system of China. In the light of the information obtained from international reports and research articles about China strengthened the evaluations.

Another limitation of the thesis is analyzing only the national strategy documents of both countries. In the thesis, only the current national strategy documents of both countries were examined in the MAXQDA program, and it was thought that the general goals and objectives that both countries will set in their AI strategies can be easily reached from these documents. However, it is thought that more information can be obtained because of examining the other documents in detail in the studies to be carried out after this thesis. "National AI R&D Strategy Plan" published by the USA in 2019 version updated and "New Generation of Artificial Intelligence Development Plan" documents were analyzed. For further researchers, a qualitative analysis with all the documents obtained in subsequent studies will be much more effective in creating the basic AI profile of both countries.

Since this study was prepared with the priority of reviewing national strategy documents, AI laws were evaluated for information only. Analysis of AI laws, which can be considered as a particularly strong example of public policy in later studies, will provide an important resource for public policy and comparative public policy analysis studies.

Since AI is a developing area, there are not enough resources in public policy studies of AI. For this reason, the limitation experienced in finding sources about the AI public policies of the countries is one of the issues that should be emphasized. Even though Sabatier (1999) argue that policies could only be evaluated realistically after ten years of the policy adoption. AI policies are very recent and concentrated on in the last five years and, 10 years of period for high-tech is an exceedingly long period of time.

5.4. Comparison of the USA and Chinese AI Policies with Policy Process Model

In line with the idea of Birkland that public decision making processes can be better understood with public policy cycle; at the stages of the public policy cycle, it is possible to examine the use of AI, its actors, activities and factors that maintain public policies (Valle-Cruz, 2019). Therefore, the usage of AI in the public policy-cycle can be analyzed in different interrelated stages: agenda-setting, policy formulation, policy legitimation, policy implementation, and policy evaluation**.**

The USA and China both presents a strong AI public policy picture among other countries. They are two examples of countries that are quite different from each other in terms of government structures, management styles, legislative processes, cultural, economic, and social history. As well as the USA having a strong and long history of technological development, China takes its place in the world agenda due to its success in AI-based technologies in a short time, actually firstly started as a copycat of the USA AI technologies (Lee, 2018: 35).

The most important aim of comparing both countries in this thesis is to identify the differences in the public policies that both countries have revealed or planned due to their competition economically and technologically under the umbrella of AI. Both countries are compared in order to make a general assessment on the AI public policies of two countries through the national strategy documents of the countries, the reports prepared by the private and public sectors, the laws they have made regarding AI, the expenditures on AI, investments and the budgets allocated.

AI policies of the USA and China was employed as a case study in the thesis. In comparative research most similar research designs have be used. These similarities have been searched in the cases. However, most different designs sometimes provide valuable insights that we can learn from. Based on a different system approach, both countries provide the same common output on AI, as well as many differences such as different contexts, different cultures, and different state structures. Most different system design is "...which seeks maximal heterogeneity in the sample of systems, is based on a belief that in spite of inter-systemic differentiation, the populations will differ with regard to only a limited number of variables or relationships" (Przeworski & Teune, 1970). Even though they employed different policies, both countries have achieved significant success in the field of AI, and the governments of the countries put forward policies in line with similar purposes.

We can summarize main reasons and justifications for choosing the USA and China as comparison units as it follows:

- Two countries are major competitors of AI and might be ranked most advanced two countries in high-tech/AI. The ambition and goal of both countries to be the first and most powerful country in AI. Both countries are mentioned as AI superpowers because of providing four main building blocks of AI in twenty-first century: abundant data, tenacious entrepreneurs, well-trained AI scientists, and a supportive policy environment (Lee, 2018: 110-111)
- China and the U.S. have a great lead over all other countries in AI, organizing the phase for a new kind of bipolar world order. Various other countries have also strong AI research labs staffed with great talent, but they lack the venture capital ecosystem and large user bases to generate the data that will be key to the age of implementation. AI companies in the USA and China gather more data and talent, the virtuous cycle of data-driven improvements is expanding their lead to a point where it will become unsurpassable. China and the USA are currently incubating the AI giants that will dominate global markets and export wealth from consumers around the globe (Lee, 2018: 33).
- According to report of PwC, AI could contribute up to $15.7 trillion to the global economy in 2030, the USA and China stand to see the biggest economic gains with AI increasing GDP by Total $10.7 trillion, 70% of the global economic impact (PwC, 2017: 3).

Different governmental regime types of both countries effect their public policies in every stages. The USA has a strong democratic tradition with old and long constitution-based federal republic, while China is an authoritarian communist-socialist state. The communist ideology of Chinese government has impact to their policies. China's large amount of population is the important advantage of Chinese government. The USA makes flexible and dynamic policies with collaborative approach while China generally make centralized the five-year plans.

In the first part of the comparison chapter of the study, the USA and Chinese governments' AI public policies were examined under three policy processes: agenda setting, policy formulation, policy legitimation. In the second part, the data obtained by coding the national AI strategies of the two countries are illustrated in the double case analysis.

5.4.1. Agenda Setting Process

Each policy takes its place on the agenda of the country in a certain way at the first stage. AI public policies of the USA and China are also realizing in a process. In this part of the study, the policies that have emerged following determination of the national AI strategies of the USA and China have been examined. At this stage of the study, the process of AI policies taking place in the policy agenda of the United States and China will be compared. The countries' agenda setting processes and other affecting factors will be examined in this title.

AI is an area of opportunity that government agencies can actively serve its citizens. Citizens always want to see more developed systems of healthcare, transportation, education, communication etc. For this reason, governments have started to determine their AI policies at various times and for various reasons. The USA has an exceptionally long and important history with the successes and results achieved in the field of AI on the contrary China. The arrival of AI in the USA started with the studies of researchers and scientists and the investments of important companies in this field.

While policies in the USA are openly brought to the agenda in a participatory and multifaceted way, China does not have a long history in this field, bringing the internet industry to the country as an imitator of the USA in the 1990s. So, AI developments comes to the country because of the Chinese scientists or students who have studied or went to work in America, adapting the developments from America to China.

The introduction of AI in the USA started when the U.S. scientists name the concept as AI at a conference held at Dartmouth College in 1956. As a result of research and development efforts mostly carried out by universities in the later times, expert systems began to be created in the 1960s and 1970s. DENDRAL (a chemical structure analyzer), XCON (a computer hardware configuration system), MYCIN (a medical diagnosis system), and ACE (AT&T's cable maintenance system) are the examples of created expert systems in the USA (Smith et. all, 2006: 12). In 1980, The Association for the Advancement of Artificial Intelligence (AAAI) is an international scientific society was arranged to provide research in, and responsible use of, AI. The main aim of the society is to promote public understanding of AI, develop the teaching and training of AI practitioners, and ensure guidance for research planners and funders regarding the significance and potential of current AI developments and future directions.

During the Obama Administration, three important AI paper were published. In 2018, Trump Administration’s priorities for AI were published. The USA mostly focus on the using AI to provide the U.S. companies with new data sources in this period. Establishing a Select Committee on Artificial Intelligence is significant step to help government agencies to know about AI technologies, as well as provide partnerships with industry and academia. In 2019, Trump administration signed an Executive Order launching the American AI Initiative which is the national AI strategy of the U.S. government. AI Summit which aims to be the world’s most innovative technology to make the U.S. government work better for the American people has also been announced.

Unlike the USA, China's AI industry began to evolve in the 1990s as a copycat model of the USA. With this copycat approach, Chinese entrepreneurs gradually grew stronger from copying to innovation and enabled today's technological progress. Because of the copying ability, the large market it has and the large data it obtains, Chinese internet companies and Chinese AI companies have been strengthened. China, which started this adventure by copying the USA, understands what to do with all its inner face with much heavier loaded, much more complex software and based on human workforce than the companies in the USA' Silicon Valley, aims to minimize the possibility of

copying by developing companies. And, because of the huge market, so much capital flew in ... came in to help the Chinese entrepreneurs develop their own set of innovations. According to Lee (2018: 35) the copycat was the perfect practice of first times, but now those who continue to copy of course get nowhere, as we would expect.

The Chinese government sets out longer-term plans while determining its policies. In China, there are two policy planning model; one is annual plans and the other one is five-year plans. AI comes to the agenda firstly with a five-year plan in 2017. And after that, there have been many different AI plans published by Chinese government. The country generally establishes AI public policies within the 3-year and 5-year plans. In 2017, the State Council of the People's Republic of China (also known as the Central People's Government) published the Artificial Intelligence Development Plan which puts forth its strategic aims. This document explains the main principles of Chinese AI policies. Its main responsible actors which shaped the document are State Council and CPC Central Committee.

To summarize; while the AI policies in the USA come to the agenda in a participatory and multifaceted ways of many scientists, academics, businessmen, think tanks, civil society and public employees who forms the ecosystem; in China due to the centralist and authoritarian state structure, AI policies comes to the agenda as a result of the regulations of the bureaucrats and the ruling political party. China which does not have a long history of R&D and application in the field of AI, policies and AI issues come to the country agenda by imitating the studies and practices of the USA in this field in the 1990s via the Chinese scientists or students who studying or going to work in the United States. They adapted the developments of AI from America to China.

5.4.2. Policy Formulation

The American AI public policies are formulated by President, The White House staff, the Congress, and the Senate, the departments, the agencies, and sub-agencies, have active role in policy process of AI. AI initiatives and policies are made by the experts from the government, industry, and academia to spark ideas for how the Federal government can adopt AI.

The first important policy movements have been observed under the Obama administration. In 2016, Obama and the White House OSTP started a series of workshops and a Subcommittee on Machine Learning and AI to monitor technological advances and help coordinate federal activity in AI. After this process there have been published three globally effective reports: “Preparing for the Future of Artificial Intelligence,” “The National Artificial Intelligence Research and Development Strategic Plan,” and “Artificial Intelligence, Automation, and the Economy.” FUTURE of AI Act is the first bill which drafted by Senator Maria Cantwell in 2017.

In China, the ultimate decision-making body is the Communist Party of China (CPC) which include the President, the Premier, the Chairman of the National People’s Congress (NPC), the head of Party discipline and other senior CPC officials, State Council, National People’s Congress (NPC), Ministries, Academics or specialists working alone, through universities or through government think tanks, Representatives of state-owned enterprises and private firms, Business associations and chambers of commerce.

Chinese government especially reliance to the five years plans, it published some plans like "13th Five Year Plan for Developing National Strategic and Emerging Industries", “Internet Plus” and AI Three Year Implementation Plan (2016-2018)", "Robotics Industry Development Plan (2016- 2020)", “Artificial Intelligence 2.0” and "Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018- 2020)" policymaking and measure the effectiveness of implementation.

To summarize; while the American AI public policies are formulated and made by the experts from the government, (i.e.; the President, the Congress, the Senate the departments, the agencies, and sub-agencies) industry, academia, and think tanks, in China, the ultimate decision-making body is the Communist Party of China (CPC) with centralized bureaucratic systems but with the support of academia and industry.

5.4.3. Policy Legitimation

In the USA, at the federal level, policy legitimation occurs when Congress pass a bill; at the state level, when a state legislature pass a bill; and at the local level, when a local legislative body such as city council pass an ordinance. All bills occur in the House of Representatives or in the Senate. There are two types of bills in the USA: public and private. AI bills originated as public bill. A bill accruing in the House of Representatives is designated by ‘‘H.R.’’ and "S." in Senate. There are some bills originated about AI such as *H.R. 2575*- AI in Government Act of 2019 and, *S. 1558*- Artificial Intelligence Initiative Act (AI-IA).

There are several types of policy documents in the USA; Executive Orders, Presidential Directives, Presidential Memoranda, Guidance and Policy Statements; all those has its own purpose and process for publication, but all must be consistent with existing law. 2019 was a crucial year for AI policy in the United States. The federal government made several important steps to provide development and deployment and positioned of AI in the United States. To strengthen its global AI leadership, beginning with President Trump’s “Executive Order on Maintaining American Leadership in Artificial Intelligence,” important policies are made in 2019.

The starting point of AI’s at the top of the agenda of the USA in 1956 with American computer scientist John McCarthy, the Dartmouth Conference, the term ‘Artificial Intelligence’ was first adopted. However, the first legislation process with a broad focus on AI has been realized in 2017, under the Obama Administration. The U.S. Senator Maria Cantwell has been drafted a bill for implementation and regulation of AI in 2017. The bill known as the FUTURE of AI Act (Fundamentally Understanding the Usability and Realistic Evolution of Artificial Intelligence Act of 2017). It prepared for the establishment of a committee by the U.S. Department of Commerce to advise the federal government on issues of AI.

By 2018, AI is still seen as a field of study open to development and new usage areas in many respects in the USA. In addition, the focus is on the workforce that is positively, negatively, or neutrally affected by AI. Considering that AI technologies require extensive data and, this data can invade privacy and maintain bias, attention is drawn to the use of necessary data for good purposes. Currently, continued American leadership in AI is of paramount importance to protecting the economic and national security of the USA.

In the USA, according to constitution: “Since a proposal cannot become a law without consideration and approval by both Houses of Congress is a remarkable virtue of its bicameral legislative system. The open and full discussion provided under the Constitution often results in the considerable improvement of a bill by amendment before it becomes law or in the final defeat of an inadvisable proposal. As most laws occur in the House of Representatives” (Congress.gov, 2020).

AI policy initiatives are realizing at the state and local level. AI is starting to be on the agenda of the American government in 2016-2017. First, draft laws emerge on the application and regulation of AI. Understanding and preparing the development of AI to ensure economic development and social stability are the primary goals of the American government.

The Communist Party of China which is the only governing party sets the policy agenda in PRC. Communist Party of China (CPC) which include the President, the Premier, the Chairman of the National People’s Congress (NPC), the head of Party discipline and other senior CPC officials, State Council, National People’s Congress (NPC), and Ministries. In China, there are two policy planning model; one is annual plans and the other one is five-year plans. AI comes to the agenda firstly with a five-year plan and after that, there have been many different AI documents published by Chinese government.

Chinese government especially reliance to the five years plans, there have been published some plans like "13th Five Year Plan for Developing National Strategic and Emerging Industries", “Internet Plus” and AI Three Year Implementation Plan (2016-2018)", "Robotics Industry Development Plan (2016- 2020)", “Artificial Intelligence 2.0” and "Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018- 2020)" policymaking and measure the effectiveness of implementation.

Table 6. Comparison of Policy Legitimation Process of the USA and CHINA

	Policy Legitimation
The USA	• In US, at the federal level, policy legitimation occurs when Congress pass a bill; at the state level, when a state legislature pass a bill; and at the local level, when a local legislative body such as city council pass an ordinance. • All bills occur in the House of Representatives or in the Senate. There are two types of bills in the U.S.: public and private. AI bills originated as public bill. • A bill accruing in the House of Representatives is designated by ‘‘H.R.’’ and "S." in Senate. • There are some bills originated about AI such as H.R. 2575- AI in Government Act of 2019 and, S. 1558- Artificial Intelligence Initiative Act (AI-IA) • There are several types of policy documents in the USA; **Executive Orders**, **Presidential Directives**, **Presidential Memoranda**, **Guidance and Policy Statements**; all those has its own purpose and process for publication, but all must be consistent with existing law. **In 2016** • First strategic document- The National Artificial Intelligence Research and Development Plan was published by NSTC Networking and Information Technology Research and Development Subcommittee. • In 2017, FUTURE of AI Act is the first bill which drafted by Senator Maria Cantwell in 2017. **In 2019** • Executive Order 13859, “Maintaining American Leadership in Artificial Intelligence, • The Food and Drug Administration (FDA) released a proposed regulatory framework for AI-based software as a medical device. • The United States signed the OECD Principles on Artificial Intelligence. • The White House NSTC released its 2019 update to “The National Artificial Intelligence Research and Development Strategic Plan, • **The National Security Commission on Artificial Intelligence (NSCAI)** released a plan which named U.S. Leadership in AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools • **The U.S. Patent and Trademark Office (USPTO)** published a request for comments on patenting “AI inventions” • Secretary of Energy Rick Perry announced the establishment of the **Department of Energy (DOE) Artificial Intelligence and Technology Office (AITO),** • The White House hosted the **Summit on Artificial Intelligence in Government,** • The NSTC released a supplemental report to the **President’s Fiscal Year 2020 Budget for the Networking and Information Technology Research and Development (NITRD) Program.** • U.S. Department of Health and Human Services Food and Drug Administration released a draft recommendation on **Clinical Decision Support Software** for Industry and Food and Drug Administration Staff • Interim Report of the National Security Commission on Artificial Intelligence.

	• The NSTC released the **"2016-2019 Progress Report: Advancing Artificial Intelligence R&D,"** • **The Department of Veterans Affairs (VA)** established the National Artificial Intelligence Institute (NAII), **In 2020** • Draft Memorandum Interim Report of the National Security Commission on AI, to the Heads of Executive Departments and Agencies, **Guidance for Regulation of Artificial Intelligence Applications** issued by The Office of Management and Budget (OMB)
CHINA	**In 2013** • China has published several national-level policy documents. **In 2015** • The State Council released suggestions on China's ***'Internet+'*** • In March 2015, the 'Made in China 2025' ("MIC 2025") initiative which was formally announced by Premier Li Keqiang. This initiative collocated with the 13th Five Year Plan ("FYP"), Internet Plus and outbound focused policy of the Belt & Road Initiative ("BRI") is centered on reforming and modernizing China's manufacturing sector. **In 2016** • In March 2016, 13th Five-Year Plan was published, includes the ideas about AI as one of the six critical areas for developing the country's emerging industries, and as an important factor in stimulating economic growth • In 2017, The 'New Generation Artificial Intelligence Development Plan' (AIDP) was released by the State Council, it acts as an integrated document that outlines China's AI policy purposes. • ''Made in China 2025' ("MIC 2025") initiative which was formally announced by Premier Li Keqiang. This initiative collocated with the 13th Five Year Plan ("FYP"), Internet Plus and outbound focused policy of the Belt & Road Initiative ("BRI") is centered on reforming and modernizing China's manufacturing sector. **In 2017** • 13th Five-Year Plan, • The New Generation Artificial Intelligence Development Plan (AIDP) • National Engineering Laboratory for Deep Learning was established under the responsibility of National Development and Reform Commission (NDRC) **In 2019** • Ministry of Science and Technology released the plan of **Beijing National New-Generation AI Innovation & Development Pilot Zone** established in Beijing. • **The National New Generation Artificial Intelligence Governance Committee** (under the National New Generation AI Promotion Office) released the *New Generation AI Governance Principles – Developing Responsible*

The State Council of the PRC's July 8, 2017 Next Generation Artificial Intelligence Development Plan directs the regulation of AI in China (State Council Document No. 35). The Central Committee of the Communist Party of China and the State Council of the People's Republic of China encourage the governing bodies of China to support the development of AI. In China, the AIDP is the strategic plan of the central government on the issue of AI but the existing innovation and transformation will be driven by the private sector and local governments (Roberts et all, 2019: 4). In other words, it is more convenient to view the AIDP as a highly promoted 'wish list' to nudge and coordinate other relevant stakeholders than a central directive (Sheehan, 2018); this is why the three-year plan encouraging the AIDP (2018-2020) emphasizes coordination between provinces and with local governments.

The document emphasizes that "AI legislation process of China have been especially started since 2013. China has published several national-level policy documents, which represent the intention to improve and distribute AI in a variety of sectors. In 2015, the State Council released suggestions on China's 'Internet+' action. It aims to integrate the internet into all elements of the economy and society. The document clearly contains the importance of designated emerging AI industries and investing in research and development" (State Council, 2015).

Within the same year, the ten-year plan 'Made in China 2025' was occurred, with the aim to transform China into the dominant player in global high-tech manufacturing, including IT technologies and AI. The other significant policy action is the Central Committee of the Communist Party of China's 13th Five-Year Plan, published in March 2016. The document includes "the ideas about AI as one of the six critical areas for developing the country's emerging industries, and as an important factor in stimulating economic growth (CCP, 2016). In 2017, The 'New Generation Artificial Intelligence Development Plan' (AIDP) was released by the State Council (which is the chief administrative body within China), it acts as an integrated document that outlines China's AI policy purposes."

To summarize; in the USA, at the federal level, the AI policy legitimation occurs when Congress pass a bill; at the state level, when a state legislature pass a bill; and at the local level, when a local legislative body such as city council pass an ordinance. The Communist Party of China which is the only governing body sets the policy agenda in PRC. AI comes to the agenda firstly with a five-year plan and after that, there have been many different AI documents published by Chinese government. The first legislation process with a broad focus on AI has been realized in 2017, under the Obama Administration in the USA and in 2017, under the Xi Jinping Presidency in China.

5.5. Main Strategic Goals

The analyses of countries' strategic goals with AI are illustrated on the Figure 17. The national AI strategy document of the two countries was coded in the MAXQDA 2020 program and the strategic objectives were visualized in the form of two-case model. As a result of the analysis, it is seen that the two countries have different goals besides some similar goals in the field of AI.

The USA's primary strategic goal is to invest in long-term research and development. NSF, DARPA, The NIH Strategic Plan for Data Science are the examples of funding foundational research in AI. The USA presents some ways for invest in long-term research and development such as: "intelligent data understanding and knowledge discovery, enhancing the perceptual capabilities of AI systems, understanding theoretical capabilities and limitations of AI, pursuing research on general-purpose AI, creating multi-AI systems, developing more capable and reliable robots, advancing hardware for improved AI, creating AI for improved hardware." The other important strategic goal of the USA is human- AI collaboration. The USA institutions have important projects on this issue like NSF's Future of Work at the Human-Technology Frontier, supporting socio-technical research enabling a future where intelligent technologies collaborate synergistically with humans to achieve broad participation in the workforce and improve the social, economic, and environmental benefits across a range of work settings (National AI R&D Strategy, 2019: 18). NOAA (National Oceanographic and Atmospheric Administration) has also an important project of human-AI collaboration.

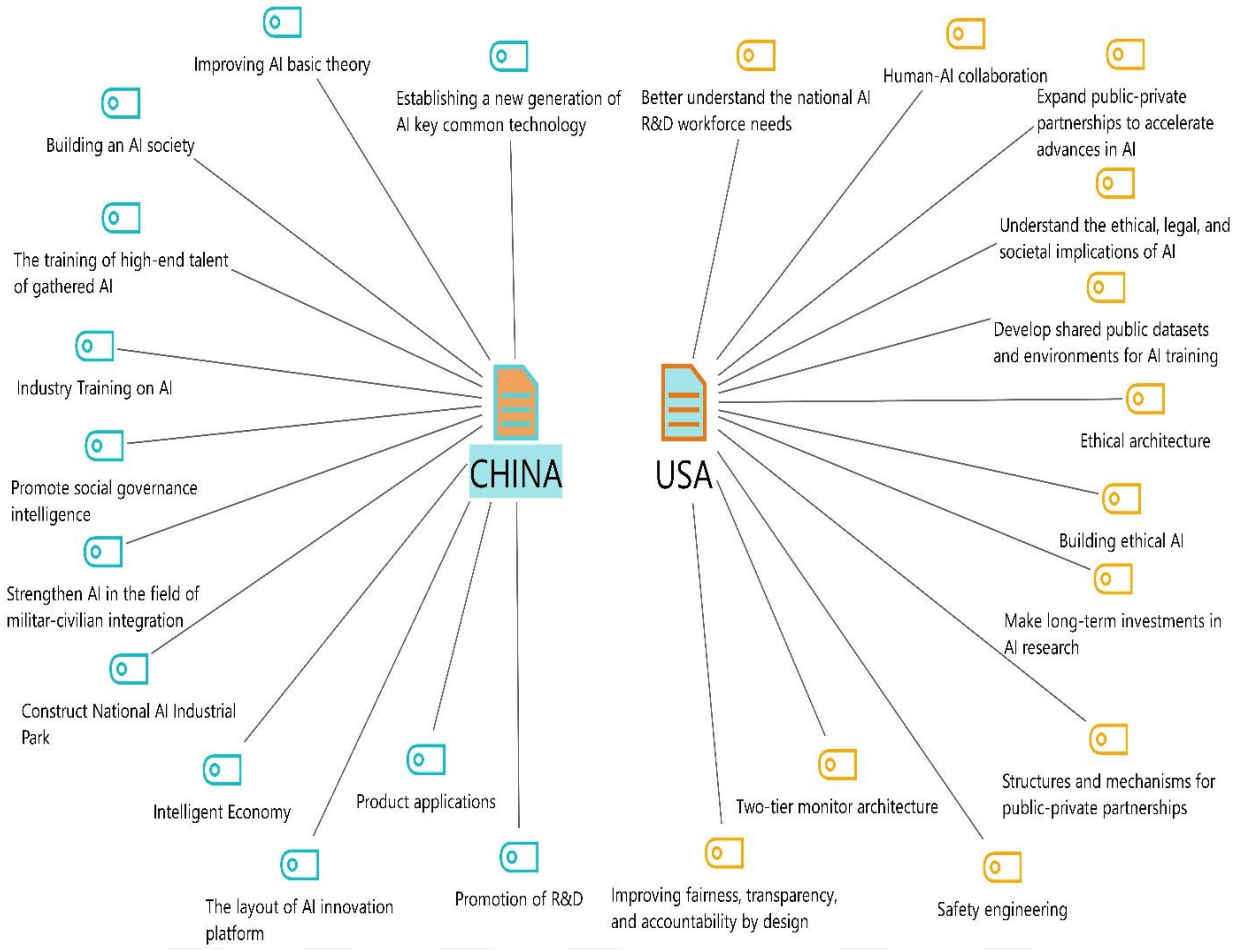


Figure 18. AI Strategic Goals of the USA and China

Source: MAXQDA Output

When we look at the AI strategic goals of China mostly focus on autonomous intelligence systems and other basic theory, and core technology will have achieved important progress (New Generation of Artificial Intelligence Development Plan, 2017: 5). For this purpose, there have been some theories are presented for application; advanced machine learning theory, autonomous collaboration and decision making theory, group intelligence theory, human-machine hybrid intelligence theory, cross-media perception computing theory, large data intelligence theory. Building an AI society is the other important strategic goal of China. It comprise the idea of build an AI society for the development of the world's science and technology, for the improvement of people's livelihood and welfare in the society and for the implementation of the ideology of people-centered development.

Table 7. Similarities and Differences Between Strategic Goals of the USA and China

Similarities	**Differences**	
	The USA	**China**
Increasing R&D on AI	Developed shared public datasets and environments for AI training	AI in military- civilian integration
Improving AI industry	Human- AI collaboration	Improving basic theory
Establishing an AI ecosystem	Multisector partnership	Promote social governance of AI
Establishing AI ethic norms	Collaborations among Federal agencies,	
Ensuring AI systems, techniques, and technologies	Direct partnerships among organizations across sectors	
Providing service to citizens with AI technologies	AI R&D workforce will consist of multidisciplinary teams	

Source: Author's Compilation.

To summarize; while the USA puts forth a broader and more detailed strategy, China offers a repetitive and narrower strategic goal and plan. When the documents are examined, it also reveals what steps various institutions have taken in line with these goals and what implementations by basing all kinds of strategic goals of America. Some of the key differences that arise in these strategic goals are that China sets a more detailed goal for the development of AI systems and technologies. America, on the other hand, draws attention to open data platforms, easy accessibility to data, and support that AI should not only be a field developed by computer scientists or other engineers, but rather a more interdisciplinary field. While the USA together with technological aspects also focus on social aspects of AI planning, China neglects social aspects and focus more on technological development aspects.

5.6. Government Role Regarding AI

OECD mentions about AI and policy relation as "Artificial intelligence is at the top of policy agendas for stakeholders and governmental institutions at both national and international levels." (OECD, 2020). Again, an OECD research has defined several roles of governments can play regarding AI (OECD, 2019: 24). These are;

- ***Government as a financier or direct investor***. Governments can ensure funding to support the development and adoption of existing technologies. Some are actively maintaining funding schemes related to call for projects or pilot proposals. Such schemes contain projects within the public sector, as well as private sector R&D projects whose outcomes may apply to the whole economy. The U.S. government has an active role for financing public & private AI projects. Sometime the U.S. also is a direct investor with its institutions like DARPA etc. Money for AI startups is coming in from venture capitalists, tech juggernauts, and the Chinese government (Lee, 2018: 12). The four Chinese funding mechanisms are the National Natural Science Foundation of China (NSFC), National Key R&D Programs (NKP), Megaprojects, and Government Guiding Funds (GGF). So, China is the financier of AI.

- ***Government as a smart buyer and co-developer.*** Governments can act as a smart buyer of existing solutions through innovative procurement practices, or as a co-developer through public-private partnerships (PPP) and other forms of collaboration to build new or tailored solutions. Governments can drive innovation from the demand side by steering the development of new solutions directly towards its needs. Both the USA and Chinese governments are as a smart buyer and co-developer of AI policies. The USA is more co-developer at the starting point, China is smarter buyer in the meaning of AI policies.

- ***Government as a regulator or rules maker.*** Accelerated innovation cycles of emerging digital technologies call for rethinking the types of policy and regulatory instruments used and their implementation. As both an enabler and a user of emerging digital technologies, governments are facing the challenge of determining how – and how much – to regulate them to maximize their innovative potential while minimizing the risks for end users. An aspect of this role involves evaluating compliance with the regulations and rules, and acting, as appropriate, when they are broken. America's long-term AI journey in the field of AI policies, the fact that every step on this path is digested and as a result, important policies emerge. However, since China does not have a long

research and development process on AI, it is trying to determine its policies by doing what America does.

- ***Government as a convener and standards-setter.*** Governments often could bring together stakeholders from many parts of the AI ecosystem (e.g. citizens and residents, businesses, organizations and academics) to help in realizing their objectives and to understand multiple aspects of relevant issues. Governments can also help develop and put in place standards and informal norms for technology in collaboration with these stakeholders. Although China uses a language that sets the standards and creates the AI ecosystem in the AI policy document, it can be said that America fits this description much more.

- ***Government as a data steward.*** Governments own, or hold on behalf of their people, vast troves of data. Such data can fuel AI-based technologies, especially when professionally managed (see Data as Fuel for AI in Chapter 2). The USA has a Data Stewardship program contains ongoing training, accountability to keep citizens' information confidential. The Data Stewardship Executive Policy Committee oversees these activities, setting the rules and policies all staff must follow. NSTC Subcommittee on Open Science was created in 2018 to coordinate Federal efforts on open and FAIR (findable, accessible, interoperable, and reusable) data. R&D investments will be needed to develop tools and resources that make it easier to identify, use, and manipulate relevant datasets (including Federal datasets), verify data provenance, and respect appropriate use policy. So, we can say government of the U.S. as a data steward (US Census Bureau, 2018).

- ***Government as a user and service provider.*** Governments provide services and tools empowered by or made possible through AI technologies. Both the USA and China provide public services empowered by AI technologies. Government organizations, education institutions and healthcare providers are increasingly using AI technologies to meet the needs of citizens.

5.7. Priority Areas/Sectors

The USA and China have different cultures, contexts, and background and so, they assign priority to different areas and sectors. These priority areas and sectors have been observed in their strategic documents. The USA mostly focus on the effects of AI on economic growth, technology development and national security (Yunhe et al., 2018: 5). The Obama administration's AI strategic document involved some of application areas, containing agriculture, education, medicine, production, and law. However, it did not mention what areas the economy and public sector should support. It only describes the funding focus on public goods, because of investments by the private sector cannot be expected due to the lack of commercial benefit (Growth et. Al, 2019: 13). Trump administration on the other hand specify priorities mostly on few basic areas such as science and engineering, defense, the economic development, health, and justice and national security. In 2019 budget for federal institutions, the statement on R&D priorities adds energy and health services to the list of priorities.

China as for that focus on industrialization of AI applications in the service of its "Manufacturing Power" strategy. According to McKinsey research on autonomous vehicles, mobility services will lead because of the autonomous vehicle's expected increased using (close to 24/7 operation) and lower labor costs (no drivers) (Pizzuto et all, 2019). The same reason puts city buses at 69 percent adoption and commercial vehicles (CVs) at 67 percent. Autonomous Vehicles (AVs) sustained the great share of global investment over the last year with $7.7B (9.9% of the total). Since 2004, China more focus on "new energy vehicles" (NEVs) and intelligent-connected vehicles (ICVs). The autonomous vehicle segment is a core part of the strategy which the Chinese government aims for being a leading world cyber power by 2035.

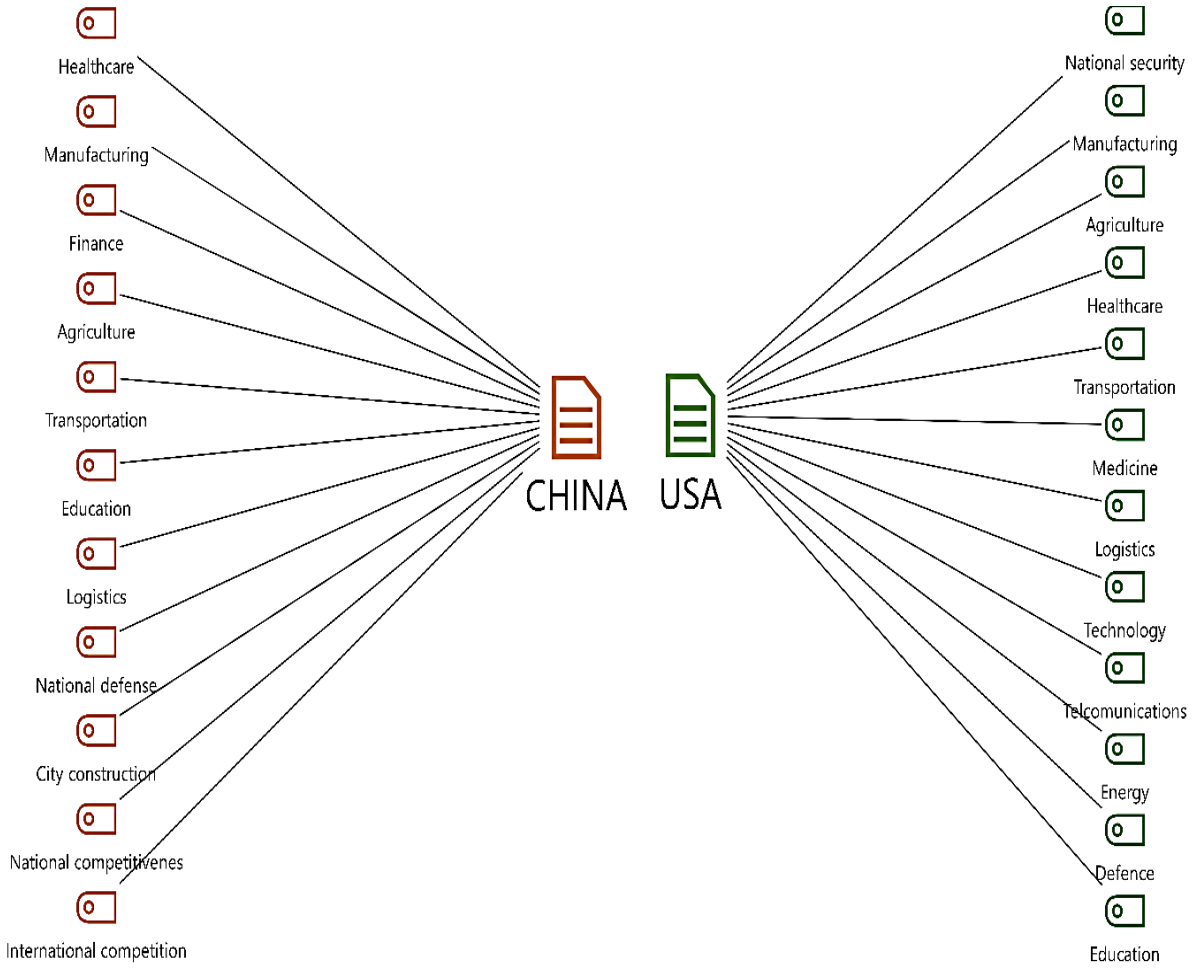


Figure 19. AI Priority Areas of the USA and China

Source: MAXQDA Output

The government focuses on AI technology development firmly embedded in the mass production of vehicles by then. In terms of new infrastructure, the Government Work Report said China will develop next-generation information networks, enlarge 5G applications and establish more charging facilities to support the broader use of new energy vehicles (The State Council, 2020). Li Yanhong who is the CEO of China's internet giant Baidu said that new infrastructure building will greatly increase economic development and improve people's livelihood, and to increase input and intensify research and development in such fields as AI. China aims to start pilot programs for autonomous driving in Beijing and Shanghai, as well as Xiongan New Area in Hebei province, to encourage intelligent transport with the support of technologies including 5G communication and the domestically improved Baidoo navigation satellite system.

The country has also boost research on technical standards to adapt the building of new roads to the development of driverless vehicles, like highway auxiliary facilities adapted to automated driving. For those aims, the country appointed five research and development centers for self-driving technology. According to the document collectively prepared by the Communist Party of China Central Committee and the State Council in September, the country aims to establish an exhaustive modern transportation system by 2035 that is safe, convenient, efficient, green, and economical (The State Council, 2020).

To summarize, while America more focus on the areas like national security and defense, China attaches more importance to areas such as infrastructure, city construction and transportation. It can be said that the reason of the USA for giving priority to these areas is its important talent and experience in this field with national security and defense organizations that the country had for many years, and that can cause to have a voice in the world by supporting those institutions with AI technologies. It can be said that China focuses on areas where it can obtain more practical solutions daily lives and for marketing AI related products.

5.8. Responsible Government Institutions on AI Policies

The number of responsible institutions for AI is considerably higher in the USA than in China. According to OECD data, the U.S. has 33 institution and, China has only 6 (Table 8). Major government institutions in America have their own AI strategies and road maps as well as the USA's national AI strategy. In the USA; The Department of Commerce, the Energy Department, the Department of Defense (including the Defense Advanced Research Projects Agency, or DARPA), the National Science Foundation (NSF), and the Intelligence Advanced Research Projects Activity (IARPA), a research organization to support the intelligence services are the most important policy institutions in relation to AI publicity (Growth et. Al, 2019: 12). The NSTC, White House OSTP; OMB are the policy making and funding driving forces. On the other hand, there are some subcommittees like NSTC Subcommittee on Machine Learning and AI formed to help coordinate Federal activity in AI and, NITRD formed to define the Federal strategic priorities for AI R&D, with particular attention on areas that industry is unlikely to address.

DARPA is one of the most accomplished research programs of the government, DoD agency that is responsible for innovations such as the Internet and GPS. DARPA explain its AI development into three "waves." First is rule-based AI and second is statistical learning-based AI and third one is contextual adaptability of AI (Growth et. all, 2019: 14). DARPA is an institution that attempts with innovators inside and outside of government, to make crucial investments in inventions technologies for national security. It consists of almost 220 government employees in six technical offices, involving nearly 100 program managers, who together supervise around 250 research and development programs. In 2018, DARPA announced that it will invest more than $ 2 billion to the AI applications for ***national security*** under the name of "AI Next" campaign (Mehta & Hamke, 2019: 23).

Key areas of the AI Next campaign contain (DARPA; 2018): "automating critical DoD business processes, such as security clearance vetting or accrediting software systems for operational deployment, improving the robustness and reliability of AI systems, enhancing the security and resiliency of machine learning and AI technologies, reducing power, data, and performance inefficiencies, pioneering the next generation of AI algorithms and applications, such as "explainability" and common-sense reasoning."

Table 8. Responsible Government Institutions for AI in the USA and China

	The USA	CHINA
1	Office of Science and Technology Policy (OSTP)	Ministry of Science and Technology (MOST)
2	Department of Defense (DOD)	The State Council for the People Republic of China
3	National Institutes of Health (NIH)	National Development and Reform Commission (NDRC)
4	National Science and Technology Council (NSTC)	Ministry of Industry and Information Technology (MIIT)
5	Department of Commerce (DOC)	Chinese Association for AI (CAAI)
6	Interagency Council on Statistical Policy	Cyber Space Administration of China
7	National Science Foundation (NSF)	
8	Food and Drug Administration (FDA)	
9	National Institute of Standards and Technology (NIST)	
10	Subcommittee on Networking &Information Technology Research &Development (NITRD)	

11	Department of Education (ED)	
12	National Security Council (NSC)	
13	Office of the Director of National Intelligence (ODNI)	
14	Office of Management of Budget (OMB)	
15	Consumer Financial Protection Bureau (CFPB)	
16	Federal Statistical Research Data Center Program Management Office	
17	Federal Committee on Statistical Methodology	
18	Defense Advanced Research Project Agency (DARPA)	
19	Federal Aviation Administration (FAA)	
20	Department of Transportation (DOF)	
21	National Aeronautics and Space Administration (NASA)	
22	President's Management Council	
23	General Services Administration	
24	U.S. Census Bureau	
25	Department of Energy (DOF)	
26	Select Committee on AI	
27	National Security Council on AI (NSCAI)	
28	Federal Geospatial Data Committee	
29	Department of State (DOS)	
30	Department of Agriculture (USDA)	
31	U.S. Air Force (USAF)	
32	Department of the Interior (DOI)	
33	National Center for Education Statistics, Department of Education and Training (DET)	

Source: OECD, 2020

The Chinese government, on the other hand, chooses to apply AI strategies with fewer institutions with a more centralized approach. For example, The Ministry of Science and Technology of China is one of the responsible institutions for AI development. It issued the guidelines for the Construction of the National New-generation Artificial Intelligence Innovation Development Pilot Area in 2019, which determined that AI social experiments were being conducted country-wide. The fundamental proposals prepared with different application scenarios such as education, transportation, government administration, medical care, environmental protection,

manufacturing, finance, agriculture, etc., and assert the comprehensive aims of social experiment such as social risk prevention, organizational reinvention, data security, and technological adaptation (Jun, 2020: 22). State Council, Central Leading Group for National Science and Technology System Reform and Innovation System Construction, Ministry of Science and Technology, and the Cyber Space Administration of Chin are the driving forces institutions of China. Significant subcommittees are Office for Advancing AI Plans and, Advisory Committee on AI Strategy which advancing project implementation through coordination of the Ministry of Science and Technology and other government authorities (China AI Development Report, 2018: 69).

To summarize; while the policies implemented in the United States with many public institutions, in China, policies are implementing with a small number of responsible institutions. The reason for this can be shown as the centralist state structure of China, in contrast to the federal and participatory state structure of America.

5.9. Government Expenditure

According to International Data Corporation (IDC) Worldwide Artificial Intelligence Systems Spending Guide, spending on AI systems will reach $97.9 billion in 2023, $37.5 billion that will be spent in 2019. Government spending is increasing at the time all around the world. Governments all over the world launched spending more funds on AI in recent years. Significant changes are seen in the role and size of the American and Chinese governments. Chinese expenditures on AI as are derived from ***Central government, local government, and enterprises***. U.S. expenditures on the other hand are derived from ***Federal Government, non-Federal Government, and businesses***, separately (Colvin, et all., 2020: 4).

5.9.1. American Government Funding on AI

The 2020 budget of the USA provides $688 million for the National Institute of Standards and Technology to direct cutting-edge research, including quantum computing, AI, and microelectronics. The Budget's key areas of focus contain autonomous systems, hypersonic, and AI, including $208 million to scale DOD's Joint

Artificial Intelligence Center. The USA budget to Office of Science $71 million for AI and machine learning (America's Budget for 2021, 2020: 25).

AI is seen as the significant potential for contributing to U.S. The Budget gives priority to competitive research through the ***Department of Agriculture (USDA)***'s the best grant program which is the ***Agriculture and Food Research Initiative (AFRI).*** Those initiatives demand $600 million for AFRI, an increase of $175 million above the 2020 presented level (America's Budget for 2021, 2020: 25).

Advances the industries of the future with AI technologies. ***Department of Energy (DOE)***'s new ***Artificial Intelligence and Technology Office*** will be held responsible for ensuring Department-broad guidance and supervision on AI. This new office will take $5 million from the budget, to increase important AI R&D projects already underway *(America's Budget for 2021*, 2020: 44).

Across directorates, ***National Science Foundation*** which is the only federal agency whose mission includes support for all fields of fundamental science and engineering, established by the Congress, recommends to spend $868 million on AI research, which is almost twice what it spent in fiscal year 2019. Part of the increase would go toward establishing further AI research institutes. NSF planned to create up to six AI institutes in 2020 fiscal year funded at up to $20 million each over five years. Some of these institutes will focus on applications of AI to research. Among the expected topics for the first set of institutes are "AI for discovery in physics" and "AI for accelerating molecular synthesis and manufacturing." (NSF, 2020).

The US give priority to the Industries of the Future, The President of the US decide to double R&D spending in non-defense AI and quantum information science (QIS) by 2022 in FY 2021 Budget. Spending of AI R&D and interdisciplinary research institutes at the National Science Foundation increase to more than $830 million, which show a more than 70 percent increase over the FY 2020 budget. The Department of Energy's Office of Science will invest $125 million in AI research, a $54 million increase over FY 2020.

The U.S. Department of Agriculture will ensure $100 million for the Agriculture and Food Research Initiative competitive grants program to improve application of developed technology, including AI, in agricultural systems. The National Institutes of Health will invest $50 million for new research on chronic diseases using AI and related approaches.

The important defense agency of AI R&D, DARPA is investing $459 million in AI R&D, an increase of $50 million from FY 2020, and the Department of Defense's Joint AI Center is increasing its budget from $242 million in FY 2020 to $290 million in FY 2021.

The FY 2021 Budget of the USA includes a major increase in nondefense AI R&D compared to the FY 2020 Budget and aiming to made it to double nondefense AI R&D by 2022. The budget contains: "Spending for AI R&D and interdisciplinary research institutes at the National Science Foundation to more than $830 million, which means a more than 70 percent increase over the FY 2020 budget. The budget also has target for AI investments of some important the U.S. institutions. Some of them are The Department of Energy's Office of Science will invest $125 million in AI research, a $54 million increase over FY 2020. The U.S. Department of Agriculture will ensure $100 million for the Agriculture and Food Research Initiative competitive grants program to increase application of advanced technology, including AI, in agricultural systems. The National Institutes of Health will invest $50 million for new research on chronic diseases using AI and related approaches. In regards to Defense AI R&D, DARPA is investing $459 million in AI R&D, an increase of $50 million from FY 2020, and the Department of Defense's Joint AI Center is increasing its budget from $242 million in FY 2020 to $290 million in FY 2021" (FY 2021 Budget, 2020).

5.9.2. Chinese Government Funding on AI

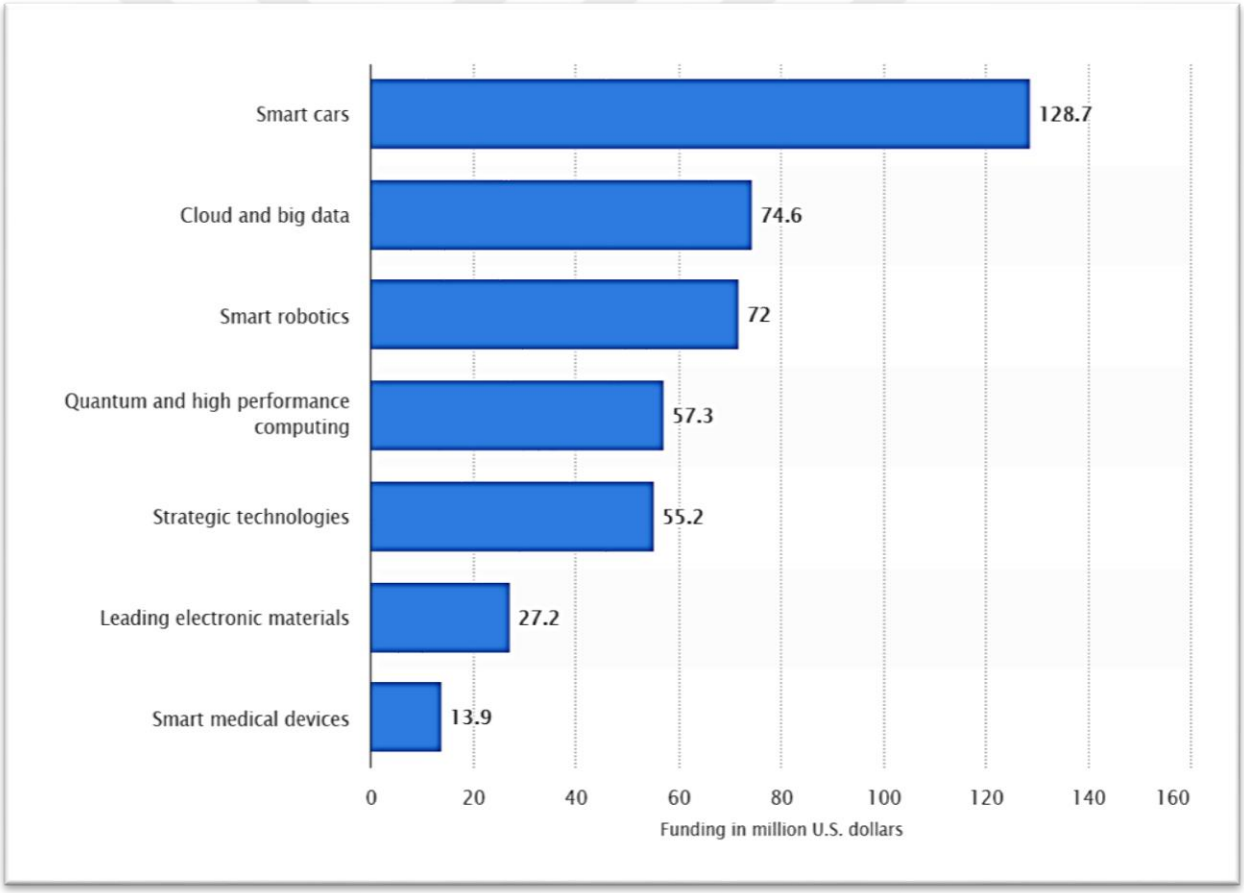
China aims to invest AI in a three strategic step; the first step, by 2020, to render scale of AI core industry to more than 150 billion Yuan and to increase the scale of the related industries by more than 1 trillion Yuan. The second step, by 2025, the scale of the core industry scale of AI will be worth than 400 billion Yuan, implementing the scale of related industries to be more than 5 trillion Yuan. The third step, by 2030, to make core industry scale of AI be more than 1 trillion Yuan, driving the scale of related industries be more than 10 trillion Yuan.

The four Chinese funding mechanisms are the National Natural Science Foundation of China (NSFC), National Key R&D Programs (NKP), Megaprojects, and Government Guiding Funds (GGF) (Colvin, et all., 2020: iii). NSFC made expenditures

of approximately 210 million RMB ($32 million USD) on direct funding for projects collate with the AI PCA (Colvin, et all., 2020: 14).

Tianjin, a major seaport city in northeastern China, has establish plans to start a 100 billion Yuan ($16 billion) fund to support the local AI industry. The statistic shows the share of global investment and financing in the field of AI by country in the time from 2013 to the first quarter of 2018. China leads all countries with 60 percent of total AI investment and funding over that period. In 2017, China accounted for 70 percent of the 39.5 billion U.S. dollars invested in AI worldwide in that year (Statista, 2020).

The figure shows that the Chinese government has invested heavily in smart cars, cloud and big data, smart robots, quantum and high-performance computers, strategic



technologies, leading electronic devices, and smart medical devices.

Figure 20. Government Funding of AI related projects in China in the six-month period ending April 2018

Source: Statista, 2020.

According to information from the China's Ministry of Finance with Chinese science and technology (S&T) programs: The National Natural Science Foundation research funding program and the National Key R&D Programs initiative. The Chinese government is planned to spend on AI: $70 billion by 2020, up from an estimated $12 billion in 2017 (Hoa, 2019). In 2018, China funded to with a total direct funding of 1.724 million yuan 38 projects about AI and intelligent systems for General Program Projects in Department of Information Sciences (National Natural Science Foundation of China, 2019: 62).

To summarize, when we comparing the U.S. and Chinese governments' AI expenditures, we can say that while the budget allocated by the USA in this area is realized in cooperation with all relevant institutions and organizations, it can be said that it is realized centrally through less government departments in China. China mostly spend on the non-military-related research, such as fundamental algorithm development, robotics research, and smart-infrastructure development. By contrast, the USA's spending for fiscal year 2020-2021 allocates most of its AI budget to defense.

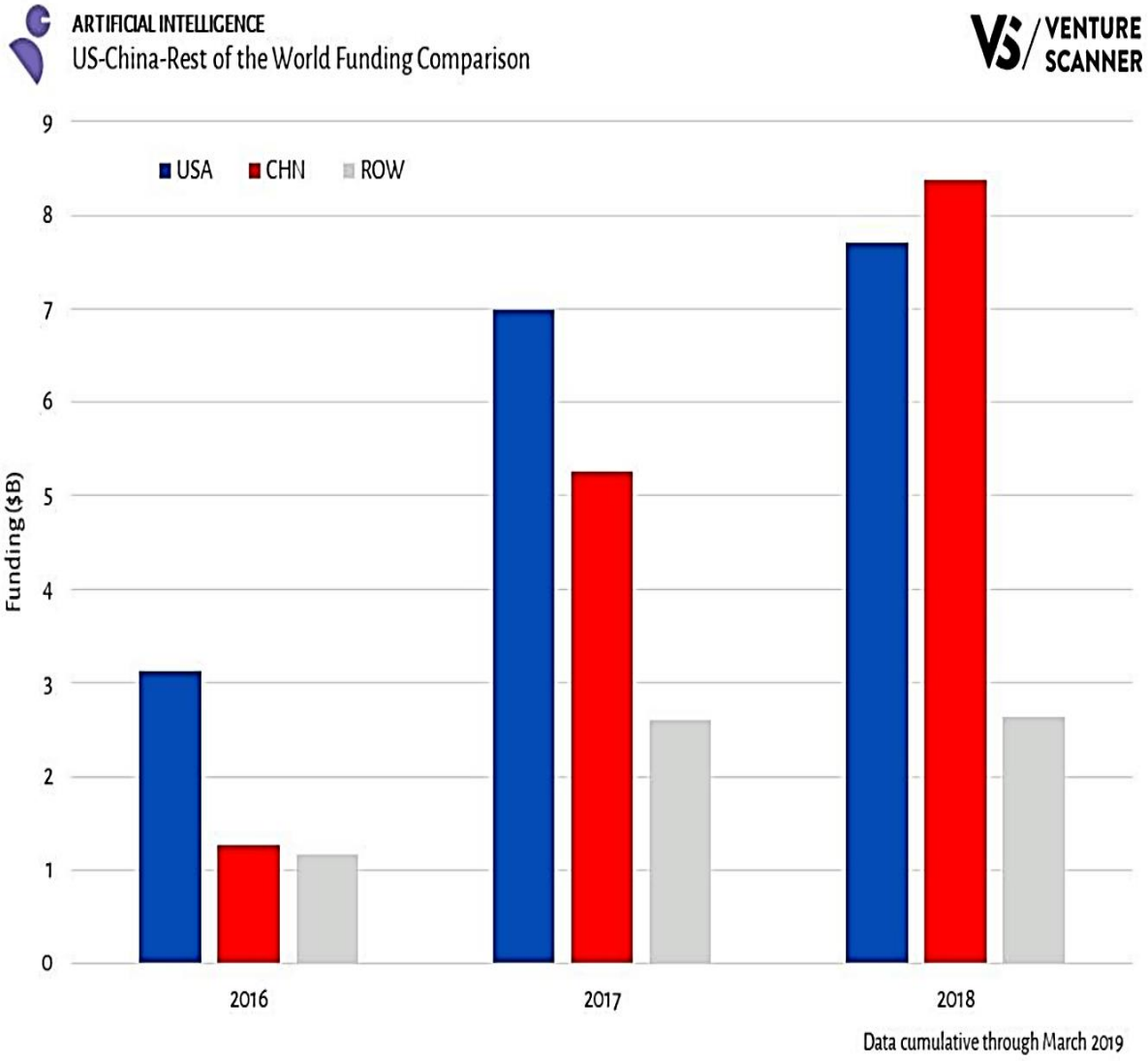


Figure 21. AI Funding Comparison of US and China

Source: Venture Scanner, 2019.

According to report of Venture Scanner in 2019, the venture capital investment to AI startup funding is happening in the USA and China, with China overtaking the USA in 2018. The USA jumped from $3 billion in 2016 to almost $8 billion in 2018, while China demonstrated even stronger growth, increasing eight-fold from $1 billion in 2016 to over $8 billion in 2018 (Figure 20). It is also noteworthy that China's AI funding in 2018 contains 44% of the whole world's AI funding, whereas the USA's AI funding comprised 41%. So, AI funding of the USA and China is by far high as far as to the world.

5.10. Policy Approaches

When implementing policies, each country creates policies with different approaches in terms of their country's dynamics, policy culture and practices. While the USA adopts a participatory and bottom up policy approach in accordance with the democratic state administration while creating their AI policies, China adopts authoritative and top down approach for its AI policies.

The American AI strategy emphasizes that harnessing the full potential of AI can only be achieved through a participatory approach and with joint efforts of the private sector, academia, the public, like-minded international partners, industry, and government. In China, State Council is the major body for initiate a policy and government bureaucrats and party officials are the other main effective actors in policy making process. These bureaucrats and party officials implement the decisions made from the center. That is, China adopts the top-down policy approach. Both countries benefited from the advantages of technology innovation approach.

5.11. AI Principles

The USA Management and Budget Office published a Draft Memorandum to the Heads of Executive Departments and Agencies, "Guidance for Regulation of Artificial Intelligence Applications" on 13 January 2020. This draft Memorandum regulates policy considerations that should guide, to the extent permitted by law, regulatory and non-regulatory oversight of AI applications developed and deployed outside of the Federal government (Memorandum for the Heads of Executive Departments and Agencies, 2020: 1). There are some principles are presented in the memorandum which are related and reflect the goals and principles in Executive Order 13859 (Table 9).

Policy actors who have formerly been largely quiet on AI governance issues have made themselves distinguished and heard, for example in the present of the Beijing AI Principles and the USA Department of Defense's AI principles (Dafoe & Anderljung, 2020: 17). Although AI governance principles deficient in some situations, these are basis and crucial for our generation.

Table 9. AI Principles of the USA and China

Federal Regulatory Principles and Practices of the USA Government	**New Generation AI Governance Principles of China**
Public Trust in AI	Harmony and friendship
Public Participation	Fairness and justice
Scientific Integrity and Information Quality	Inclusive and sharing
Risk Assessment and Management	Respect for privacy
Benefits and Costs	Safety and controllability
Flexibility	Shared responsibility
Fairness and Non-Discrimination	Open collaboration
Disclosure and Transparency	Agile governance
Safety and Security	
Interagency Coordinations	

Source: Memorandum for the Heads of Executive Departments and Agencies, 2020, National New Generation Artificial Intelligence Governance Expert Committee, 2019.

On June 17, 2019, the National New Generation Artificial Intelligence Governance Expert Committee published the "New Generation Artificial Intelligence Governance Principles - Developing Responsible Artificial Intelligence", which proposes framework and action guidelines for AI governance (Ministry of Science and Technology of the PRC, 2019).

"People-oriented" principle is the coherent purpose of China to improve AI and other emerging technologies. Chinese government and academia are highly interested with the impact of AI on human society and endeavoring to explore the AI social governance scheme, so as to develop the AI technologies to better serve the goodness of human beings (Jun, 2020: 21). SU Jun notes that advancing the social policy system for the development of AI from the perspective of humanities and social sciences is the significant purpose of China.

5.12. Future Expectations

The common goal that the USA and China want to achieve with AI in the future is to become a world leader by providing sufficient progress and development in this field. The President of the USA, Trump noted that “Continued American leadership in AI is of paramount importance to maintaining the economic and national security of the United States.” (Trump, 2019). Investing in the cutting-edge industries of the future is the primary aim of the USA with AI. The USA is early developer and the leader in the issue of AI but, it is aware of the world is going to develop swiftly. So, the country wants to continue its leadership in this area.

In 2017, Tim Persons who is the Chief Scientist of the General Accountability Office of the USA Government (GAO) answer the question of “Why is the GAO interested in AI, and the implications for public policies”. He noted that “AI is an emerging and emergent technology. It has very disruptive implications, and most of you all know that is a business term, and the idea of “disruptive” changes the way we think and do things. And, the USA government, for all its challenges in certain areas, also is a leading purveyor of innovation and sponsor these sorts of things. AI has been one of them ever since the concept came up in a workshop in Dartmouth in 1956. It’s because of the profound implications brought about AI, and the need to help the Congress work in a more proactive manner rather than a reactive manner.”

David Bray who is the Chief Information Officer of the Federal Communications Commission, he explained the relationship between AI and public policy with the following sentences: “We moved everything to public cloud and a commercial service provider, which as a result, has reduced our spending (on data) from 85% of our budgeting systems to less than 50% on a fix budget. But more importantly, we reduced the time it takes to roll out new services, and new prototypes of offerings to the public that the FCC does, from being 6-7 months, to if you come to us with new requirements now, we can have something in less than 48 hours. Now, I say that cloud computing is the appetizer for the main course, which is beginning to make sense of all the data that the internet of things would be collecting. The only way you can do that is with a combination of machine learning, and what some call AI and what we are getting out there as well. What experiments can we begin to do that show its benefit to making public service more responsive, more adoptive, and more agile in our rapidly changing world?”

China on the other hand, is developing more and more AI technologies every day. Striving to achieve more practical results with these technologies, China continues its AI adventure with the goal of becoming a country that will be mentioned in the world in this field with large AI projects. It plans to increase its success with large AI projects started in the main cities of China. In addition, the size of the Chinese population is striving to take advantage of AI technologies. Thanks to these technologies, it can use the amount of data it can obtain for the benefit of the country.

6. CONCLUSION

AI, which can be considered as the last link of rapid technological developments is one of the most important agenda and topics of our century. In 2016, 2017, primarily the USA and Canada later on many governments and international organizations all over the world intended to determine different strategies and road maps, publish various national and international level policy documents, make laws, and implement AI policies and practices. Countries seem to have diverse AI strategies and policy priorities. While some of them focus on economic aspects and the impact of AI by concentrating, technology development and national security, others attach importance to ethical risks such as security, privacy, and human dignity caused by AI. These situations lead to remarkable differences among the countries in their AI research and application areas. In line with these strategic objectives, the main interests, priorities, and objectives of the governments in determining these policies can be clearly observed from their policy documents.

When countries adopting AI policies, determining, and presenting strategic goals, AI ecosystem, priority policy areas which countries focus mostly are the significant steps for adopting AI policies. Considering all these developments, the main question of this thesis is to reveal and explain how AI policies are perceived by governments, what conditions are emphasized when adopting these policies, and for what purpose AI policies are adopted. Countries intend to determine the national AI strategies and apply AI public policies to be competitive and not to fall behind in this high-tech development. Also, many benefits of AI technological developments to increase efficiency and lead to significant developments in many public service areas like health, defense, education, transportation etc. are main motivators for many countries to make AI public policy and regulate this field. Thus, the reality that emerges is that if which country can determine its strategy in the field of AI in a fastest way, determine and implement policies in line with these goals will be successful in this field.

The USA and China are the outstanding countries that has significant developments and applications of AI public policies among other countries. Both countries are the big players who are making major developments in AI and they are also the pioneers and forerunners in the global AI race (Hollywood, 2019). Both countries are major competitors of AI and might be ranked most advanced two countries in high-tech/AI. Both have a great lead over all other countries in AI. They organize the phase for a new kind of bipolar world order. To have lack the venture capital ecosystem and large user bases are the important features of both countries to generate the data that will be key to the age of implementation. Both countries have biggest economic contribution to the world with increasing of AI GDP all around the world. Both gives priority to AI developments. They prepared their own national strategic AI plans and established a roadmap for leading AI in the world. The important strategic documents of the USA are "Preparing for the Future of Artificial Intelligence", "The National Artificial Intelligence Research and Development Strategic Plan", "Artificial Intelligence, Automation, and the Economy" and "2019 Version of The National Artificial Intelligence Research and Development Strategic Plan". The strategic documents of China are "13th Five Year Plan for Developing National Strategic and Emerging Industries", "Internet Plus and AI Three Year Implementation Plan", "Robotics Industry Development Plan", "Artificial Intelligence 2.0", "Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry" and "New Generation Artificial Intelligence Development Plan (AIDP).

As a result of the information obtained from the documents and literature examined, this thesis arises based on the assessment that the American and Chinese governments' making and implementing their AI policies by considering featured topics of ***public policy process, government role regarding AI, responsible policy actors, government expenditure on AI, AI policy approaches, AI principles and future expectations of the countries.*** The national AI strategy documents of the two countries were coded on the MAXQDA 2020 program, and ***main strategic goals and priority areas/sectors,*** examined through two case analysis models.

The findings obtained in the thesis are while the AI policies in the USA come to the agenda in a participatory and multifaceted way of many scientists, academics, businessmen, think tanks, civil society and public employees who forms the ecosystem; in China due to the centralist and authoritarian state structure, AI policies comes to the agenda as a result of the regulations of the bureaucrats and the ruling political party. While the American AI public policies are formulated by President, the Congress, the Senate, the White House staff, administrative agencies, departments, sub-agencies, and AI initiatives and policies are made by the experts from the government, industry, and academia to spark ideas for how the Federal government can adopt AI, in China, the ultimate decision-making body is the Communist Party of China (CPC) and centralized bureaucracy. In the USA, at the federal level, the AI policy legitimation occurs when Congress pass a bill; at the state level, when a state legislature pass a bill; and at the local level, when a local legislative body such as city council pass an ordinance.

In China, The Communist Party of China which is the only governing body sets the policy agenda. AI comes to the agenda firstly with a five-year plan and after that, there have been many different AI documents published by Chinese government. The first legislation process with a broad focus on AI has been realized in 2017, under the Obama Administration in the USA and under the Xi Jinping Presidency in China also in 2017.

There are some similarities and differences have been founded in the documents by analyzing in the MAXQDA program. One of them is while the USA presents a wide and more detailed strategy, China offers a repetitive and constricted strategic goal plan. When the documents are examined, it also shows up what steps various institutions have taken in line with these goals and what implementations by basing all kinds of strategic goals of America have been obviously expressed. Some of the key differences that arise in these strategic goals are that China sets a more detailed goal for the development of AI systems and technologies. America, on the other hand, draws attention to open data platforms, easy accessibility to data, and support that AI should not only be a field developed by computer scientists or other engineers, but rather a more interdisciplinary field.

The main purposes of both countries in determining their AI policies is to be the best in this field and leader of the AI in the world. With the strong competition perspectives, they set their policies with remarkably similar goals. However, there are also some areas where they differ when determining policies. While America focus more on the areas like national security and defense, China attaches more importance to areas such as infrastructure, city construction and transportation. It can be said that the reason of the USA for giving priority to these areas is its important talent and experience in this field with national security and defense organizations that the country had for many years, and that can be cause to have a voice in the world by supporting those institutions with AI technologies. It can be said that China focuses on areas where it can obtain more practical solutions such as city construction, infrastructure, and transportation due to its intensive population and marketing AI related technologies.

The main differences between the USA and China is their government structures, The USA has a decentralized federal state system, and China has a centralized system. When we look at the Chinese AI policy determination and implementation process, it can be said that there is a central strategy which determined by Chinese government and local implementation on AI policies. Both countries have different policy approach for implementing AI policies. While America has a participative and bottom-up policy and technology innovation approach, China has an authoritative and top down policy and technology innovation approach in determining the national AI strategy and its implementation throughout the country. Because of the federal state structure of the USA, it reveals its policies in a bottom-up approach. Evidence of this can be given to the USA AI laws. On the other hand, because of the central state structure of China, different policies are being realized by the local and central governments to put into practice the right AI talent and projects. There are also important AI projects and tax policies that benefit technology companies developing or adopting AI. In China, private champions support the aims of central government for example, Ministry of Science and Technology of the People's Republic of China (MoST) appointed the four largest Chinese AI companies—Baidu, Alibaba, Tencent, and iFlyTek—to "lead the development of national AI innovation platforms in self-driving cars, smart cities, computer vision for medical diagnosis, and voice intelligence, respectively."(Faggela, 2019). Research and development investments seemed mostly made by the private sector, by firms such as Google and Amazon in the USA, while

China has adopted a more state-centric approach in this situation. So, the AI approach is top-down approach in China.

The USA is the number one of ranking in global AI race with its important steps in AI; it has the higher education level with 34 of the world's top 100 universities for studying computer science. Its achievements mostly seen on private growth, entrepreneurship, and the San Francisco Bay Area (Hollywood, 2019). It focuses crucially on defense sector. The government spends every $1 on AI-related investments, 43 cents go to the Department of Defense on research participating from group decision-making to disease recognition and auditory analytics. United States lawmakers and regulators have primarily maintained AI in autonomous or self- driving vehicles and defense. The Department of Transportation is investigating to the use of autonomous vehicles, including multi-vehicle convoys. Department of Defense is focusing on policies which provide development and deployment of AI systems as they concern national defense.

China is not the number one for AI for now. However, the current president and government is on his way to achieving his aim of being the power in AI by 2030. Chinese government's one of the important strategic goals is establishing the AI ecosystem with cluster integration of knowledge, technology, industry and mutual support of talent, system, culture, foresee the risks and challenges, pushing sustainable development as the center of the intelligent. As a result comprehensively increase the social productive forces, national strength and national competitiveness for the purpose to speed up the construction of innovative countries and the science and technology power of the world, to achieve "two hundred years" goals and to provide strong support for the great rejuvenation of the nation (New-Generation of Artificial Intelligence Development Plan, 2017: 4).

The AI ecosystem of China is the supreme strength is that the government, private sector, and academia are working together to achieve national AI goal. We can understand this issue from the mega projects of China. It is not possible to realize high-spend infrastructure projects just by private companies because those companies cannot possibly afford to build cities and highways. Facial recognition is an important development AI technology of China. Perceiving the important point of the Chinese strategic document which is assign by central government, but the main innovation and transformation will be driven by the private sector and local governments (Roberts et al. 2019: 4). In 2019, 85% of patents for facial recognition technology were eventuated in China. This is 13 times more

than the number of facial recognition patents in the US (Hollywood, 2019). The expand population of China is the important advantage for facial recognition and providing data from Chinese people.

The Chinese state system allows the government to collect and use data much more systematically than in the USA (Growth et. all, 2019: 18). Looking at the data obtained, China spends the most money on R&D worldwide after the USA.

The documents and reports of Chinese central government is often too insufficient in terms of information, timing, sources, and purpose in comparison with U.S. Federal government. Most expenditures made by the U.S. Federal Government flow through the departments and agencies of the executive branch. Like that in China, the State Council, and its including institutions - the Ministry of Science and Technology (MOST), the Ministry of Industry and Information Technology (MIIT), and others- have the same duty. Expenditures made by the Chinese central government flow through the State Council and the ministries below it. Main policies about AI made by these bodies or their subordinates are considered competent and show that central government involvement in any activities they have start.

The USA claimed that China has long benefited from the open nature of the U.S. academic and commercial ecosystem to establish its AI capacity. U.S. universities have trained many of China's primary AI researchers. Many American universities and technology companies trust Chinese nationals for research and technical expertise. Their mutual business relations continue for many years. U.S. entrepreneurs fund AI startups in China, while Chinese sovereign wealth funds, regional and local governments, universities, and companies are investing in and obtaining U.S. technology companies. Beijing's enhanced program of military-civil combining try to mobilize civilian technological advances in support of China's military modernization and encourage broader economic growth and innovation by exterminating barriers between the commercial and defense sectors (2019 Annual report to Congress).

In the study, it was not easy to reach the policy documents in the Chinese literature and the lack of reliable information on Chinese government expenditures on AI research and development R&D made it difficult to do robust comparisons between Chinese and U.S. expenditures on AI, which in some cases have procure alarm among U.S. policy makers and observers (Colvin, et all, 2020: 1). The issue that can be counted as the most important limitation is the difficulty of reaching even the originals of Chinese resources because of

language barrier. In the light of the information obtained from international reports and research articles about China, comments could be broadly made.

Future studies might consider language barriers. In the study, only the national strategy documents of the two countries were analyzed. "National AI R&D Strategy Plan" published by the USA in 2016 version updated and "New Generation of Artificial Intelligence Development Plan" documents were analyzed. For further researchers, a qualitative analysis with all the documents obtained in subsequent studies will be much more effective in creating the basic AI profile of the two countries. Since this study was prepared with the priority of reviewing national strategy documents, AI laws were evaluated for information purpose only. The analysis of AI laws, which can be considered as a particularly strong example of public policy in later studies, will provide an important resource for public policy and comparative public policy analysis studies. China did not have specific laws regulations for AI was another reason for benefiting laws in comparison.

In the social sciences, particularly in the field of management science and public policy, due to the lack of AI policy researches in Turkey and the first example of the work to be done in this area this thesis has significant example and contribution. This study tries to include all the activities that countries do or do not do consciously, from the most abstract to the most concrete of the policy documents of both countries selected in two country case study. Comparing the AI policies of American and Chinese governments, determining the differences between them such as policy implementation process, national strategies and institutions and actors of policies, in the AI policy setting and implementation process can help all other countries for better understanding what are the opportunities and challenges of AI policies for them and can help to adopt “best practice” methods and solutions. With this study, the policy recommendations to be given to policy makers will be expanded with many detailed and related studies to be carried out in the future and can provide an important road map for public policy makers.

Lessons learned from the USA and Chinese AI Policies and Policy Recommendations.

In the strategic documents examined by the USA and China, the following inferences can be made in order to understand the success they have achieved in the field of AI and for countries that have not yet determined their national AI strategy or those who want to put forward successful policies in this field.

1. ***AI S&T Output;*** One of the most important factors that can be shown as the reason for the success of America and China in the field of AI is the studies and efforts in AI science and technology. After 1990s, there have been over 100,000 scientific papers published on AI every year and most of them belongs to the USA and China. It is known that China (369588) and the USA (327034) ranked first and second in AI acientific papers published between 1997-2007 (CISTP, 2018: 15). In terms of institutions which has scientific AI papers, Chinese Academy of Sciences (CAS) is the first in the world. However, the top 10 government agencies in AI scientific output are all from the USA, including government departments such as Department of Defense and Department of Energy as well as funding institutions such as National Institute of Health and national laboratories, reflecting the USA's strong interest and active interest in AI research at the government level. Among the top 100 institutions in AI scientific output, there are 87 universities, 8 research institutions, 3 government agencies, and only 2 enterprises. The three government agencies are the U.S. Department of Energy, the U.S. Department of Defense and the National Aeronautics and Space Administration (NASA); and the two enterprises are IBM and Microsoft (CISTP, 2018: 17). Considering all these data, it is a very important step to be successful in the field of AI because of the quality and number of research and development studies in this field, as well as the cooperation of the government, academia and companies in this field.

2. ***AI Ecosystem;*** For the first step of the functional AI policies, countries should establish a wide and versatile AI ecosystem. The mutual collabaration of government, universities, and industry led to an innovative, vibrant AI sector. the topic that both countries emphasize very much is the AI ecosystem. The USA emphasizes the significance of the role of industry and academia which are the primary sources for emerging AI technologies for promoting and coordinating participation in standards and benchmarking activities of AI. In the USA, high-tech companies are investing significant resources into staffing faculty members and students with AI expertise. Universities and industries are in a battle to recruit and retain AI talent. While the USA AI ecosystem is more large, innovative, and divers, China does not yet have the same kind of vigorous AI ecosystem. It can be said that the American leadership in science and engineering research and innovation is originated with its unique government- university-industry R&D ecosystem.

3. ***Establishing Ethical AI Doctrine;*** Another important issue is ethics. The issue of "reliability" of AI systems is an especially important condition for policies to be made in this area. When policy makers deciding policies, which includes AI systems and technologies they should pay attention to ethical implications of AI for citizens. They should apply policies on AI system behavior that restrict action to conform to ethical doctrine. It is a known fact that ethical issues can vary according to culture, religion and beliefs. However, generally accepted ethical reference frameworks should be developed and adopted in order to prevent the negative effects of AI systems that countries should pay attention to while creating their AI policies.

4. ***Transform the Nature of Work;*** AI will change the nature of work and some jobs lose their effects and value. So, those problems will surely entail government impact. Such planning and regulation can only be provided by the government to cover an entire country. It is an inevitable fact that AI will change the workforce of the future. For this reason, governments should determine policies to prevent the negative effects of the workforce gap or workforce change. For example, In the USA, The National Science Foundation (NSF) Future of Work at the Human-Technology Frontier work on the big idea that supporting socio-technical research enabling a future where intelligent technologies collaborate synergistically with humans to achieve wide participation in the workforce and develop the social, economic, and environmental benefits across a range of work settings.

5. ***Training Policymakers;*** Decision makers and those who influence them should be trained on the benefits and dangers that can be achieved with AI. They should have the knowledge about to what extent, in which areas, for which priorities AI can be used in current and future policies.

6. ***International Policy Making Groups;*** The meeting of the policy makers around the world on common platforms in order to make common decisions, evaluate the policies and determine the policies to be more qualified in the field through joint studies will enable the emergence of AI policies on a more solid basis. Organizations to be established to achieve these goals can also assist policymakers in advising.

7. ***Cooperation between public, private, civil society, and academia;*** To provide continuous communication between public, private, civil society, and academia. Their opinions will be crucial in influence policy makers' opinions and actions.

8. ***Government Support:*** AI investments need to be made with the support of the government in order to put forward policies that are beneficial to the whole country.

9. ***Funding to Academia;*** Most AI researchers argue that funding universities in AI will be at the most significant step in future success. The reason behind these thoughts is that AI research is a priority step in terms of applications. It is a fact that these researches are carried out by researchers in universities.

10. ***Venture Capital Investment:*** AI startups are increasing day by day worldwide. According to CrunchBase data, AI startups raised a total of $277.3 million in funding rounds in 2010. In the next three years, this number jumped to over $1bn for the first time. In the second quarter of 2018, it increased to $26.6bn a tenfold increase in eight years. Statistics show that 2019 has witnessed the most significant increase in the value of investments, with the total figure growing by $19.1bn and reaching $53.6bn at the end of the year. Increased investments into AI companies sustained in 2020 with the total amount of raised funds growing by $8.2bn from January to July, despite the slowdown in venture capital funding caused by the COVID-19 pandemic (Inside Bigdata, 2020). North America is the leading region with a total of $33.7bn worth investments in AI startups. The USA companies raised more than 95% of that amount, with California, San Francisco, and New York as the main hubs. Asian companies as for raised a total of $20.3bn in funding, ranking as the second-leading region globally. Therefore, the important step for successful in AI, venture capital investment to AI startups in a country is more significant phase.

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