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Georgia - Fit for the Age of Artificial Intelligence?

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Research

Georgia - Fit for the Age of Artificial Intelligence?

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2021
Tbilisi

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ABBREVIATIONS

AA	–	Association Agreement between Georgia-European Union
AI	–	Artificial Intelligence
EU	–	European Union
GDPR	–	Regulation (EU) 2016/679 (General Data Protection Regulation)
GITA	–	Georgia's Innovation and Technology Agency
GoG	–	The Government of Georgia
IMF	–	International Monetary Fund
Ministry of Economy	–	Ministry of Economy and Sustainable Development of Georgia
ML	–	Machine Learning
MS	–	Member State of the European Union
NLP	–	Natural Language Processing
OECD	–	Organization for Economic Development
PPP	–	Public-Private Partnership
PwC	–	PricewaterhouseCoopers
R&D	–	Research and Development
UN	–	United Nations
US	–	United States of America

1. INTRODUCTION

Artificial Intelligence (AI)[1] is increasingly becoming a part of our everyday lives. The use of Unmanned Aerial Vehicles (UAVs) was observed in the Nagorno-Karabakh conflict[2]; AI model was developed to diagnose COVID-19[3]. The leader of the Georgian Dream criticized opponents for using deepfake programs to misinform the electorate[4] during the 2020 parliamentary election campaign. AI offers tremendous benefits for our societies, in terms of public governance, business development[5] and healthcare, but it also raises important economic, legal and ethical questions.

Governments aiming to develop effective AI policies face a twofold challenge. On the one hand, they have to create an AI friendly eco-system, attract AI investors, boost the development of AI technologies, increase the industrial application of AI and therefore, improve overall, AI-generated economic and social welfare. On the other hand, governments should create policy frameworks to balance AI associated risks, which might be related to personal data protection, targeting, algorithmic discrimination, cybersecurity, and/or AI liability.

AI technologies are expected to add US$15 trillion value to the global economy by 2030.[6] According to PricewaterhouseCoopers (PwC) research, global GDP could be up to 14% higher in 2030, as a result of AI.[7] Several countries developed national AI strategies during the last couple of years.[8] EU recently announced ambitious AI goals to compete with the US and China and issued several AI policy documents[9]. Some of the EU member states (MSs) also made significant progress, in terms of national or sector-specific AI policies.[10] US & China are world leaders in terms of AI technologies, but countries

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[1] For more information about AI, you can for example check Artificial Intelligence in Society, OECD, available here.

[2] See, for example, The Nagorno-Karabakh conflict is ushering in a new age of warfare, available here.

[3] J. Chu, MIT news, "Artificial intelligence model detects asymptomatic Covid-19 infections through cellphone-recorded coughs", available here.

[4] Caucasus Plus, Irakli Kobakhidze: Radical opposition prepares materials using such programs as "Deep Fake". here.

[5] E. Martinho-Truswell, Harvard Business Review, How AI Could Help the Public Sector", available here.

[6] Oxford Insights, AI Readiness Index 2019, available here.

[7] PwC, Sizing the prize - What's the real value of AI for your business and how can you capitalise?, available here.

[8] Ministry of Economic Affairs and Employment of Finland, Finland's Age of Artificial Intelligence, 47/2017, available here.

[9] See for example the information about the AI policy developments in the US, available here For information about the AI policy developments in China, information available here.

[10] See, for example, the German government's Action Plan of the Digitalization and AI in Mobility, available here.

like Canada[11], Japan[12] and Singapore[13] also allocated solid resources for AI policy and research development. Leading international organizations like the World Economic Forum (WEF) and the Organization for Economic Development (OECD) established AI policy programs.[14]

AI positioning of the developing and the developed countries differ greatly; AI could even widen the gap between the rich and the poor nations, by shifting more investments into developing countries and replacing the labour force of the developed nations.[15] Georgia's AI positioning in the world is modest. According to the AI Readiness Index, the country was ranked #72 out of 172 countries and #5 in the region, below Turkey, Ukraine, Belarus and Azerbaijan.[16] Interestingly, out of 10 ranking dimensions, Georgia received the highest score in Data Representativeness (70.91) and the lowest in AI Vision (0). Georgia is a country of limited human, economic and technological resources. Considering the current AI state of play in the country and especially the issue with the "vision", it is important to take radical and effective steps to improve global and regional AI competitiveness and ensure that Georgia is not left behind by the "AI revolution".

Following the international experience, the first step for Georgia to tackle the AI-related challenges and opportunities could be the development of a comprehensive AI strategy. The research aims to investigate the potential of developing a national AI strategy in Georgia, which could potentially create an opportunity for further sector-specific AI policy developments/research. Strategy document could serve as the foundation for AI ethics and policy development in the country.

Working on a national AI strategy requires the involvement of a wide group of actors, including government representatives, business companies/associations, international experts, representatives of academic/research institutions and the public.

AI technologies are broadly applied in several sectors, from military to education, that is why it is significant for the strategy document to be comprehensive and cover important areas of governance and economy. Having a clear strategy could help to coordinate several governmental policies and ensure that there is no contradiction between the AI strategic goals and certain sectoral goals. Therefore, the strategy preparation process has to be transparent and inclusive, to ensure the high legitimacy of the document. The

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11   See for example, here.
12   See for example, here.
13   OECD AI Policy Observatory, Singapore, available here.
14   See, for example, OECD work on AI principles, available here.
15   International Monetary Fund, "How Artificial Intelligence Could Widen the Gap Between Rich and Poor Nations", blog, available here.
16   Oxford Insights, AI Readiness Index 2019, available here.

international aspect of the AI policy is also significant, both in terms of potential risks and business opportunities.

The research would be based on a qualitative policy research method, combining the secondary research and interviews with the relevant industry experts. The quantitative method would also be used in certain cases. The research data will include official governmental documents (regulations, policy and strategy documents, decisions and the statements of the government officials) and academic literature related to legal, technical, economic and ethical aspects of AI. The scope of the research would be limited to the AI policy issues in Georgia, the EU, MSs. The examples from two neighboring countries of Georgia – Turkey and Russia would also be used.

The second chapter of the paper focuses on the definition, historical development, application and importance of AI. The third chapter describes recent AI policy developments in different countries and identifies the main characteristics of these policies. The fourth chapter maps AI in Georgia and explores the current state of play of AI in the country with regards to the policy/regulation, business and education sectors. Based on the findings of the previous chapters and considering the experience of foreign countries, the fifth chapter provides recommendations for governmental, business and education sectors. The findings of the research are concluded in the final chapter.

2. DEFINITION AND IMPORTANCE OF AI

The concept of Artificial Intelligence serves as an umbrella term for technologies that appear to act as if they were rational beings.[17]Finding one universal definition of AI is a difficult task. European Commission suggested in its Communication that AI refers to systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals[18].

AI-based systems can be purely software-based, acting in the virtual world (e.g., voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g., advanced robots, autonomous cars, drones, or the Internet of Things applications)."[19]

OECD suggests three main elements to define the concept of AI: Sensors, Operational Logic and Actuators. Sensors collect raw data from the environment, while Actuators take actions to change the state of the environment.[20]

Figure 1. *Conceptual view of an AI system*
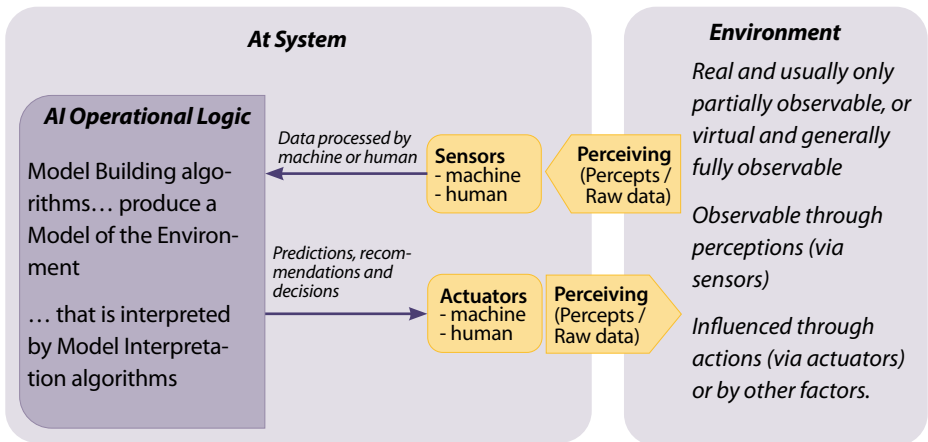
Source: OECD[21]

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17 A. M. Turing, "Computing Machinery and Intelligence," Mind 59 (1950): 433-442.

18 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Building Trust in Human Centric Artificial Intelligence. Available here.

19 AI for Europe, COM/2018/237 final available here.

20 OECD principles on AI, available here.

21 Ibid.

Sometimes specialists distinguish the so-called narrow (also known as weak or applied) and general (or strong) AI. Narrow AI systems are the ones that can perform one or a few specific tasks. A general AI system is intended to be a system that can perform most activities that humans can do. Currently deployed AI systems are examples of narrow AI.[22] Some of the terms often associated with the AI include[23]:

- Machine Learning (ML): Teaching computers to learn without explicit programming (solve problems from data);

- Computer Vision: Teaching computers to understand visual content like images and videos (incl. facial recognition);

- Natural Language Processing (NLP): Computer's ability to read and understand language.

Big data and ML played a prominent role in the evolution of AI. Data is essential to enable AI devices to learn. The abundance of data in areas such as healthcare diagnostics and online shopping preferences has provided the fuel to test the potential of AI. Big technological companies have access to large amounts of data which enable their AI systems to better understand their customers and provide customized services such as advertisements or promotions.[24] ML which includes techniques like neural networks and deep learning uses algorithms to improve the ability to perform a particular task by learning from data over time. This allows computers to adapt to unpredictable situations that defy codification by static rules.[25]

AI is a General Service Technology (GST) and could be applied in any sector of the economy, from healthcare and agriculture to education and financial services[26], that is why AI has a great potential to stimulate economic development[27].

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[22] European Commission, High-Level Expert Group on Artificial Intelligence, "A Definition of AI: Main Capabilities and Scientific disciplines, available here.
[23] OECD, Facebook AI Research, available here.
[24] UN, Economic and Social Commission for Asia and Pacific," Artificial Intelligence in Asia and the Pacific" available here.
[25] National AI Strategy of Singapore, P.12, available here.
[26] See for example information about AI impact on the healthcare sector, available here.
[27] D.Strusani and G.V.Houngbonon, The Role of Artificial Intelligence in Supporting Development in Emerging Markets, available here.

Figure 2. *Illustrates the benefits, the drivers and the impact of AI*
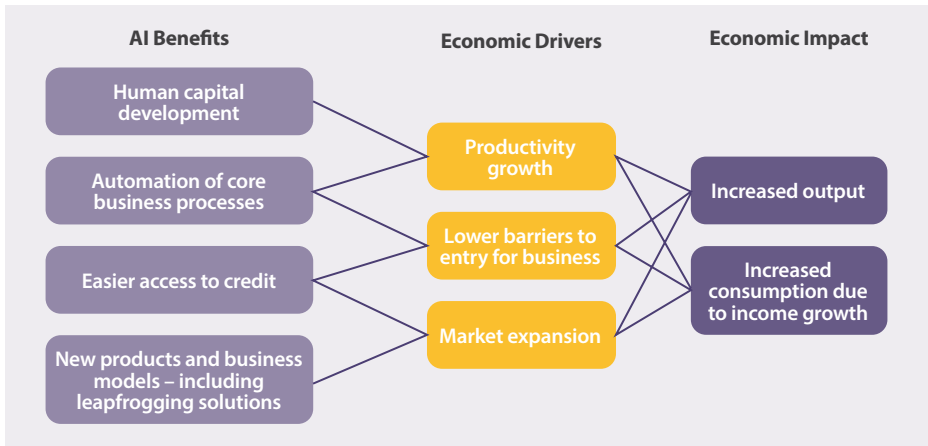
Source: International Finance Corporation[28]

Three important steps could be distinguished in the lifecycle of AI. Development, deployment and use. Therefore, there must be strong coordination between AI research, AI development, deployment to fasten AI progress and maximize the benefits. As it would be shown in the following chapter, all the international AI initiatives are based on strong coordination between the public and private actors.

28   Ibid.

3. INTERNATIONAL AI POLICY DEVELOPMENTS

According to OECD, more than 300 AI policy initiatives took place during the last decade from more than 60 countries, with more than 130 of those policies initiated by the national governments.[29] The types of initiatives vary and could include the creation of the AI expert group, National AI Strategy Document, Regulatory oversight, Grants schemes for R&D or the public awareness campaigns. The first part of this chapter provides a brief overview of the national AI policies of some countries. Considering Georgia's European integration ambitions and the legal harmonization duties derived from the Association Agreement between Georgia-European Union (AA), priority is given to the AI policy developments in the EU and some of its member states, relevant for the Georgian context, due to the country size or the political past – Finland, Estonia, Lithuania and Latvia. To gain a regional viewpoint, the AI initiatives of the two neighboring countries of Georgia – Turkey and Russia are introduced. International organizations play an important role in the AI policy developments. For this reason, some of the initiatives of the International Organizations are discussed. The second part of the chapter will summarize the key takeaways from the current policy initiatives.

Figure 3. *Country landscape - AI Strategy*

Source: Holon IQ.[30]

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29   OECD.AI (2020), powered by EC/OECD (2020), STIP Compass database, accessed on 14/01/2021, available here.

30   Holon IQ, The 2020 AI Strategy Landscape, available here.

3.1. National AI Initiatives

EU

A European approach to AI is based on excellence and trust aiming to strengthen the global AI competitiveness of the EU, but at the same time to ensure the respect of European values.[31]To achieve its ambitious goals, the EU initiated several AI policies. Building on its 2018 AI strategy[32], the EU published a White Paper on Artificial Intelligence - A European approach to excellence and trust, in February 2020.[33] The documents suggest a "regulatory and investment-oriented approach with the twin objective of promoting the uptake of AI and of addressing the risks associated with certain uses of this new technology", with the aim of creating an AI ecosystem that brings technology and benefits for 1. Citizens 2. Business 3. Services of Public Interest.[34] The white paper is complemented by the report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics[35]; it should also be read in combination with the other EU policy initiatives, like the European Data Strategy[36] or the Digital Education Action Plan[37]. The involvement of top expertise is essential for the EU while developing its policies, that is why the High-Level Expert Group on AI (HLEG) was established, consisting of 52 leading AI experts, coming from academia, civil society, and industry. Besides the AI White Paper, the HLEG contributed to the development of the Communication on Building Trust in Human-Centric Artificial Intelligence and worked on 4 more significant deliverables[38]:

- Ethics guidelines for Trustworthy AI
- Policy and Investment Recommendations of the Trustworthy AI
- Assessment List for Trustworthy AI
- Sectoral Considerations on the Policy and Investment Recommendations

The EU foresees the socio-economic changes generated by the AI and acknowledges the importance of modifying business models and education systems, that is one of the reasons why the EU increased its annual investment into its Horizon 2020 program.[39] It is important that the newly allocated resources are aimed at achieving two main goals: A. Support the AI applications in key sectors B. Support and development

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31   European Commission, Shaping Europe's Digital Future, Artificial Intelligence, available here.

32   AI for Europe, COM/2018/237 final available here.

33   White Paper on Artificial Intelligence - A European approach to excellence and trust, COM/2020/65 final, available here.

34   Ibid, p.2

35   Report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics, COM/2020/64 final, available here.

36   European Commission, A Europe fit for the Digital Age, European Data Strategy, available here.

37   European Commission, Digital Education Plan, available here.

38   European Commission, Shaping Europe's Digital Future, High-Level Group on Artificial Intelligence, available here.

39   European Commission, Shaping Europe's Digital Future, Artificial Intelligence, available here.

of the AI-on Demand Platform and Ecosystem, which would help to create a pan-European AI mechanism to "share AI resources produced in European projects, including high-level services, expertise in AI research and innovation, AI components and datasets, high-powered computing resources and access to seed funding for innovative projects using the platform".[40]

The involvement of the public is an important element of the decision-making process in the EU, that is why European citizens can provide direct input to the AI policy development, via ad hoc consultations or the European AI Alliance. Interestingly, both the AI White Paper and the Ethics Guidelines for Trustworthy AI documents went through the consultation process and attracted more than 1500 contributions jointly.

Two prominent upcoming EU initiatives, related to AI are the Legislative Proposal to regulate AI and the updated Coordinated Plan, to ensure that the efforts of the EU and its member states are coordinated. Both policy initiatives are scheduled to be published in the first quarter of 2021.

- Legislative Proposal – the AI White Paper addressed the importance of adjusting EU law to the new, AI-generated reality. Some of the MSs started voluntarily adopting AI concerning regulations.[41] It became obvious that the lack of EU-wide hard law could create issues like internal market fragmentation[42]. Following the outcomes of the public consultations, with this new regulation, the EU will aim to "safeguard fundamental EU values and rights and user safety by subjecting high-risk AI systems to mandatory requirements related to their trustworthiness. For example, regarding human oversight, providing clear information on the capabilities and limitations of AI systems.

Coordination - During April-July 2018, MSs, Switzerland and Norway signed the Declaration of cooperation on Artificial Intelligence (AI)[43] to strengthen the EU's AI potential jointly. The document is focused on 4 key areas: increasing investment, making more data available, fostering talent and ensuring trust. It sets the objective of adopting National AI Strategies by mid-2019 for every MS. According to the McKinsey research, a clear gap in AI readiness exists with Southern and Eastern Europe lagging.[44] For now, only 17 MSs published their national AI strategies[45] and only Malta managed to integrate all 7 requirements of the Trustworthy AI in its policy. The updated Coordinated Plan will focus on horizontal cooperation among the MSs, Switzerland and Norway.

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40   AI4EU consortium, available here.

41   See the examples of Malta and Denmark, White Paper on Artificial Intelligence - A European approach to excellence and trust, COM/2020/65 final, p. 10, available here.

42   Ibid, p. 10.

43   European Commission, Shaping Europe's Digital Future, "25 European countries signed a Declaration of cooperation on Artificial Intelligence (AI).", available here.

44   McKinsey & Company, Tackling Europe's gap in Digital and AI, available here.

45   : Vincent Van Roy, AI Watch - National strategies on Artificial Intelligence: A European perspective in 2019, EUR 30102 EN, Publications Office of the European Union, Luxembourg, 2020, available here.

Finland

Finland is ranked #3 (score 79.238) in the global AI readiness Index, above any other MS, gaining its lowest score (36.16) in the size category and the highest score (100.00) in terms of vision[46]. The Finish vision is embodied in the 11 national AI policy initiatives, most notably in the first strategy document - Finland's Age of Artificial Intelligence (December 2017)[47]. While some countries are struggling to take even the initial AI initiatives, Finland already published the second AI strategy document, titled - Leading the Way into the Age of Artificial Intelligence (June 2019)[48].

Finland's AI vision is delivered through 11 key components: 1. Enhancing business competitiveness using AI 2. Effectively utilizing data in all sectors 3. Ensuring that AI can be adopted more quickly and easily 4. Ensuring top-level expertise and attract top experts 5. Making bold decisions and investments 6. Building the world's best public services 7. Establishing new models for collaboration 8. Making Finland a forerunner in the age of artificial intelligence 9. Preparing for artificial intelligence to change the nature of work 10. Steering AI development into a trust-based, human-centric direction 11. Preparing for security challenges.[49]

The strategy documents are complemented, by narrower and more practical sectoral initiatives to achieve the national AI objectives:

- Finish Center for Artificial Intelligence - the nationwide center of excellence connecting three leading academic institutions, the Aalto University, University of Helsinki, and VTT Technical Research Centre of Finland. FCAI leads AI research but also plays an important role to put research achievements into practice and enable industrial renewal. It also promotes the transformation of society through effective and ethically responsible application of AI.[50]

- AuroraAI – is a state program, developed to allow citizens to access the wide range of services available from various government and cross-sector service providers in a seamless way.[51] The program will provide people with access to a new way of taking care of their overall well-being and, at the same time, will promote service providers' ability to form customer-oriented and dynamic service chains in collaboration with other operators. The program will also enable service providers to manage their activities based on up-to-date information.[52]

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[46]   Oxford Insights, AI Readiness Index 2020, Finland, available here.

[47]   Ministry of Economic Affairs and Employment of Finland, Finland's Age of Artificial Intelligence, 47/2017, available here.

[48]   Ministry of Economic Affairs and Employment of Finland, Leading the way into the age of artificial intelligence, 41/2019, available here.

[49]   Ibid.

[50]   Finnish Center for Artificial Intelligence, available here.

[51]   OECD AI Policy Observatory, Finland, AuroraAI, available here.

[52]   Ministry of Finance of Finland, Implementation of the AuroraAi project, available here.

- LUMI (Large Unified Modern Infrastructure) - is a new HPC system, located in the CSC's data center in Kajaani (Finland) from mid-2021. It ranks amongst the world's top supercomputers capable of executing more than 375 petaflops or more than 375 million billion calculations per second, with a theoretical peak performance of more than 550 petaflops per second.[53]

- Finland's Artificial Intelligence Accelerator (FAIA) is a successful example of Public-Private Partnership (PPP)[54], as it is a joint venture of a private company Silo.AI and the Ministry of Economic Affairs, Technology Industries of Finland. FAIA helps the organizations deploy AI, particularly by facilitating a 6-month long accelerator batch.[55]

- Business support program – In 2018, Finland allocated public funds with the amount of EUR 34 Million to launch the AI business support program managed by Business Finland[56]. It aimed at building an AI ecosystem and attracting investments in Finland.[57]

The three Baltic Sea states

The former-soviet Baltic Sea states, Estonia, Lithuania and Latvia, who are now EU MSs, adopted national AI policies. According to the AI readiness index, these countries are ranked #17, #26 and #36, respectively. It is also important to note that all three countries are part of the regional, Declaration on AI in the Nordic-Baltic Region, together with Denmark, Finland, the Faroe Islands, Iceland, Norway, Sweden, also including Åland Islands (the autonomous Finish province).

- Estonia – is the home of world-famous technology companies, like Skype, Bolt and TransferWise. It comes as no surprise that among the three states Estonia is the AI leader. The notable feature of the Estonian AI approach is a strong focus on AI use in public services, with more than 40 AI solutions currently used by the Estonian government[58].

- Lithuania – besides national AI strategy, Lithuania has 5 AI-related policy initiatives, most notably a regulation creating a possibility of testing self-driving cars on Lithuanian roads and.[59]

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[53] EuroHPC, "LUMI: a new EuroHPC world-class supercomputer in Finland", available here.

[54] According to the a PPP as "a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance", see more information available here.

[55] Finland's AI Accelerator, available here.

[56] Business Finland is the public organization for innovation funding and trade, travel and investment promotion in Finland, see more information available here.

[57] Business Finland, New value from AI and platform economy, available here.

[58] For example, instead of manually viewing images, the Estonian Environment Agency is running an AI prototype to identify wild birds and animals. The Estonian government is also using an ice-map solution, a ML approach to monitor the snow and ice cover of Estonian coastal waters. The information available here.

[59] See the information, available here.

- Latvia – published its AI strategy in February 2020, following the public consultation process with the relevant stakeholders. The document is in line with the EU Coordinated Plan suggestions and covers broad aspects of AI, including education reforms, legislative initiatives, strengthening PPP and international cooperation, etc. Latvia is aiming to allocate public funding worth 25 million euros and a total budget of 74 Million euros (public and private investment).[60] Some of the country's most prominent AI infrastructures include the High-Performance Computing Unit at the Ventspils International Radio Astronomy Centre (VSRC), the RTU Scientific Computing Centre and the Institute of Electronics and Computer Sciences (EDI).[61]

Regional context (Turkey & Russia)

According to OECD AI Policy Observatory, the two neighbors of Georgia, Turkey and Russia developed 10 & 12 AI-related policy initiatives, respectively. Although Turkey has not yet published the national AI strategy, it seems that the document is in the preparation process. One interesting aspect regarding the AI developments in Turkey is the Assembly of the Turkish Scientists Abroad, which includes the leading Turkish experts working abroad. One of the sub-groups of the Assembly was dedicated to scanning the artificial intelligence landscape. Current global trends and international collaboration models in Artificial Intelligence were discussed among Turkish scientists, which will pave the way for future planning in this area.[62]

Russia published its AI strategy in 2019, in a sign that the Government is serious about trying to improve Russia's capabilities. "A large part of the Russian state's interest in AI is military, but there are signs that military research and development could lead to advances in civilian technologies as well. For example, the company 'Kryptonite' aims to turn military advances into civilian products."[63] According to the Oxford AI Readiness Index Report, the government-supported Sberbank is the biggest commercial adopter of AI in Russia.[64]

International Organizations

Leading international organizations like the International Monetary Fund (IMF) and United Nations (UN) are actively involved in AI policy development and research. For example, in 2015 the UN's Interregional Crime and Justice Research Institute (UNICRI) established the Centre for Artificial Intelligence and Robotics. OECD has also been very influential, most notable for the development of AI principles, adopted by 42 countries[65].

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[60]   More information about AI policy developments in Latvia, available here.

[61]   Ibid.

[62]   OECD AI Observatory, Turkey, available here.

[63]   Oxford Insights, Government AI Readiness Index Report,2020, Russia.

[64]   Ibid, p. 65

[65]   See, Forty-two countries adopt new OECD Principles on Artificial Intelligence, available here.

The principles include:

- Inclusive growth, sustainable development and well-being

- Human-centered values and fairness

- Transparency and explainability

- Robustness, security and safety

- Accountability

Besides the principles, OECD also provides recommendations for the development of national AI policies - i) investing in AI research and development; ii) fostering a digital ecosystem for AI; iii) shaping an enabling policy environment for AI; iv) building human capacity and preparing for labour market transformation, and v) international co-operation for trustworthy AI.[66]

3.2. Some takeaways from the International AI Policy Initiatives

Following the assessment of some of the international AI policies, the following trends could be indicated.

- Process drivers – Most of the AI policy initiatives, except for some MSs, who just followed the EU policy developments, are originated by the national governments. In some countries, (e.g., U.S.) AI progress is greatly driven by business companies, however, the examples from most of the countries demonstrate that the state institutions are best positioned to lead the AI developments.

- AI expert groups – AI policy requires the involvement of expertise from academia, business and the industry. Creating a group of experts is vital both for establishing and implementing the AI strategy. Ideally, the group must be permanent, with long-term goals, provided with political, administrative and financial support.

- Strategy Scope - most international AI initiatives have three dimensions 1. Ethics and regulation 2. Benefits (business development, economic growth, improvement of governmental services 3. AI education and research.

- Commercialization - AI deployment could be as important as AI development. Following the Finish example, supporting companies to deploy AI could be extremely beneficial, especially for countries like Georgia, with a small economy and undeveloped industries.

- Financial resource allocation – funding is important, even if it is enough only for the adoption of AI strategy and not enough for the advanced AI research and/or startup funding.

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[66] OECD, Recommendation of the Council on Artificial Intelligence, available here.

- Long-term vision – besides the AI strategy document, it is important to have a post-strategy development phase. Some of the AI policy pioneer countries, like Canada and Finland, are now going through the second phase of the "AI revolution".

- International cooperation - following the previous takeaway, relying on international expertise could be extremely helpful, whether on an individual expert level or a country level. As demonstrated in this chapter, regional and/or international multilateral AI cooperation is quite a possibility[67] and could be extremely beneficial for a developing country with limited resources.

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[67] Besides the Declaration on AI in the Nordic-Baltic Region mentioned in the chapter, see for example the information about the Franco-German AI cooperation, available here.

4. MAPPING AI IN GEORGIA

The chapter aims to investigate the AI state of play in Georgia, based on governmental, business and education sectors. The goal is not only to describe the current situation and trends but to explore the existing challenges. The chapter is written with the understanding that the three sectors are sometimes closely interlinked and could greatly influence each other. For example, the developments in governmental policy could promote or hinder business development, while creating new AI technology by the business entity could improve the quality of the public services.

Before exploring the local issues, it is interesting to have a look at the global technological/AI positioning of Georgia. According to the 2020 Global Innovation Index (GII), Georgia demonstrated one of the largest decreases in the region, dropping from 48 (2019) to 63 (2020) in overall GII rankings.[68] When it comes to AI, Georgia reached 43.39/100 index score and was ranked 72nd out of 172 countries, according to the AI Readiness Index 2020.[69] Figure 4 illustrates the scores received by Georgia, in each of the 10 sections of the AI readiness index evaluation areas.

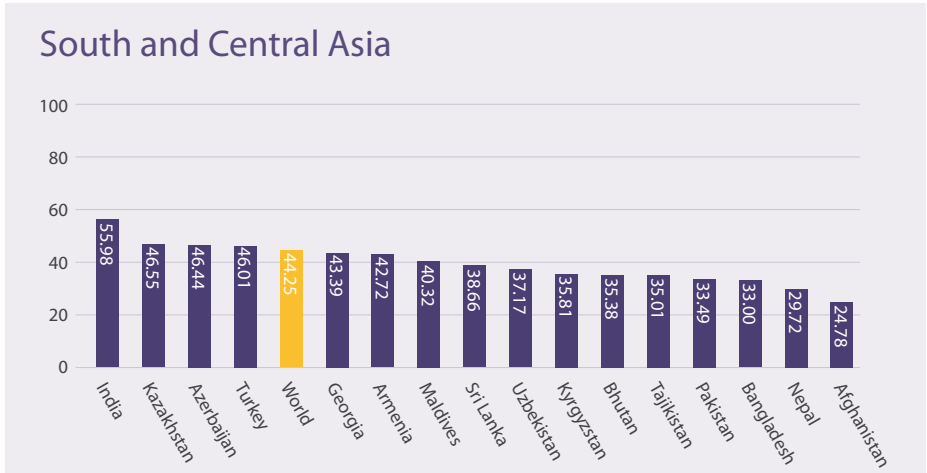*Figure 4.* *AI Readiness Index of Georgia*
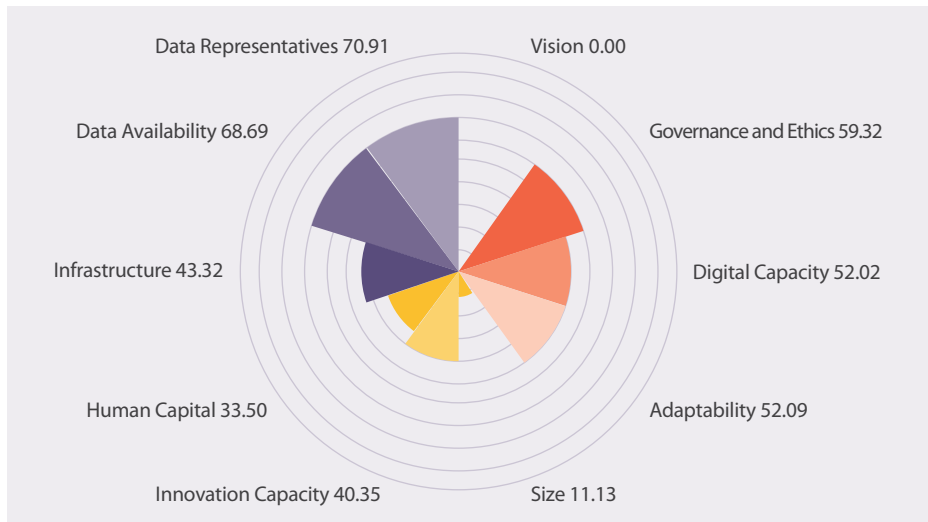
Source: Oxford Insights[70]

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[68]   Global Innovation Index 2020, p.32, available here.

[69]   Oxford Insights, AI Readiness Index 2020, Georgia, available here.

[70]   Ibid.

According to the Oxford Insights, Georgia is among the South and Central Asia country group. Figure 5 Demonstrates how Georgia is compared to some of the other members of the region and the World Average score.

Figure 5. *Regional positioning of Georgia based on AI Index*

South and Central Asia chart showing AI Index scores: India 55.98, Kazakhstan 46.55, Azerbaijan 46.44, Turkey 46.01, World 44.25, Georgia 43.39, Armenia 42.72, Maldives 40.32, Sri Lanka 38.66, Uzbekistan 37.17, Kyrgyzstan 35.81, Bhutan 35.38, Tajikistan 35.01, Pakistan 33.49, Bangladesh 33.00, Nepal 29.72, Afghanistan 24.78.

Source: Oxford Insights[71]

As it is demonstrated by Figure 4, Georgia gained its highest points in terms of Data Availability and Data Representativeness, while (the lack of) vision was identified as the main issue. Developing a national AI strategy could be a prominent step forward to address the issue and develop a comprehensive, long-term AI vision.

According to the National Statistics Office of Georgia (GeoStat), the Information Technology Sector has been on the rise during 2014-2019. In particular, the revenue generated by the IT companies increased from 144.6 Million Gel (2014) to 254 Million Gel (2019), while the number of people employed in the IT sector also increased from 1494 to 3062, during the same period[72]. The major issue regarding the IT sector research in Georgia is the lack and the quality of the statistical data as the methodology used by the GeoStat is not comprehensive. It is evident when it comes to the AI-related statistics as there are no separate sub-groups for AI and thus, no reliable information regarding the turnover, the number of companies and the people involved is available.

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71   Ibid.
72   FOIA, National Statistics Office of Georgia.

4.1 Government

The government of Georgia (GoG) has a twofold role concerning AI: 1). AI could be broadly used for providing governmental services, reducing costs and improving the overall quality of the service 2). Progressive governmental policies could help to build an AI-friendly environment in the country, which could attract investors and AI talent, who could generate additional economic and social welfare.

Use of AI

During the last two decades, Georgia conducted significant public service reforms and hails its Ease of Doing Business rating - 7th among 190 countries.[73] However, when it comes to the E-Government Development Index (EGDI), the country was only ranked 65th out of 193 countries.[74] Georgia was one of the first countries to introduce blockchain technologies in public services, adopting a blockchain-based land titling system and offering the public to easily verify the ownership of a property deed.[75] When it comes to using AI in public services, ethics and transparency issues need to be considered. Below you can find some examples of AI usage by the Georgian governmental organizations.

Chatbots are the most widely used AI technologies in Georgian public services. Several governmental agencies are using Chatbots to consult citizens[76]. Rustavi City Hall and Rustavi Innovation Hub recently collaborated to develop Ci – Bot, a Chatbot integrated on Facebook, answering questions regarding Rustavi City Hall services, COVID-19 and several other topics.[77] The Ministry of Internal Affairs (MIA) of Georgia, is using AI - automatic Photo (radars) and Video technologies for road traffics. The State Inspector Service of Georgia investigated the use of these automatic technologies by the MIA and found out that the methods of collecting and processing information are not in compliance with the Georgian data protection regulation and issued a recommendation to MIA to modify practices to make them compatible with the Georgian legislation. The recommendation was particularly regarding information registry, data storage dates and the deletion after the expiration dates. According to the information received from MIA, the Expert-Forensic Main Division is using the licensed, automatized face recognition (Polyface) technology – PAPPILON.[78] The Revenue Service of Georgia declared the importance of using AI in its services, particularly the AI Chat-bots[79], while the Georgian National Tourism Administration used AI solution for its Emotions project. The goal of the project was to gather and analyze data from the tourists who visited Georgia.[80] In its

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73   See, World Bank Group, "Economy Profile of Georgia", 2020, available here.

74   Ibid.

75   Shang Q., Price A., "A Blockchain-Based Lang Titling Project in the Republic of Georgia", available here.

76   See for example the information about Rustavi City Hall Chatbot, available in the Georgian language here.

77   Information about C-Bot available, here.

78   FOIA, Ministry of Internal Affairs of Georgia.

79   Revenue Service of Georgia, Service Development Strategy 2019-21, available in the Georgian language, here.

80   The information available in the Georgian language, here.

2020 annual report, the Prosecutor's Office of Georgia declared that the organization is using the IBM I2 program to conduct a sophisticated investigation, identify needs, facilitate the coordination of different units and manage the crime investigation. According to the First Deputy Prosecutor General, the AI program helps the user to integrate the information generated from different sources, quickly analyze the data, visualize the results, identify artificial behavior and dangers.[81]

Strategy & Regulation

In the absence of a national strategy, there is a challenge of implementing holistic AI policy in Georgia. There is no single governmental institution responsible for setting AI policy targets and therefore, coordinating the AI-related developments in different policy areas is difficult. Considering the universal applicability of AI to any sector, several governmental agencies, including the Intellectual Property Office, Competition Agency of Georgia or the State Procurement Office might face the necessity to solve AI-related issues. In the absence of central strategy, there is always a danger that the sector-specific solutions are short-term, inefficient and do not take into account the broader policy considerations. A universal strategy document could be extremely beneficial for developing a national legislative and/or policy framework. AI-friendly regulations and soft law could attract AI investors and increase AI development in the country. Georgia already has the experience of using aggressive deregulation as a mechanism for economic growth, however, when it comes to AI, the risks associated with the use and development go beyond economic benefits and can give rise to significant cybersecurity or human rights concerns. That is why it is important to develop a balanced regulatory framework.

Currently, the most relevant legal act, regarding AI is the Law of Georgia on Personal Data Protection, which sets the standards for data collection and possession. According to the Office of State Inspector, the organization is aware of AI regulatory developments in different countries and is actively studying international practice.[82] However, the first and so far, the only AI-related regulation in the country was adopted by the National Bank of Georgia. It entered into force on January 1, 2021, the "Data-Driven Statistical, Artificial Intelligence, and Machine Learning Model Risk Management".[83] To encourage the proper use of the models and mitigate potential risks, the National Bank of Georgia has designed the regulation of data-driven statistical, AI, and machine learning model risk management. The purpose of this regulation is to establish a framework to ensure effective risk management. This regulation sets out the basic principles of model development, validation, and application. Model Risk Management standards consider the existing practices and challenges of the Georgian financial sector and modern international supervisory experience.[84]

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[81] The First Deputy Prosecutor General, "The Prosecutors Office started using AI technology in investigations", interpressnews.ge, available in the Georgian language, here.

[82] FOIA, State Inspector Service of Georgia.

[83] See the act issued by the President of the National Bank of Georgia, 151/04, August 17, 2020, available in the Georgian language here.

[84] See Statement by the National Bank of Georgia, available here.

Financial support

The Georgian government developed several mechanisms to attract foreign investments, including but not limited to the Free Industrial Zones, Film in Georgia, etc.[85] The Minister of Economy and Sustainable Development of Georgia, held negotiations with the leading international companies, to offer them attractive investment opportunities and stimulate the post-COVID-19 economy.[86] The recent demonstration of the proactive investment policy is the favorable tax regime initiative for the international IT and Maritime companies willing to open regional offices in Georgia.[87]

Besides attracting foreign investors, the Georgian government has mechanisms like Enterprise Georgia, offering grants and other kinds of financial support for Georgian business companies/citizens. The governmental organization with the most relevant specialization in AI is Georgia's Innovation and Technology Agency (GITA), offering funding mechanisms for innovative startups with the potential to enter the global markets. During the last three years, GITA received overall 65 applications for funding AI startups.

Year	Applied	Financed
2018	8	1
2019	28	5
2020	29	3

Grants	Applied	Financed[88]
100 000 GEL	54	7
650 000 GEL	11	2

4.2 Business

Two types of companies could be distinguished while discussing AI and the business sector. The first ones are the so-called "AI companies" whose business models are based on developing and offering AI products and/or services, whether to other companies on a B2B model or to governmental organizations. The second ones are the entities, that do not develop/offer AI products/services themselves, but rather use AI-related technologies in their operations. These could for example include the companies from the healthcare or financial sectors.

The AI community in Georgia is small. Some of the prominent local "AI companies", include:

- **Pulsar AI** has created Natural Language Processing (NLP) technologies for different languages from scratch. Pulsar AI helps companies improve their communications with their customers by speeding up the response time and improving the quality of their answers.[89]

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85   See the information available here.

86   See for the information issued by the Ministry of Economy of Georgia, available here.

87   For information regarding the tax benefits, see information, available here.

88   FOIA, GITA.

89   See the company web-site, available here.

- **Maxine AI** is an IT consulting company, offering broad types of solutions, including "chatbots, recommendation systems, conversion predictors, named entity recognition tools, user behavior prediction tools, adult content filters, and others".[90]

- **Flashbot AI** is a chatbot developing platform, mostly providing services for Georgian companies.[91]

- **Optio AI** mainly specializes in the banking sector. The company's series of "powerful, data-driven software products enable financial firms to precisely categorize their customers' transactions and create conversational banking experiences that help people to manage their personal finances."[92]

Chatbots seem to be the most in-demand service for the Georgian AI companies, however, it is also clear that most of them can provide a variety of services. Local companies are mostly targeting foreign markets Maxin AI and Pulsar AI that have the experience of successfully operating on European and US markets. The focus on foreign markets could be partially explained by the little demand for AI technologies/consultancy by the local industries. Like in many other aspects of organizational/service innovation, the Georgian financial industry is leading the way in terms of AI use. In particular, the two biggest banks of Georgia, TBC Bank and the Bank of Georgia (BOG) have a successful collaboration experience with local AI companies. For example, Optio AI and BOG recently announced a joint Virtual Assistant project, which, currently on pilot mode, would use the Georgian Natural Language Processing engine to provide a superior experience for the customers of the bank.[93] Another good example is Pulsar AI creating a voice payment system for the TBC Bank.[94] While the financial industry is leading the way, the others are also trying to follow. Caucasus Medical Center recently announced the use of AI in their healthcare services. According to the Head of the IT department, Levan Danelia, AI would be used in the "fields of intracranial hemorrhage (hemorrhage in the brain) and pneumothorax (accumulation of air in the pleural cavity). The COVID-19 algorithm will be launched, which monitors the lungs of infected individuals and does not require patient involvement. An algorithm (Bone Health) will also be introduced, which will determine the level of calcium in the bone and give the necessary recommendations. We plan to work towards this direction and make maximum use of the possibilities of artificial intelligence."[95]

Grant mechanism and other types of support from GITA play an important role in local AI ecosystem development. For example, Pulsar AI and Optio AI are both receivers of the state grants and they later managed to attract foreign investors[96], however, like in

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90   See the company web-site, available here.
91   See the company web-site available here.
92   See the company website available here.
93   The information regarding the Virtual Assistant project is available, here.
94   See the video interview with the company representatives, available in the Georgian language here.
95   The information is available on the web-site of Caucasus Medical Center, here.
96   For example, Pulsar AI secured a Silicon Valley investment worth 1.2 Million USD. The information available in the Georgian language, here.

the case of other GITA-funded ideas, AI startups struggle to become sustainable and remain on market, despite securing the initial funding.

AI Business Association was launched in 2019 and it could play an important role in strengthening cooperation between Georgian AI stakeholders, including the development of PPP projects, however, several challenges for the business sector are obvious:

- **Lack of skillful workforce** – the graduates of Georgian universities have theoretical knowledge and lack practical skills, that is why the Georgian AI companies have to develop special teaching course for their employees to equip them with the necessary skills. Lack of soft skills among the IT graduates was also identified as an issue during the interviews. High-skilled labour outflow is also obvious as the brightest graduates seek to join foreign organizations and it is hard for Georgian AI companies to compete on the global job market.

- **Lack of industrial development** – the financial sector, is one of the best-developed industries in the country, that is one of the reasons why it is leading the way in terms of AI use. The lack of development in other sectors results in little demand for AI technologies/services and makes the already small Georgian market seem even smaller. It also leaves the local AI companies with no choice other than to target foreign markets.

- **Lack of trust** – the major issue the Georgian AI companies are facing, while entering the foreign markets, is the lack of trust from their potential clients. Even if the Georgian companies have the advantage in terms of price, compared to their foreign competitors, the clients find it difficult to trust them. AI development hugely depends on access and possession of large amounts of data, which could sometimes include persona and/or sensitive data. Local AI companies are currently using Open Data sources or very limited amounts of data to provide their products/services. Having access to larger and better-quality data could improve the potential of Georgian companies dramatically. One important aspect of this issue is the lack of a legal/policy framework to ensure the trustworthy and secure transfer of data to Georgia.

4.3 Education

COVID-19 influenced significant changes in the education system. The increase in technology use in the teaching process creates a great opportunity for new AI solutions to assist students and teachers. The world's leading universities are also using AI to manage their organizations and improve the quality of their services. The new reality created by technological advancements requires a new set of skills and therefore, urges educational institutions to modify their study curriculums. Considering such trends, the Georgian education system needs to follow the trend and offer adequate education to the students. AI raises significant economic, political and ethical questions, that is why it is important to introduce AI teaching not only in IT program curriculums but also to offer AI-related courses to the social science students.

Ministry of Science, Culture, Education and Sports (Ministry of Education) is the main governmental institution responsible for the Education policy in the country and therefore, has a vital role in improving AI skills. Below you can find some AI-related activities implemented by the Ministry of Education.

Secondary school students in Georgia can ask digital assistants for help thanks to the Anima Chatbotics. One of the most well-known examples of chatbots for school children is the creation of Cyber Galaktioni, a "digital clone" of the famous Georgian poet Galaktion Tabidze. "Filled with his writings, diaries, poems and thus mimicking the poet's linguistic style of writing/answering letters, etc. - one can experience something we call digital spiritism," say the creators.[97] Following the success of Cyber Galaktioni, there is a potential to develop similar digital assistants whether it would be another famous poet or the chatbot answering biology-related questions.[98] The Ministry of Education is using Microsoft programs at secondary/high schools, however, one of the biggest issues is the suitability of the Georgian language, which makes it hard to integrate a full Microsoft package for the secondary school children.[99]

Several Georgian universities are offering AI-related programs to their students.

- Business and Technology University (BTU) – is launching a PhD program in AI, approximately opening 5 PhD positions for students. According to the director of the program, the goal is not only to have graduates with technical specialization but also to produce policymakers who can address the broad policy issues relevant to AI[100]. In terms of infrastructure, BTU owns a "Supercomputer" which could be used to develop certain AI ideas and projects. The university also tries to strengthen its connection with the AI practitioners. Several AI startups and AI Business Association have strong links with the BTU and even run several joint projects together.[101]

- Georgian Technical University has an AI department at the faculty of Informatics, teaching several AI-related subjects.[102]

- Tbilisi State University – offering some AI-related classes.

- The Free University of Tbilisi – is a leading institution in terms of AI teaching with some of the graduates working at Big Tech. On the undergraduate level, Free University offers two AI covering programs, one in Electrical and Computer Engineering and the second in Mathematics and Computer Science. According to the university representative, the Free University of Tbilisi does not offer AI courses on a graduate level, because there is not enough research in the Georgian language and the students can directly pursue PhD studies abroad.[103]

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[97]   Available here.

[98]   Interview Asatiani A.

[99]   Ibid.

[100] Interview Gabisonia Z.

[101] See information at Interpressnews.ge (21.12.2020), available in the Georgian language here.

[102] See the university website, here.

[103] Interview Ghvinepadze, Sh.

- Ilia State University – Ilia State University recently introduced an AI teaching course, however, it is open only for third-year students and the first group of students would be able to choose the elective course in 2 years. There is also an ongoing AI project at the university, working mainly in Georgian language adoption. In terms of infrastructure, there is a university data center that can be used for AI-related projects.

- Kutaisi Technical University (KIU) was only launched recently and developed three academic programs in partnership with TUM International. One of the programs BSc in Computer Science offers AI-related studies. Considering the announced ambitions and the investment amount, KIU could play a significant role in developing AI skills in the country.

Besides the traditional higher education institutions, there is a potential for creating special, AI teaching platforms/companies. Neiron Academy was launched in 2020, providing both AI services and teaching, currently offering 4 AI-related courses[104].

Leading tech companies and educational platforms like Coursera are offering free AI-related courses, however, most of the courses are available only in English language. BTU is partnering with EdX to offer certain courses in Georgian language, there is also a local platform Qandle[105] offering ICT-related courses in Georgian.

GoG has two prominent education/research funding organizations that could potentially contribute to AI studies and Research. Shota Rustaveli National Foundation of Georgia already provided funding for AI-related project, running at Ilia State University,[106] while International Education Center mostly specializes in funding Master and Doctoral level studies for Georgian students pursuing studies at leading foreign universities.

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[104]   Neiron Academy, available here

[105]   Qandle, available here.

[106]   Interview Magradze, E.

5. RECOMMENDATIONS

Considering the economic challenges generated by COVID-19, the rapid development of AI and Georgia's current positioning in terms of AI and the technology sector in general, radical steps need to be taken to boost AI development in the country and generate the related economic and social benefits.

Before providing recommendations, it could be useful to define what makes good and bad AI strategies. According to Oxford Insides, a good strategy should have:[107]

1. Clear and realistic purpose
2. Clear timeline
3. Measurable goals
4. Funding
5. Strong coordination

Based on the considerations mentioned above, the following recommendations could be provided for the Georgian government, business companies and educational institutions:

GOVERNMENT

•   **Developing national AI strategy**

    GoG should follow the foreign experience and create a national AI strategy to minimize AI-related perils and strengthen the development of the AI ecosystem in Georgia.

•   **Selection of governmental organization responsible to lead national AI policy and coordinate the work of several sector-specific governmental actors.**

    Again, considering the broad nature of AI, the lead organization needs to have broad expertise and be on the top of the governmental hierarchy. According to the international experience, there are two types of models for leading AI policy. 1) When the AI policy is led by the existing governmental agency with a general mandate, usually creating a special department or sub-department dealing with AI 2). When the separate independent entity is created to tackle the AI or the Technology Policy developments in general. Considering the current positioning of Georgia and the importance of high legitimacy, option 1 should be better, while option 2 could also be effective at a later stage while implementing the strategy.

    National AI policy should be lead by the Prime Minister of Georgia and the Research and Innovation Council[108] could be the best suited governmetal entity to admin-

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[107]   Oxford Insights, what makes a good AI strategy? available here.
[108]   Information about the Research and Innovation Council, available in the Georgian language, here.

istrate the strategy development process, by creating a specialez AI task-force.[109] Besides the leading organization, it is also significant that all relevant governmental institutions are involved in the process. A good example of the joint effort of several governmental agencies is the work of the State Migration Commission, which gathers the representatives from 9 Georgian governmental agencies.

- **Creating a group of experts**

  Considering the nature of the AI, the risks and the benefits associated with AI use, it is important to create a group of experts with the mission to work on national AI strategy and the long-term AI policy in general. It is essential for the expert group to have high legitimacy and therefore, the decision should be made on the highest governmental level. The policymakers, businessmen, technicians, academics and AI ethics researchers to be represented in the group. Like the work of the Constitutional Commission of Georgia or the Parliamentary Investigative Committees, the workgroup should ensure high transparency and involvement of the Georgian public by providing information and organizing discussions. One of the major problems identified during this research was the lack of communication between the stakeholders working on AI and the lack of knowledge about each other's projects/work. To ensure maximum involvement of all interested actors, it is equally important for the expert group selection process to be transparent and fair. In that regard, sharing the EU experience and opening a public consultation to allow experts and citizens to provide their views could be extremely beneficial.

  The involvement of international AI specialists could provide a tremendous contribution to the work of the expert group, both in terms of expertise and legitimacy. Ideally, the participation of the ones with the experience of already working on the national AI strategies of other countries.

- **Allocation of budget**

  Although Georgia cannot compete with the world's leading economies in terms of AI funding, it is essential to allocate certain financial resources to ensure that at least the minimum requirements for the Export Group functioning and necessary research are provided. Financial support from international partners could be extremely important to conduct a high-quality preparation of the documents, however, it is important not to wait for external support and start taking initial steps voluntarily even with the limited resources.[110]

- **Strengthening international cooperation (especially with the EU)**

  International cooperation is important for two reasons: 1). As already discussed in the paper, the EU recently announced ambitious AI goals and initiated several policy documents. It could be beneficial to keep the eye on the world's most

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[109] Interview Janelidze, M

[110] Ibid.

influential regulator[111] 2). Georgia already has strong economic, legal, political and cultural ties with the EU. By signing the Association Agreement with the EU, Georgia took a responsibility to gradually harmonize its legal system with the EU Acquis. The key legal tool, dealing with AI development, Georgian Personal Data Protection law is mirroring EU General Data Protection Regulation (GDPR). Other areas of Georgian legislation, whether it is Intellectual Property or Consumer Protection would inevitably be influenced by the EU directives and the decisions of European Courts.[112] However, if the legal approximation is sometimes seen as a burden by some Georgian policymakers and business representatives, in exchange for the economic and political association, it is important to ensure that the AI policy is not seen as a burden. Although many of the sectors covered by the AA are hugely affected by AI, the term Artificial Intelligence is not explicitly mentioned in the agreement between the EU and Georgia. As currently there are no legal obligations regarding AI, the cooperation should be initiated by the Georgian side voluntarily, rather than waiting for the moment until it becomes the subject of the AA agenda. An important aspect to consider is the fact that although having some obligations under the AA, Georgia is still not a member of the EU, thus, the EU Law is not directly applicable, which gives Georgia the room for a maneuver and the possibility to transfer EU AI policy developments only to a degree, that are reasonable and suitable[113].

Georgia should also look beyond the EU and cooperate with other partners regarding the AI strategy. Cooperation with strategic partners like the US and other non-European countries could be extremely beneficial. International organizations like OECD have already a solid experience of conducting prominent projects in Georgia. The government should seek strong cooperation with all relevant actors.

- **Creating safe and trustworthy bilateral data transfer mechanisms with foreign countries**

    Following the previous recommendation and the issue related to the lack of trust in Georgian companies, when it comes to international data transfer, GoG should try to create safe international data-transfer tools. Again, collaboration with the EU is essential as it is the leading and most influential player in terms of data protection standards. While there is yet no Adequacy Decision[114] about Georgia, it could be possible to develop alternative data transfer mechanisms like standard contractual clauses, binding corporate rules, "derogations" etc.[115]

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[111]   Bradford, A, The Brussels Effect - How the European Union Rules the World, available here.

[112]   Reich A. and Micklitz H-W., The Impact of the European Court of Justice on Neighbouring Countries, available here.

[113]   Interview Janelidze M.

[114]   Adequacy Decision is the power of the European Commission to determine, on the basis of article 45 of Regulation (EU) 2016/679 whether a country outside the EU offers an adequate level of data protection.

[115]   For more information about the EU rules on international data transfer, see the information available here.

- **Defining AI priorities**

   Although the strategy document should be comprehensive, aiming to create a universal AI framework in Georgia, it is obvious that the country with the limited resources, cannot afford as radical transformation as some of the leading economies. In that regard, it might be reasonable to identify a few AI policy priorities: 1). Which could be strategically important for Georgia 2). Georgia has better resources to develop 3). Where there is a high international demand so that it has the economic potential.

- **Attracting leading technology companies**

   The world's leading companies like Facebook and Apple already have their major ongoing AI projects. Companies of such caliber attract the brightest AI talents and offer the best working conditions. GoG should try to persuade these companies to implement permanent or temporary projects in Georgia, whether it would be an AI teaching course or an AI Bootcamp. For example, Google already runs the Google Developer Group (GDG) in Tbilisi and organized some AI-related activities.[116] Frequently conducting similar activities, would only strengthen the AI ecosystem in Georgia. Creating regulatory sandboxes for AI testing and developing AI-friendly environment in the country, could be extremely beneficial to attract such enterprises.

- **Promoting Georgian AI companies abroad**

   As local AI companies are extremely foreign market-orientated, it could be beneficial to support them to enter new markets. Enterprise Georgia for example, operates several export support mechanisms,[117] such as the organization of international exhibitions, organization of trade missions and connecting foreign buyers to the local producers. It could be helpful to organize these types of events for Georgian AI companies so that they can unleash new opportunities.

BUSINESS

- **Strengthening local cooperation**

   One of the issues identified during the research, was the lack of cooperation of AI companies, with local businesses, educational institutions and government. Considering the size of the country, maybe Georgian AI companies are too focused on the international market and pay less attention to the needs of potential local clients. Despite not having a sufficient number of highly competitive and technology-driven industries, where AI could be used, there is still the potential to identify local sectors and offer services. Another obvious issue for local AI companies is the lack of qualified human resources. Most of their current employees are self-taught or developed necessary skills via training within the company. In that regard, having strong cooperation with the educational institutions could help AI companies to transfer practical skills to the students so that better qualify candidates for their job openings.

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[116]   See for example the event, organized by the Google Developers Group (GDG) Tbilisi, available here.

[117]   Enterprise Georgia, Export Support, available here.

- **Strengthening the role of the AI Business Association**

  AI Business Association can potentially generate new initiatives regarding AI strategy or a specific AI-related issue. It could also be useful for successful communication with the government or raising AI awareness among the public.

- **Narrow specialization**

  One of the strategies of local AI companies could be the development of narrow specializations[118]. Like specializing in languages that are not commonly used. That way, Georgian AI companies can create certain niches and satisfy certain demands on the global market.

EDUCATION

- **Allocation of resources on AI teaching and research**

  Georgian universities have only recently started introducing AI-related courses in their programs. The amount of AI research/projects conducted by Georgian institutions is also limited. Educational organizations should first try to allocate, more internal resources for AI teaching and research. Lack of specialists is also a major problem, so attracting local AI practitioners or international AI experts could be beneficial for Georgian academic. Launching AI study programs and research initiatives might initially be costly but can generate long-term financial benefits for Georgian educational institutions, as AI is becoming a popular discipline worldwide among the prospective students. It is likely that there would be a similar trend in Georgia too.

- **Stronger partnership with business sector**

  Strengthening partnerships between the universities and private organizations for AI teaching, research and application. For example, Neiron Academy is partnering with the Georgian National University[119]. Besides local AI entities, Georgian educational institutions should target collaboration with the world's leading IT companies. Types of cooperation could for example include study visits, joint research programs or internships for Georgian students.

- **Support in Certification**

  Gaining a diploma from a Georgian institution could not be enough to be competitive for the leading industry jobs, that is why the Georgian graduates need to keep in mind that they should simultaneously get their certifications, to become better equipped for the global job demands.[120] Certification can help Georgian graduates to gain better-paid jobs[121]. While the role of Georgian educational institutions could be to provide help and guidance on the certification preparation process.

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[118] Interview Parunashvili S.

[119] See the company web-site, available, here.

[120] Interview Gourdet JS.

[121] See for example information about the certification, available here.

6. CONCLUSION

Rapidly developing AI technologies are offering tremendous opportunities for economic transformation. Despite a handful of governmental initiatives and a few achievements in the business and education sectors, Georgia is not yet fully fit to grasp the opportunities generated by AI. While some of the foreign governments are launching the second phase of AI policies, Georgia has not yet even started working on the national AI strategy document. Bold steps are necessary to boost the development of the national AI ecosystem. Considering the limited financial resources of Georgia and the current Covid-19 situation, allocating budget for the AI policy might not seem like an urgent necessity for the Georgian government. However, it is important, at least to find the resources for the establishment of the expert group, to start working on policy initiatives. Besides the financial aspect, AI research requires sufficient human expertise and infrastructure. At this point, it might be more effective for Georgia if the resources are directed towards the implementation of applied AI solutions. In that regard, it is significant for local industries to start deploying AI. Not only it would be beneficial for their own productivity but would also open new opportunities for the local AI developers/service providers.

Strengthening international partnerships would be essential for developing sustainable AI initiatives, whether it is human capital, technical support, or financial investment. The positive element of the delayed Georgian "AI revolution" is the fact that the country can learn from foreign experience and carefully tailor a suitable and realistic AI strategy.

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FOIA REQUESTS

1. Georgia's Innovation and Technology Agency – received 11/12/2020
2. State Inspector Service – received – 21/12/2020
3. National Communications Commission – received 23/12/2020
4. Ministry of Internal Affairs of Georgia – received 11/01/2021
5. National Statistics Office of Georgia – received 25/01/2021

INTERVIEWS

1. Kasradze, A. – Georgia's Innovation and Technology Agency - 11/12/2020
2. Gabisonia, Z. - Business and Technology University – 15/12/2020
3. Asatiani, A. – Ilia State University/Ministry of Education, Science, Culture and Sport of Georgia – 15/12/20
4. Maghradze, E. – Ilia State University/Maxin AI – 22/12/2020
5. Macharashvili N. – ForSet – 23/12/2020
6. Gourdet, JS. – Olmait – 23/12/2020
7. Mamaladze, G. – Siemens Germany – 23/12/2020
8. Parunashvili, S. – Wit.AI – 24/12/2020
9. Janelidze,M. – PMCG – 25/12/2020
10. Gvinepadze, Sh. – Free University of Tbilisi – 06/01/2020
11. Beridze, I. – Centre for Artificial Intelligence and Robotics, United Nations, UNICRI – 25/01/2021