Asia-Pacific Economic Cooperation

Learning Workshop in Artificial Intelligence: Experiences of APEC Economies

APEC Telecommunications and Information Working Group

June 2022

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APEC Project: TEL 01 2020A

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APEC#222-TC-04.1

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Abbreviations

ABAC	APEC Business Advisory Council
AI	Artificial Intelligence
APEC	Asia-Pacific Economic Cooperation
DNA	Data Network and Artificial Intelligence
GPAI	Global Partnership on Artificial Intelligence
ICT	Information and Communications Technology
ML	Machine Learning
OECD	Organization for the Economic Co-operation and Development
QoE	Quality of Experience
QoS	Quality of Service
SDG	Sustainable Development Goals
SME	Small and medium-sized enterprises
SOC	Social Overhead Capital
STEM	Science, technology, engineering, and mathematics
TD	Digital Transformation
R&D	Research and Development
4RI	Fourth Industrial Revolution

1. Introduction

The workshop is a Peruvian initiative sponsored by the economies of Chile, China, Mexico, and New Zealand and supported by APEC. Its objective is to generate knowledge and capacities so that public policy makers and key stakeholders can share international experiences and have the necessary information to understand and address the main benefits and challenges of AI technologies.

According to the 2019 Digital Economy Report prepared by the United Nations Conference on Trade and Development: The United States and China account for 75% of all patents related to blockchain technologies, 50% of spending worldwide on the Internet of Things (IoT) and more than 75% of the global market for cloud computing directed at the public. They also represent 90% of the market capitalization of the 70 largest digital platforms in the world. Europe's share is 4% and Africa and Latin America together is only 1%. The project seeks to reduce the knowledge gaps between the economies with greater economic and human resources in the technological field, which allows them to take better advantage of the development and use of emerging technologies (such as big data, IoT, blockchain, and AI), and developing economies due to structural factors, such as different levels of access.

The project sought to create a virtual knowledge sharing space to build capacity and exchange information regarding the use of AI to foster greater efficiency in the operation of the public and private sectors of APEC economies. Its development will be important for economies such as Perú, Chile, Mexico, and Malaysia, among others, to promote the adoption of AI in the public and private sectors. The project will boost the capacity of APEC economies with less-developed guidance on AI to establish policies for the adoption of AI and development of potential AI projects that optimize resources and generate great social benefits.

The development and results of the virtual workshop will allow the generation of knowledge and capacities so that public policy makers can share international experiences and have the necessary information to understand and address the main benefits and challenges of AI. This project will also promote the application of technologies to accelerate economic recovery and enhance inclusive growth, which will help APEC economies face the current challenge generated by COVID-19.

2. Project Plan

The project builds on the Host Economy Leader's Statement "Connecting people, building the future" (APEC CHILE 2019), which considers that new perspectives are emerging, including through digital technologies and the knowledge and information society. In this regard, reducing economic disparities between APEC economies is important and possible through the promotion of digital technologies such as AI to strengthen SMEs. Likewise, it contributes to the fulfillment of APEC objectives for the development of capacities of the member economies in the relevant areas to achieve medium and long-term goals; and help members to participate more fully in the regional economy, as well as in the process of liberalization and facilitation of trade and investment.

In relation to the principles for capacity development, the project seeks:

1. To share the experiences from APEC Economies and other International Organizations.
2. To promote participation and strengthen the discussion on AI in the SMEs.
3. To present best practices in AI material for the benefit of all economies.
4. In the medium term, to generate collaboration among regional networks and promote the participation of different stakeholders.
5. To consider diverse perspectives, including a focus on gender, vulnerable populations, and geographical backgrounds for the benefit of local public organizations.

In summary, the project will promote economic and social well-being. In terms of capacity building, this project will focus on promoting the responsible use of AI in public and private sectors, in order to improve organizational capacity, productivity, as well as effective adoption of AI technologies in a wide range of applications, while aiming to ensure that the benefits of AI can be experienced broadly and equitably. The project responds to needs, is highly profitable and is aligned with APEC policies, which will allow its outcomes to spread between organizations in APEC economies and regional levels. The workshop will primarily benefit economies that do not have, or are in the process of developing, a domestic AI strategy such as Papua New Guinea, Brunei, Indonesia, Thailand, the Philippines, Vietnam, and Peru. It will also expand AI strategies developed by some economies that focused primarily on the public sector.

The objective of the project is to optimize the operation of public institutions and support the business sector, mainly SMEs in developing APEC economies, by sharing information on experiences related to AI and solutions for different sectors. A training workshop and sharing of information on existing principles and lessons learned on the adoption of AI will be input for the report of the workshop. In addition, this project has the added benefit of strengthening cooperation and raising awareness of the importance of applying these technologies for economic recovery in the face of the global health crisis.

Public entities involved with digital transformation, connectivity and the promotion of SMEs will participate. On the part of the private sector, business associations representing SMEs and those universities that promote the development of SMEs participate.

The project was developed based on the third APEC pillar related to economic and technical cooperation. Also, of the declarations in the APEC of Chile 2019, on digital technologies and knowledge and information societies. Through this project we can contribute to the development of the APEC Digital and Internet Economy Roadmap by reporting on existing principles, experiences, and solutions regarding AI to encourage the creation of new opportunities for APEC economies.

The project is in line with APEC Connectivity Blueprint for 2015-2025: contributing to physical connectivity, institutional connectivity, and person-to-person connectivity. This project contributes to the priorities for APEC Malaysia 2020, namely the priorities of "Inclusive Economic Participation through Digital Economy and Technology" and "Driving Innovative Sustainability" and is also aligned with the MRT Declaration of APEC Chile (2019) regarding the development of the digital society, integration 4.0, the reduction of barriers to women and the development of SMEs.

This project is aligned with the following priority areas of the Strategic Action Plan of the APEC Telecommunications and Information Working Group 2016-2020: 1) to develop and support ICT innovation; 2) Promote a secure, resilient, and trusted ICT environment; 3) promote regional economic integration; 4) improve the digital economy and the Internet economy; and 5) strengthen cooperation.

The workshop will contribute with the following established objectives and actions of the Strategic Action Plan 2016-2020:

Priorities	**Objectives**	**Actions**
Develop and support ICT innovation.	Promote innovation and value creation in ICTs	Facilitate cooperation with stakeholders. Share experiences and best practices on social and economic benefits from investment and liberalization of ICT infrastructure and services.

Priorities	Objectives	Actions
	Greater adoption of ICTs within APEC economies	Identify and share best practices and strategies to encourage adoption of ICT services. Explore ways to promote a culture or system that enable entrepreneurship and innovation
Enhance the Digital Economy and the Internet Economy	Enhanced ICT industry ecosystem	Promote measures that are conducive to the ICT industry to support a robust Digital Economy.
	Enhanced application of ICTs in services	Promote a favorable environment for innovation in new economic sectors.

This project also aligns with APEC's Internet and Digital Economy Roadmap in the following areas: Promoting innovation and adoption of enabling technologies and services; enhancing inclusiveness of Internet and Digital Economy; developing holistic government policy frameworks for the internet and digital economy; and fostering coherence and cooperation of regulatory approaches affecting internet and digital economy.

3. Workshop

The following is a recount of the presentations and discussions delivered during the Learning workshop in Artificial Intelligence by experts, stakeholders, and Member Economies. Experiences of APEC Economies Workshop. They do not necessarily represent the official views of all APEC Member Economies.

3.1. Session 1: Day One

3.1.1. Artificial intelligence for development: risks and opportunities[1]

Data is the critical input that fuels AI systems. Its generation, collection, storage, processing, and use have implications that go far beyond technological aspects. Quality of data is important for decisions made from data to be reliable, which means meeting a set of requirements, mainly: to be accessible, complete, consistent, easy to find, accurate, complete, timely, valid, and reusable. Furthermore, the interoperability of the systems is important since AI systems use data from different sources.

Knowing the data value chain allows public managers to understand the needs of citizens; define where to concentrate efforts to improve its use, processing, and exploitation; improve services; define, and implement policies; and monitor performance and integrity of governments.

Based on its ability to function, a distinction is made between general AI and specific AI. General AI is when a system can understand and execute generalized tasks, interact with users, and perform operations as a person would, but with greater capacity to process and use information quickly. Technological advancements have not yet reached general AI.

All current AI applications fall into specific AI, that is, those designed to fulfill a specific task or function. Machine Learning, for example, is the use of statistical techniques, computer code,

[1] María Isabel Mejía, Senior Specialist in Digital Government and Public Innovation, Digital Innovation in Government Department CAF, Development Bank of Latin America.

and algorithms that, using historical data, allow a computer to make predictions that are automatically updated and revised ("learn):

- Machine learning consists of a series of techniques that allow machines to “learn” and make predictions from historical data, based on identifying patterns, while being able to adjust their algorithmic code without input from a human.
- The application possibilities of AI range from computer vision - e.g., medical imaging, robotics, manufacturing, speech and natural language processing, and autonomous vehicles.

CAF – The Development Bank of Latin America has done a comprehensive regional report on the experiences, opportunities and challenges related to AI policies. The report identified three ways in which governments could see AI as an ally, as it can contribute with the improvement of public policy formulation, citizens services design and delivery, and a state’s internal efficiency. As a result, AI can contribute to the way the public administration gathers information and manages that information in an efficient and quick way to better serve its own objectives.

The challenges that AI pose to the public administration can be divided into:

- Effective use of information and human resources management.
- Culture and public processes.
- Legitimacy and public trust.

All these possibilities can be directed towards specific topics, such as health, education, or the administration of justice, as documented in the case studies presented in this report. However, there are also risks related to AI, which mainly raises questions around identifying, understanding, and mitigating them, through an open dialogue with society stakeholders. Risks include:

- Privacy and confidentiality.
- Transparency and explicability.
- Inclusion, equity or representativity.
- Security and integrity.

Since AI algorithms should be trained with data, the above risks could impact reliability and trust. For example, if the data does not sufficiently represent the entire population, then policies can fail in implementation. Moreover, data collection also involves biases, such as gender, class, or race, which if not considered and mitigated could influence AI algorithms and skew AI decision making.

Secure AI processes also require reliable data infrastructure:

- Quality data,, high security, interoperability, and respect for privacy are important to generate public value and deliver reliable AI results.
- All data have at least one producer, one administrator, one governor and one consumer, with different functions and responsibilities.

Starting from an analysis of each economy is important in designing data governance policies with an ethical framework. The availability of quality data, with high security, interoperability, respect for privacy, and other ethical considerations is important because only if they have these characteristics can they create public value and offer reliable results.

AI has demonstrated its ability to obtain better results, perform more efficient, faster, and lower-cost processes, facilitate the management of limited resources, eliminate repetitive and routine tasks, improve projections, and execute costly tasks.

However, cutting edge AI technologies have also generated uncertainty and raise many questions:

- What are the implications in terms of displacement, destruction, or generation of jobs?
- What policies are necessary to respond to the growing demand in the labour market for qualified personnel, or how to adapt workers to a new labour reality, as a result of the transformation of organizations and processes?

A study by Weller et al. (2019) in Latin America shows that the percentage of the workforce at high risk of technological substitution in the category of «public administration and defence» is approximately 30%.

AI can have a positive impact on public servants by freeing time through the automation of tasks, which then allows people to take on tasks of greater added value, and the possibility of being more productive through complementarity with new technologies (Accenture, 2020). But that implies that organizations review their working methods, and that the workforce is trained to make use of the new tools.

Different reports and research highlight the importance of having strategies to continuously train workers in skills relevant to AI, and development of an appropriate organizational culture to adapt to change and talent management planning in all its phases: recruitment, training, recycling, and retention, among others. It is important for government and business organizations to integrate these processes into their broader digital transformation strategies.

Governments in the LATAM region are developing artificial intelligence strategies unevenly, with different approaches and different speeds. However, there has been an acceleration and intensification of the debate on public policies and government strategies in recent years.

- Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Uruguay have adopted AI domestic strategies or are in the process of doing so, but only Uruguay has focused its strategy specifically on the public sector.
- Most economies that do not have an AI strategy have a more general one for digital government or a related agenda or program.
- If Latin American governments collaborate on AI, overall results could be enhanced because of the relative strengths that each one can contribute to certain areas. For example, Argentina in experimentation, Brazil in interoperability, Chile in understanding users' needs, Colombia in ensuring an ethical and trustworthy approach, Panama in infrastructure, Uruguay in underlying data strategy, etc.

Certain critical capacities are necessary for governments to define and successfully implement strategies in the public sector. These capabilities will allow an adequate use of AI complying with standards in the following aspects: ethical principles; equity and mitigation of biases; transparency and explicability; safety and responsibility; inclusive and user-centred approaches, and spaces for experimentation with AI.

3.1.2. The role of Japan's government in creating public policies to encourage development of Artificial Intelligence[2]

Representatives from Japan shared that the Japanese economy has been working on initiatives led by its, to help build and strengthen an AI Network Society, which refers to a formation of networks where AI systems become connected over the Internet or other ICT networks and able to interact with each other.

These initiatives started in 2016 with the G7 Minister's Meeting, where the AI R&D Principles drafts was presented. The purpose of the draft was to:

- accelerate multistakeholder participation in R&D and utilization of AI (such as developers, service providers, users including civil society, governments, and international organizations) at both national and international levels, in the discussions towards establishing "AI R&D Guidelines" and "AI Utilization Guidelines"; and
- promote the international sharing of best practices in the R&D and utilization of AI, which will help gain the trust of users and the society in AI and facilitate the R&D and utilization of AI.

As for efforts to develop a comprehensive AI policy for building an AI Network Society, Japan implemented in October 2016 the Conference Toward AI Network. A multi-stakeholder (industry, academia, consumer organizations and government) conference body responsible for leading discussions on how issues concerning the development and deployment of AI network may affect society, covering social, economic, ethical, and legal issues.

The Conference is chaired by a representative of the academic Sector, Dr. Osamu Sudoh, Professor at the Faculty of Global Informatics, Chuo University and Project Professor at the Graduate School of Interdisciplinary Information Studies, University of Tokyo, and its members are industry experts, academia (universities and research organizations), and top executives from major firms related to AI in Japan and the world. Additionally, relevant government agencies such as the Cabinet Office participate as observers.

This platform contributed to the release of the "Draft AI R&D Guidelines for International Discussions"[3], to protect the interests of users and deter risks generated by AI implementation, which also included an impact assessment of the AI Network on society.

The guideline principles could be summarized as following:

Principles of:	Developers should consider:
Collaboration	Interconnectivity and interoperability of AI systems.
Transparency	Verifiability of inputs/outputs of AI systems and explainability of their judgments.
Controllability	Controllability of AI systems.
Safety	Ensuring that AI systems will not harm the life, body, or property of users or third parties through actuators or other devices.
Security	Security of AI systems.

[2] Yuichi Homma is the Principal Researcher, Institute for Information and Communications Policy (IICP), the Ministry of Internal Affairs and Communications (MIC), Japan.

[3] (English Version) https://www.soumu.go.jp/main_content/000507517.pdf

Privacy	Ensuring that AI systems will not infringe the privacy of users or third parties.
Ethics	Respecting human dignity and individual autonomy in R&D of AI systems.
User Assistance	Ensuring AI systems will support users and make it possible to give them opportunities for choice in appropriate manners.[4]
Accountability	Make efforts to fulfill accountability to stakeholders including users.

.

Moreover, it also published the "Draft AI Utilization Principles oriented to encourage AI users" [5] (especially AI service providers who provide AI services, etc. to others and business users who use AI systems, etc. on a business basis) to recognize the proper consideration needed in relation to AI utilization. These principles are voluntary.

The AI Utilization Guidelines (AI Utilization Principles), which address issues that business operators are expected to consider[6], are as follows:

Principles of:	**Description:**
Proper utilization	Users should make efforts to utilize AI systems or AI services in proper scope and manner, under the proper assignment of roles between humans and AI systems, or among users[7].
Data quality	Users and data providers should pay attention to the quality of data used for learning or other methods of AI systems.
Collaboration	AI service providers, business users, and data providers should pay attention to the collaboration of AI systems or AI services. Users should take it into consideration risks might occur and even amplified when AI systems are networked.
Safety	Users should ensure that AI systems or AI services will not harm the life, body, or property of users, indirect users or third parties through actuators or other devices.
Security	Users and data providers should pay attention to the security of AI systems or AI services.
Privacy	Users and data providers should take into consideration utilization of AI systems or AI services will not infringe on the privacy of users' or others.
Human dignity and individual autonomy	Users should respect human dignity and individual autonomy in the utilization of AI systems or AI services.
Fairness[8]	AI service providers, business users, and data providers should pay attention to the possibility of bias inherent in AI decision making systems

[4] To support users of AI systems, it is recommended that developers pay make efforts to make available interfaces that provide in a timely and appropriate manner the information that can help users' decisions and are easy-to-use for them. Additionally, they must make efforts to consider make available functions that provide users with opportunities for choice in a timely and appropriate manner (e.g., default settings, easy-to-understand options, feedbacks, emergency warnings, handling of errors, etc.). Finally, developers should take measures to make AI systems easier to use for socially vulnerable people such as universal design. In addition, it is recommended that developers should provide users with appropriate information considering the possibility of changes in outputs or programs because of learning or other methods of AI systems.

[5] (English Version) https://www.soumu.go.jp/main_content/000658284.pdf

[6] Including AI service providers, business users, etc.

[7] AI service providers and business users are expected to use AI in a proper scope and manner based on information and explanations provided by developers, and after properly recognizing the utilization purpose, usage, nature, and capability of the AI according to its social context. Furthermore, AI service providers are expected to provide necessary information in a timely manner.

[8] Note that there are several criteria for "fairness" such as group fairness and individual fairness.

	or AI services and take into consideration that individuals and groups should not be unfairly discriminated against by AI decisions.
Transparency[9]	AI service providers and business users should pay attention to the verifiability of inputs/outputs of AI systems or AI services and the explainability of their judgments.
Accountability[10]	AI service providers and business users should make efforts to fulfill their accountability to the stakeholders including consumer users and indirect users.

In 2019 the Integrated Innovation Strategy Promotion Council of Japan, hosted by the Cabinet Secretariat, adopted the "Social Principles of Human-Centric AI"[11]. This document established the basic philosophy behind AI policy in Japan, based on:

- Dignity, which affirms the importance that AI as a tool allows people to demonstrate their various human abilities, show their creativity, and engage in challenging work.
- Diversity and inclusion, so that people with diverse backgrounds, values and ways of thinking can pursue their own well-being.
- Sustainability, so that economies can develop new businesses and solutions to address social disparities and develop a sustainable society that can deal with issues such as global environmental problems and climate change.

Furthermore, it also develops a human-centric AI by introducing what Japan calls the "social principles of human centric- AI. These principles ensure that AI does not infringe on fundamental human rights guaranteed by a Constitution and international standards; promote further AI understanding and literacy regarding risks and uses; guarantee privacy and data protection of users; promote broad research and development related to AI (from immediate measures to deep essential understanding), such as proper risk assessment and research to reduce security risks; guarantee a fair competitive environment to create new businesses and services, maintain sustainable economic growth, and present solutions to social challenges; and transcend boundaries such as national borders, industries, academia, governments, race, gender, nationality, age, political convictions and religion.

The Conference Toward AI Network recently produced a comprehensive report published in 2020[12] that records AI implementation, after the formulation of principles. The report includes private and public initiatives for developers and AI providers, business users, consumers, security, and insurance. These includes recommendations to implement checklists for businesses, regulatory changes, best practices, and security safeguards. The report was the result of interviews and surveys that helped Japan understand how different stakeholders are taking part in building an AI Network Society.

Finally, it is important to follow domestic and international trends to disseminate case study information of initiatives taken by business operators, etc. and contribute information related

[9] This principle is not intended to ask for the disclosure of algorithms, source codes, or learning data. In interpreting this principle, privacy of individuals and trade secrets of enterprises are also considered.

[10] "Accountability" means the possibility to take appropriate measures, such as to proving the explanation behind the meaning and reason for the judgment, along with compensation as needed, after clarifying with the person responsible, to gain the understanding of the person who is affected by the result of the judgment.

[11] (English version) https://www.cas.go.jp/jp/seisaku/jinkouchinou/pdf/humancentricai.pdf

[12] (English Version) https://www.soumu.go.jp/main_content/000770658.pdf

to the economies' experience. In this respect, cooperation within platforms like APEC, the OECD and GPAI is key to strengthen AI governance and build trust among stakeholders.

3.1.3. Digital gender gap particularly related to Artificial Intelligence (AI)[13]

3.1.3.1. Why does the digital gender gap a problem?

Public programs have been affected by gender bias and the gender gap. Models, algorithms, and data reflect the social conditions that surround their development. These biases have sometimes been translated into AI and shown the flaws that can affect AI systems.

- A study done by ProPublica in the United States addressed how a computer program was used by a court to score criminal offenders and determine the likelihood of each offender committing a future crime.
- However, according to ProPublica, the program was unreliable because only 20% of the people that were supposed to commit a violent crime actually did so. It also found that African Americans were more likely to receive a harsher sentence than white Americans.

This is an example that illustrates the problem. Because humans are not unbiased, code is not unbiased. Moreover, as experts have pointed out "if there is sexism embedded within the data, the algorithm will pick up that pattern and exhibit the same sexist behavior in its output. And unfortunately, the workforce in AI is male dominant"[14].

This article is more than 3 years old

Amazon ditched AI recruiting tool that favored men for technical jobs

Specialists had been building computer programs since 2014 to review résumés in an effort to automate the search process

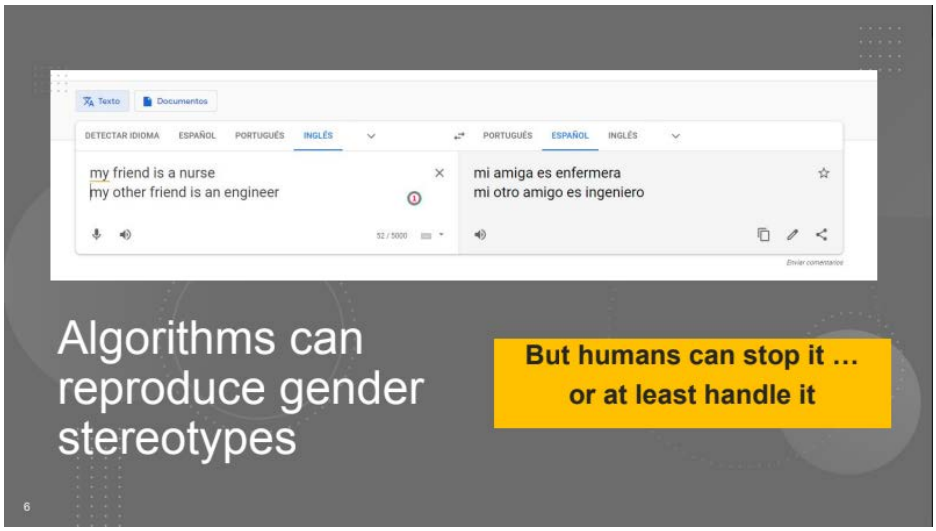
Amazon's automated hiring tool was found to be inadequate after penalizing the résumés of female candidates. Photograph: Brian Snyder/Reuters

Amazon's machine-learning specialists uncovered a big problem: their new recruiting engine did not like women.

[13] Pilar Vanessa Hidalgo Leon, researcher with special interest in the integration of Data Sciences with Social Sciences in gender studies.

[14] MADGAYKAR, Anu, A conversation on artificial intelligence and gender bias, McKinsey, 2021: https://www.mckinsey.com/featured-insights/asia-pacific/a-conversation-on-artificial-intelligence-and-gender-bias

Under these conditions, the gender gap sets the conditions for bias to develop within code. In this sense, algorithms are not aware of biases, but developers should be conscious of how these are incorporated in the AI data processes. As a result, stakeholders should consider using data that is representative, diversity on the development team and a non-stereotypical design.



3.1.3.2. Bias in data

As data mirrors reality, then those inequalities that are still found in society will be translated into algorithms as data is collected. Therefore, identifying inequality and bias should be the first step to make necessary corrections and broaden data sets. For example, biases can lead to insufficient or limited data collection that will lead to algorithmic decision that exclude challenges that are faced by minorities within a broad political, social, and economic context. As a result, without accurate data, it may not be possible to identify problems and propose corrections that consider specific conditions for minority groups or women.

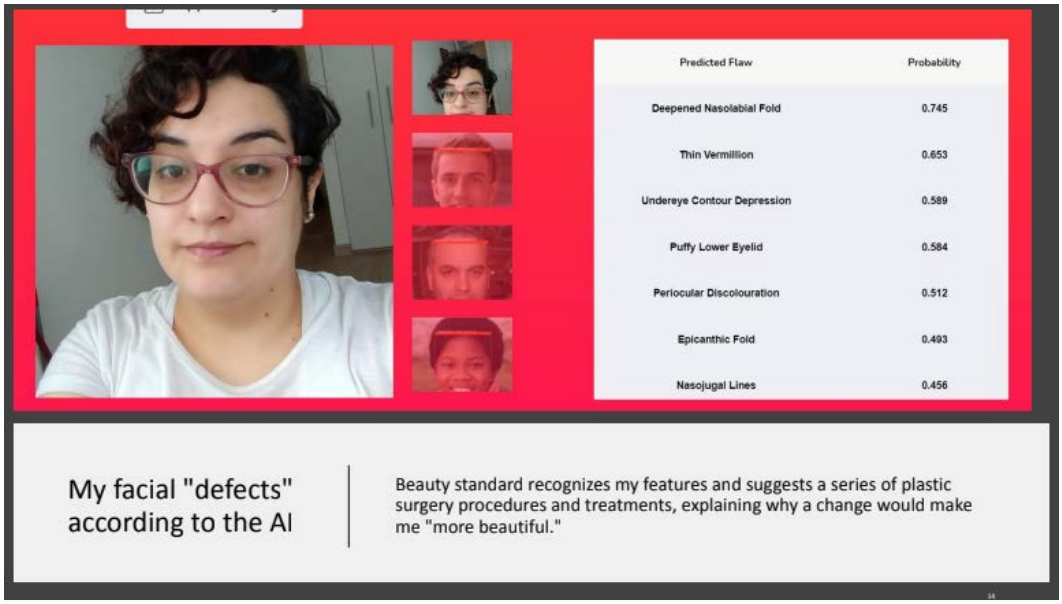
3.1.3.3. Bias in design

Designs can reproduce gender stereotypes, as designs are based on human preconceptions, and humans have biases. A way this occurs can be seen in the following design:

- Why is the assistant female?
- Why is she 35 years old?
- Should a woman that has been to college and is 35 years old be more than an assistant?

These questions show how biases can be translated into the design and as a result the functions and software goals can reinforce gender stereotypes and gaps.

Moreover, other AI goals used to sell certain beauty standards have shown how different groups of people are given similar results, and there is difficulty in determining the reasons or analyzing the data that is being used to determine beauty standards for different women from different cultures.



3.1.3.4. Gender gap in tech teams

According to the World Economic Forum Global Gender Gap Report there is a gender diversity problem in AI, because currently only 26% of the professionals that work in data and AI are women. This was shown in research done by WIRED and Element AI, which showed that only 12% of leading machine learning researchers are female. Moreover, in big tech companies, only 15% of researchers are women, and in Google only 10% of their total research staff are women.

Additionally, a study by Carol Criado (2017) showed how women that reach high level positions can enact effective change in how entities consider women. For example, Google did not have a parking space for pregnant women until one of its top female executives requested one.

Finally, it is important to reiterate how biases are acknowledged and then incorporated into AI design, from the construction of teams, gathering of data and conditions that make certain minorities vulnerable. This means that data collection needs to be comprehensive and incorporate the complexities of social conditions, including those that do not have access to technologies and broadband. Furthermore, the collectors of data, the model makers and in general the participants in the development process should also mirror social diversity. However, mitigation of algorithmic bias should not be limited to the data and the actors but should also cover training to create a general awareness of the problem and greater transparency regarding the information and the ways in which algorithms work that information.

3.2. Session 2: Day Two

3.2.1. SMEs in the context of Artificial Intelligence[15]

AI is advancing at a much faster pace than any other time in history, and companies are realising that AI can be the biggest differentiator within the industry. It has moved from the research arena to its application.

First, understanding the difference between data science, AI, big data, and information technology is important:

- Data science produces insights.

[15] Habib Baluwala, Chapter Lead, Commercial Data Chapter Area, Spark, New Zealand.

- Artificial intelligence produces actions
- Big Data produces volume, variety, and velocity.
- Traditional IT is meant to build the pipelines for data to travel.

3.2.1.1. How can AI impact people?

Current AI systems can only perform very narrow tasks and can most likely only augment the output of current business processes. For example, AI can impact legal services in the following ways:

- Discovery: AI systems can search pre-trial documents and sort out relevant terms, topics, and other criteria.
- Research: AI systems can search through thousands of cases and provide an attorney with a handful of the most relevant cases.
- Due diligence: AI can search documentation and information to extract key points and organise everything for review.
- Litigation prediction: AI can analyse similar facts and provides a statistical analysis to predict litigation outcomes.

Currently these tasks take 80% of a lawyer's time, but with an adequate AI tool can be reduced to 20%. This will allow the legal professional to concentrate their time on substantial issues and quality activities.

3.2.1.2. Is there a place for small businesses in AI tech?

Small businesses provide a very large and dynamic ecosystem, that can increase the demand for technological solutions to generate growth and reach. This can interest technology companies for the provision of specific technological solutions, such as:

- Web interface.
- Subscription based revenue models.
- Easy user interface
- All-in-one platforms or easy integration, which allows users to access, locate information and services directly instead of accessing multiple different platforms.

3.2.1.3. How will AI impact the costs of legal/advisory services?

AI can help make legal services more effective and lower the cost of billing hours. The result will rapidly impact the general services sector. As more industries and companies adopt AI then it will be necessary for SMEs to adapt, improve competitiveness, and raise productivity.

Other businesses can also benefit from AI by:

- Providing more efficient customer service.
- Using off the rack solutions or ready-made solutions that can be easily implemented to solve known problems or issues.
- Transform the marketing process.
- Cost and time benefits.
- Greater insights into competitors' business processes.

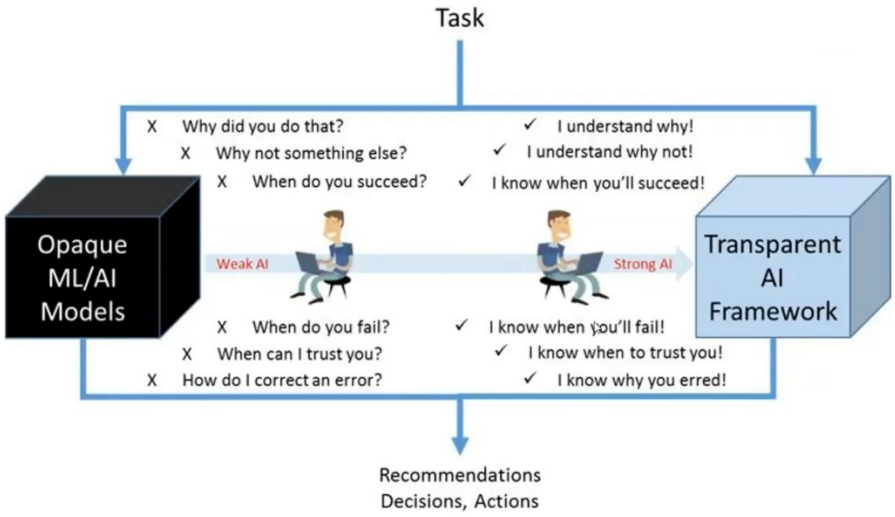
3.2.1.4. AI is treated like a black box

Many software vendors claim they can build models and they do not know how they work because they incorporate thousands of neural nodes in hundreds of intricate layers. As a result, developers should consider transparency, explainability, and accountability when building AI systems AI, meaning that analysts and researchers should be able to understand

the AI system's decision making, understand the reasoning behind the decisions, and show the mathematical certainty underpinning the decision.

3.2.1.5. How can we trust AI?

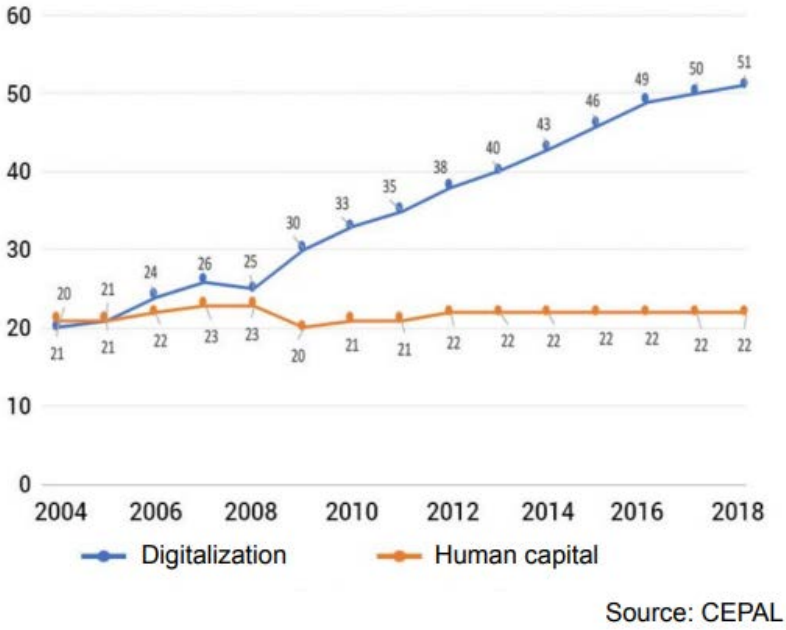
Governments should consider improving transparency in AI development to make it more understandable and accessible:



3.2.2. Public policies for the development of SMEs and Artificial Intelligence[16]

The covid pandemic has pushed governments to accelerate their digitalization processes. As remote work became necessary across the global economy, citizens developed new expectations and there is a greater dependency on cloud, data, and advanced tech for decision making. As a result, governments can experience problems with meeting these new expectations. We can see here how capacity building has not moved in the past years, not at the same rate as digitalization:

[16] Enrique Zapata, Principal for Data Intelligence and New Technologies at the CAF - Development Bank of Latin America.



Source: CEPAL

There are complex and technical issues around SDGs, not only from the regulatory perspective but also the need to deliver policies that comply with the UN's Sustainable Development Goals (SDGs). This is due also to the limitations public institutions have inside the public administration systems related to human resources or financial systems, and in the capacities to deliver public services facing the public and those that are there to help the public institution provide those services. In this context, COVID provided APEC economies with a test of what is coming in the next years.

CAF considered that GovTech was an approach effective to help economies grow their delivery capacity through technology. GovTech according to the Bank is the ecosystem in which governments and data-driven start-ups and SMEs collaborate to solve public problems. In this sense, the solution is not about the technology that needs to be used but the problem that needs to be addressed.

As economies cannot have technical teams devoted to developing different kinds of technologies, then the private sector has an important role being a driving force for innovation. Moreover, considering that government spending on technology to support future operations is expected to grow from $450 billion today, up to $1 trillion in the future, it provides an interesting market that could attract new tech companies to solve problem problems through technology.

GovTech is a way to rationalise existing behaviours and relations between governments and high expertise private sector innovators start-ups. It additionally, provides a "capacity pool" for the public sector, which is outside the public entity and therefore benefits from a different financial and incentives dynamic. In return, there are economic returns in the private sector that can be generated, and social impacts can be identified. Finally, GovTech can help detonate a new high value-added economic sector comprised of start-ups scale-ups and SMEs.

CAF is working on a comprehensive portfolio compromised called the GovTech Lab and it is comprised of reports, investment, assistance, indexes, an observatory, innovation, and a global alliance to build the necessary conditions from both the supply-side (SME) and the demand-side (Public entities), by building the necessary bridges to better understand each other.

In 2019 CAF released the GovTech Index which allows governments to unlock the potential of GovTech Ecosystems in Latin America:

- The Index consists of three pillars that are intimately connected with each other: startups industry, government policies, and procurement systems. These pillars are based on 7 policy dimensions: innovation environment, digital environment, industry environment, policy environment, digital government, procurement frameworks, and procurement culture; that were assessed by drawing from 28 indicators[17].

The Bank also launched in 2020 a global report[18] with 30 recommendations to detonate the GovTech ecosystems. These are aimed at articulating comprehensive strategies, enhancing existing elements, and overcoming existing barriers to growth. Additionally, in its conclusion Report advises the members of the Bank the following:

- CAF recommends that economies assume the role of leaders and main drivers of GovTech ecosystems. They should design and implement comprehensive strategies to promote spaces, which promote better connections between governments and GovTech start-ups, introducing culture of innovation in the public sector, and increased demand for digital solutions by public administrations.
- The Bank also proposes the implementation of more open decision-making channels and transparent public procurement, which incentivize the development of solutions and the participation of GovTech startups in public innovation processes.
- The final recommendation was that governments, corporations and investors increase their understanding of the public value and social impact offered by GovTech entrepreneurship, as well as the potential for business offers for investors

3.2.3. Experience in Artificial Intelligence – APEC economies[19]

The APEC Business Advisory Council (ABAC is invested in the potential of AI and the ways our economies can enter a new era of prosperity with ground-breaking digital solutions that it believes will spur our region. ABAC advances private sector priorities within Asia-Pacific economies. In other words, it is a voice for business in a region that accounts for 60% of the world's GDP and 48 percent of its trade.[20]

ABAC has just produced a comprehensive report on regional enablers for AI – one that was created with significant input from private sector stakeholders across APEC economies.

- The Report begins by identifying the driving motivation for the focus on artificial intelligence.
- AI is increasingly becoming an everyday reality.
- Its influence can be innocuous, such as when we use social media, and sometimes it can be more profound, like when doctors leverage it for better diagnoses.
- The purpose of the first AI Report in 2020was to illustrate how AI-based technologies are being implemented by APEC economies to spur economic growth, address societal challenges, and solve critical business issues.[21]

As AI evolves at dizzying speeds, ABAC is confident it will transform the world:

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[17] GovTech 2020 Index: https://scioteca.caf.com/bitstream/handle/123456789/1580/The_Govtech_Index_2020_Executive_Summary.pdf?sequence=15&isAllowed=y

[18] Govtech y el futuro gobierno (only in Spanish): https://scioteca.caf.com/bitstream/handle/123456789/1645/Govtech%20y%20el%20futuro%20gobierno.pdf?sequence=1&isAllowed=y

[19] Jan Da Silva – President and CEO of Toronto Region Board of Trade – ABAC, Canada.

[20] APEC.org

[21] 2020 ABAC AI in APEC Report.

- The McKinsey Global Institute estimates that AI will boost global GDP by 14%, or US $16 trillion, by 2030. The question is not which sectors will be impacted and when, but how and to what degree.
- For small and medium-sized businesses – which make up 97% of businesses in the Asia-Pacific region – leveraging AI will mean tremendous growth through more efficient supply chains, automated customer support, personalized e-commerce, and highly targeted customer access.

ABAC's 2021 follow-up report illustrates how economies are preparing for an AI future by evaluating the state of AI readiness in each APEC economy – and categorizing them accordingly:

- On one end of that spectrum are global leaders – economies that have considerable influence because of their market size, geopolitical power, and leadership in AI research.
- Next are the AI middle power economies that play significant roles in AI governance internationally, but lack the same geopolitical, academic, and business influence as the global leaders.
- The remaining categories are regional hubs, emerging economies, and nascent economies.

It is important to note that our report does not "rank" these economies. Rather, these categories are used to identify what strengths and opportunities exist within each economy and indeed each category of economies.

For instance, regional hubs help attract AI talent and investment to their regions. Likewise, emerging AI economies are primed to accelerate AI adoption through certain strengths, such as large populations or a strong domestic AI strategy.

To understand these strengths, Canada and Peru can serve as examples. Canada, as an AI middle power and at the global forefront of AI innovation. Businesses actively invest in institutes and corporate research labs dedicated to AI and machine learning. Concurrently, the Canadian economy invests in commercializing AI and retaining talent.

Over the past decade, this combination of private and public investment has helped Canada grow over 600 AI start-ups, attracting $2.4 billion USD in investment. Now, we are positioned diffuse that expertise across the region to unveil more solutions. As for Peru, an emerging AI economy, its strengths are a substantive AI strategy and a growing population.

On the strategy side, there has been incredible progress on AI in Peru since its government launched its first Digital Agenda in 2006 and, more recently, the Secretariat of Digital Government and Digital Transformation in 2017.

As for population growth, fourteen million Peruvians currently do not have a bank account. Banks and fintech start-ups are already using AI in outreach, education, and communications to close this digital literacy gap and include these citizens more fully in the economy. Even more AI players are being attracted to Peru to support with risk scoring, building customer profiles and fraud detection. Canada and Peru are quite different economies and yet, by using ABAC's report as a framework, both economies can learn from what the other does well.

Peru illustrates how a strong domestic AI policy can catalyze change in the private sector. Canada illustrates how public investment into private sector capacity is a winning strategy. By working together, while also integrating with other APEC economies, economies can be more than the sum of their parts.

The Report calls greater collaboration between APEC economies "collective AI readiness." A shared ecosystem of AI enablers will drive growth for all businesses across the region.

ABAC believes collective readiness will be achieved in three ways. These three elements make up the report's core recommendations.

- **First**, APEC must create an enabling regional AI ecosystem.

- To do that, we need regional, multi-stakeholder forums where policy and business leaders from places like Canada and Peru can share knowledge about the latest developments in AI governance.

- This also requires us to address the AI talent gap. Competition for talent is fierce. Training and up-skilling programs, along with transferable APEC certifications, can increase the talent pool for our region.

- **Second**, APEC must leverage the role of diverse regional AI leaders.

- The AI ecosystems in APEC economies vary widely when it comes to maturity, policy support and local knowledge. More advanced members – like middle powers and regional hubs – can leverage their networks to diffuse AI technology in their regions.

- And **finally**, APEC must build trustworthy AI.

The digital economy does not have borders in the way we have traditionally conceived them. Economies should work together to coordinate on cross-border issues like open data flows and governance. In doing so, we will be better equipped to tackle questions around ethical AI while reducing barriers to international trade. If these three recommendations are implemented, then APEC will have an opportunity to position itself as the global hub for AI development, attracting investment, talent, and growth.

In conclusion, to capture as much of that $16 trillion, AI-fuelled growth in the Asia-Pacific region as possible and do so in an inclusive way. This report enumerates each economy's state of play – what their strengths are, and where there are opportunities. The report also lays out what steps should be taken to capitalize on those opportunities: things like more resource sharing and broader trust.

3.3. Session 3: Day Three

3.3.1. Artificial intelligence and the Sustainable Development Goals: opportunities, challenges, governance[22]

Machine learning scales better than rule-based code: AI goes beyond coding as a set of instructions, moving to a more tailored response for more complicated problems. In this sense, AI enables Google to develop a more tailored response in the following products and features:

- Google: Query understanding, speech recognition, speech synthesis, translation, new diversity, and knowledge panels.
- YouTube: Recommendations, content detection, thumbnail selection, automatic captions, face blurring, and authoritative content.
- Cloud: Cloud, datacentre optimization, and smart canvas in Workspace.
- Google phone: Night sight, face unlock, music recognition, call screening, optimized battery use, and health recommendations.

AI's core capabilities can determine what is in the sound or image provided, take historical data to predict what will come next (classification), training systems to generate new music or original texts (prediction), and understand language (generation), and users can have dialogues with the AI system (understanding).

[22] Dan Altman – Senior Policy Adviser Google, USA.

AI can be used to help achieve the SDGs and tackle societal problems in different ways: AI can help accelerate the disease detection process, it can also monitor water sanitation, or fuel economic growth:

AI enables many mission-driven organizations deliver on their objectives in favour of the collective good:

- Kenyan organizations are using AI to screen for respiratory diseases.
- Climate TRACE is using AI to measure carbon emissions.
- Ginggo in Indonesia is using AI to determine and sort recyclable products, alleviating pollution, and trash impacts.
- American University in Beirut is using AI to help with irrigation and farming.

An example of how governments can partner with AI developers to solve social problems can be found in the ML flood forecasting project. According to the global statistics, 2.3 billion people have been affected by floods in the last 25 years, generating US$ 10 billion in annual damages. Considering this an annual phenomenon which can be prevented, early warnings have actually cut fatalities in 43% and economic damages in 35%.

As a result, Google partnered with India to provide a joint effort solution that used machine learning to help generate an early forecast system. To do that Google provided the public-facing interfaces, computational resources, scalability, and machine learning. On the other hand, India could provide information regarding the moment water rises by measuring the water levels constantly using a network of sensors, hydrologic expertise, local information networks and contact with users.

Google complements the government's efforts by providing accurate forecast by using a hydrologic model that measures precipitation and temperature to forecast what will happen in a river area (Taking measurement of snowmelt, precipitation, evaporation, percolation, absorption, and surface flow to determine water flow in the future). It also uses a hydraulic model that provides simulations related to the behaviour of water as it moves across the ground and potentially floods (Collects thousands of satellite images, simulates how water flows over surfaces, and cross references them with government measurements). Finally, it provides a warning distribution system with digital alerts, informing local and regional governments of impending floods, and outsources alerts.

Using machine learning rather than modelling every subpart of the process, the data can train a model which can then refine itself and process information, with a 90% accuracy. The result can be the provision of reliable and quick information that allows communities to prepare and

act before a natural disaster occurs. As response time is crucial, it lets people protect their crops, houses, and lives.

To date there are around 2, 000 proposals that address the 17 UNSDGs. However, machine learning is not always the answer and cannot be used as a blanket solution to every issue and it does face a few challenges and limitations. For example, there are challenges related to the information that is available to build effective AI systems, there is also limited access to human capital that can develop these systems, many organizations are duplicating efforts in certain areas while other issues remain untouched, 40% of proposals have no previous experience in AI, and 70% do not propose new AI models, but relied on existing AI frameworks.

In this context, the government's role is important because public policy should be a driver of responsible AI development that hits towards societal benefits. In doing that, it should also encourage open source and algorithmic transparency, develop AI talent through investing in STEM, encourage cross-border data slows, regulate appropriate data privacy, use AI for public services, and regulate high-risk applications.

3.3.2. AI and 5G, the ITU vision[23]

The presentation gave a comprehensive vision for AI, 5G deployment, and the future of the internet. For example, the use of AI to generate reduced costs in the planning of 5G networks, allow for a more automated design, the increases in deployment speed, generate better Quality-of-Experience (QoE) and allow for an improvement of Quality-of-Service (QoS). The challenge identified by ITU has been the identification of practical applications of AI to advance the UN SDGs and scale those solutions for global impact.

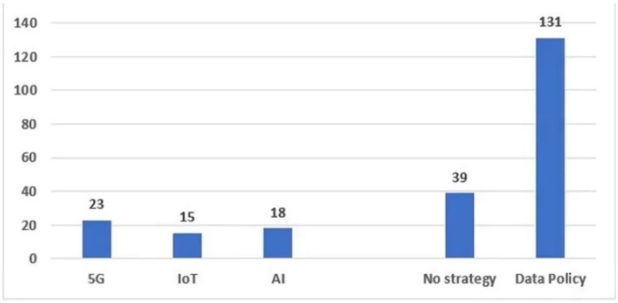
The discussion of policy and regulatory frameworks for AI remain at initial, formative stage, and the ITU's role is limited providing a neutral platform for government, industry, and academia to build a common understanding of the capabilities of emerging AI technologies and consequent needs for technical standardization and policy guidance. As a result, to encourage members, the ITU has established a checklist of issues that could be considered:

- Use, accuracy, and methods used by AI tools, including in relation to humans, the development of bias in machine learning models and the data used to train them.
- Accountability and responsibility accompanying the use of AI models.
- Purpose of the AI models.
- How datasets are used to train AI models, and the methods used to collect (or 'scrape') data.

There are a number of economies with strategies for emerging technologies as of 2020:

[23] Carlos Lugo, International Officer at International Telecommunication Union ITU.

Figure: Numbers of countries with strategies for emerging technologies, 2020



Source: ITU annual regulatory survey.

Several ITU study groups and affiliated focus groups are exploring ways to leverage AI to address topics within their specific mandates. For example, the ITU is addressing the methodologies for assessing or predicting spectrum availability, the use of AI for broadcasting, the method for objective measurement of perceived audio quality, and the architectural framework to integrate ML into the 5G and future networks. Specific example reports and recommendations are noted in the annex.

Moreover, regarding AI it has issued a series of unofficial recommendations, like the Recommendation ITU-T Y.3172[24], which specifies an architectural framework for machine learning (ML) in future networks, including IMT-2020[25]. This means it provides a set of architectural requirements and specific architectural components needed to satisfy these requirements are presented. This Recommendation also describes an architectural framework for the integration of such components into future networks including IMT-2020 and guidelines for applying this architectural framework in a variety of technology specific underlying networks.

Additionally, the ITU also published the Framework for data handling in support of ML (ITU-T Y.3174)[26]. As various components in the telecommunications network produce data with differing characteristics. This diversity in network data sources forms one of the biggest challenges addressed in this recommendation. It also considers that future networks are expected to be more flexible and agile, and this may increasingly complicate the configurations of these networks. As examples, the introduction of flexible air interface, service-based architecture and a central unit enables agile deployments with richer configuration options. This increased flexibility and agility makes it challenging to enable the use of ML mechanisms in future networks including. Finally, the evolution of networking techniques has resulted in evolving sources of data together with a multiplicity of applicable network configuration parameters and policies. Adapting to the changes in future networks while preserving the quality of data needed for ML applications is a challenge.

[24] Recommendation ITU-T Y.3172: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-Y.3172-201906-I!!PDF-E&type=items#:~:text=Summary-,Recommendation%20ITU%2DT%20Y.,satisfy%20these%20requirements%20are%20presented.

[25] International Mobile Telecommunications-2020 (IMT-2020 Standard) are the requirements issued by the ITU Radiocommunication Sector of the International Telecommunication Union (ITU) in 2015 for 5G networks, devices, and services.

[26] Recommendation ITU-T Y.3174: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-Y.3174-202002-I!!PDF-E&type=items

The ITU Secretariat has also published the Emerging technology trends report series of publications which promotes the deployment of emerging technology to contribute to the achievement of the Sustainable Development Goals. The report "Artificial intelligence and big data for development 4.0[27] includes a checklist intended to serve as a guide for policymakers and regulators in identifying and assessing policy and regulatory issues concerning AI and big data. The checklist comprises seven sections that address the key areas for creating an enabling policy and regulatory environment for deployment of AI and big data in support of development. The ITU-T also organizes the annual AI for Good Global Summit, which aims to connect innovators in the field of AI with public and private sector decision-makers to develop AI solutions that could help in achieving the sustainable development. Finally, the Emerging technology trends document promotes the wide scale deployment of emerging technology to contribute to the achievement of the Sustainable Development Goals. The 2021 report[28] on AI highlights opportunities and outlines good policy and regulatory practices for implementation, while also flagging key challenges and offering hands-on suggestions to developing countries in managing and overcoming these roadblocks.

3.3.3. Policies for the use of AI in Internet of Things use in public environments[29]

The Internet of Things (IoT) was coined by Kevin Ashton. He said that if we had computers that knew everything there was to know about things -using data they gathered without any help from us- we would be able to track and count everything, and greatly reduce waste, loss, and cost. We would know when things needed replacing, repairing, or recalling, and whether they are fresh or past their best. The IoT has potential to change the world, just as the internet did.

- IoT Industry: Platform, network, devices, and services that enable organizations to produce, collect, share, and utilize collected information by connecting all electronic devices through the internet.
- IoT: The technology or service that links various things with the internet to allow dynamic communication of the information between people and things.
- OECD: IoT refers to the networking and communication of physical devices and objects whose state can be altered via internet with or without active involvement of individuals.

In Korea IoT is seen to advance faster in the healthcare industry and social welfare industry, and automotive industry. On the other hand, Defence and agriculture are seen as sectors that are the least expected to adopt IoT. According to surveys done by Korea the main limitations in the development of IoT in business are related to the lack of business funds and lack of government support are the main obstacles to IoT identified the Koreans, which is followed by uncertain markets and inadequate technical expertise.

The Korean economy established National Strategy for AI on December 17th, 2019, with the vision of **'Toward AI World Leader beyond IT',** Korea aims to achieve digital competitiveness, create an important economic effect of AI, and improve quality of life for people by 2030. It consisted of 100 government-wide action tasks under 9 strategies in three areas of AI ecosystem, AI utilization, and people-centred AI.

The strategy considers that "the cognitive, learning and reasoning capabilities of AI will improve industrial productivity and result in new added value throughout industry by

[27] Emerging technology trends: Artificial intelligence and big data for development 4.0: https://www.itu.int/dms_pub/itu-d/opb/tnd/d-tnd-02-2021-pdf-e.pdf
[28] Emerging technology trends: Artificial intelligence and big data for development 4.0: https://www.itu.int/dms_pub/itu-d/opb/tnd/d-tnd-02-2021-pdf-e.pdf
[29] Dr. Sangwon Ko, Senior Research Fellow, Korean Information Society Development Institute (KISDI) - Policies for the use of AI in Internet of Things use in public environments.

maintaining an optimal production environment and predicting and controlling obstacles. In addition, more use of AI-based precision diagnosis and real-time risk detection functions will greatly contribute to solving social problems such as caring for the elderly in the aging era, preventing crime and strengthening public safety"[30].

Furthermore, AI has a key role in Korea's Digital New Deal[31]:

> "The Digital New Deal aims to build a digital economy and promote growth in promising 'untact' industries[32]. It heightens the competitiveness of Korea and its industries by establishing digital infrastructures in areas such as data, network, and artificial intelligence (DNA). At the same time, major infrastructures including those for transportation, water resources, urban planning, and logistics will be digitalized".

The objectives of the Digital New Deal can be summarised as following:

- Improve the DNA (Data Network and AI) Ecosystem: Accelerate the digitalization of all industries for Korea's economic growth.
- Digitalize the education infrastructure: expand the digital infrastructure of schools and job training centres.
- Digitalize Social Overhead Capital (SOC): Make people's lives safer and more convenient through smart cities/ complexes/ logistics.
- Nurture Contactless Services: Actively nurture contactless services in sectors closely related to day-to-day lives (health, work, business).

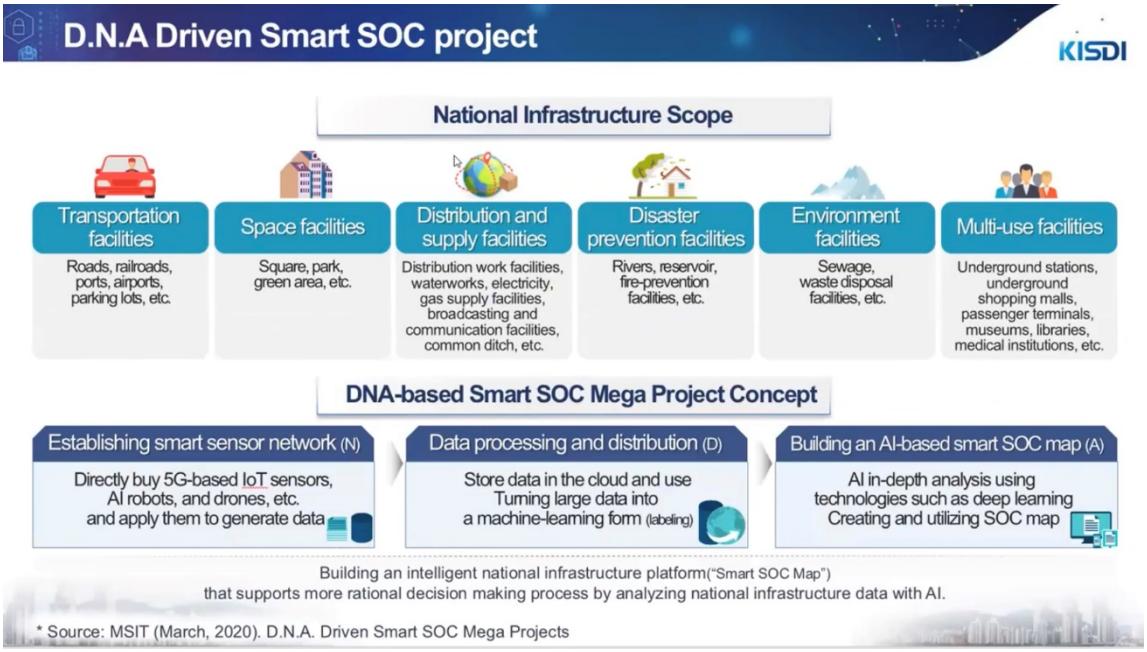
IoT and AI in DNA Ecosystem is comprised of:

- Data collection by sector (private and public): Bio, medical, manufacturing, energy, finance, administration.
- Data storing and processing: Data accumulation and processing gathering 150 types of data for AI learning.
- Data utilization (AI): AI processing data voucher and AI convergence (creating business using private AI).

[30] Toward AI World Leader beyond IT: https://www.msit.go.kr/bbs/view.do?sCode=eng&mId=10&mPid=9&bbsSeqNo=46&nttSeqNo=9

[31] Digital New Deal: https://english.moef.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=4948#fn_download

[32] Untact: a combination of the prefix 'un' and the word 'contact' – has been floating around in marketing circles since 2017. It describes doing things without direct contact with others, such as using self-service kiosks, shopping online or making contactless payments: https://www.bbc.com/worklife/article/20200803-south-korea-contact-free-untact-society-after-coronavirus



Examples of DNA Driven Smart SOC Project:

- Smart facility safety management such as DNA-driven underground common ditch: manage safety in real time by collecting data with IoT, unmanned mobile robots (inside), intelligent CCTVs, and drone (outside) and building AI analysis system.
- DNA-driven smart energy facility management: Detect risk signs in real time by using optical infrastructure, IoT sensing (pipe conduit, junction) and drones and robots (outside) and set up an integrated management system.

Final caveat: Governments should consider modifying regulations that would strengthen security for a growing list of network-based smart devices and checking other potential digital security loopholes, such as public Wi-Fi networks.

3.4. Session 4: Day Four

3.4.1. Hacking AI[33]

This presentation covered the issues involving AI cybersecurity and how AI systems can be hacked. As excitement surrounding AI grows, the vulnerability of those systems is often overlooked, increasing the potential security risks generated by different types of attacks that could disrupt or deceive AI algorithms.

Adversaries will use different attack methods depending on the level of access and knowledge that they have regarding the machine learning model they want to attack. For example, white box attack is when attackers have complete access to the ML model that they are targeting (e.g., the code, the architecture of the model, etc.), this might also include access to the dataset used to train the model.

On the other hand, when attackers do not have access to the ML model that they are targeting (e.g., the code, the architecture, or the data used to train the model), it is called the black box attack. When attackers have partial information about the ML model that they are targeting, the attack is called grey box attack.

[33] Caroline Baylon, Research Affiliate at the Centre for the Study of Existential Risk at the University of Cambridge.

There are many types of attacks on ML systems and as ML become more complex hackers find new ways to access them and take advantage of their vulnerabilities. This is an illustrative list of the main ways to attack ML models to-date:

- Poisoning attacks: Involve poisoning the training data.
  - **Data Modification attack** (Supply Chain attack): If an adversary has full access to the training data.
    Involves poisoning the training data directly by modifying the data before it is used to train the model in an offline environment.
  - **Label Modification attack:** If an adversary is only able to modify the labels used in a supervised learning training dataset.
    By altering the labels used in training the model, the model learns based on incorrect information and is corrupted.
  - **Data Injection attack**: If an adversary does not have access to either the training data or algorithm but is able to add new data to the training dataset, he can inject bad data into the training dataset, which is another way to corrupt the model's "learning process".
  - **Logic Corruption attacks**: If an adversary can tamper with the learning algorithm directly and corrupt it.

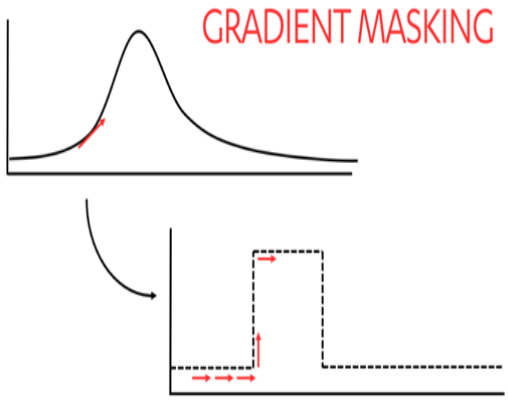
- Evasion attacks (Adversarial Examples): Involve providing bad inputs so that the model produces incorrect outputs.
  - Occur during the production phase.
  - Most common example involves attacks against Image Classifiers used in computer vision.
  - Involve intentionally altering an input image so that it appears normal to the human eye but looks completely different to the ML model, to fool the model into misclassifying the input and producing an incorrect output.
  - A type of AI algorithm that when given an input can predict its label, which is also called its class.
  - Image Classifiers are Classifiers trained to recognize images: e.g.: If a picture of a cat is inputted, the Image Classifier will predict its class to be "cat". Also includes a probability estimate of the image being in that class.

- Inference attacks: Involve trying to retrieve data from the model.
  - Used to extract information from or about a model.
  - Can also be used to obtain data that was used to train the model.
  - Many are carried out during the production phase, but they can also be carried out during the training phase.
  - **Input Inference attacks (Model Inversion attacks):** Used to extract data from the training dataset.
    E.g., An adversary can employ against an image classification model to extract a particular image from the training dataset. So, if the adversary has an individual's name, he can extract that person's photo.
    Membership Inference attacks: Used to guess whether a particular datapoint was used in the training dataset.
    E.g., An adversary can employ against an image classification model to guess whether a particular individual was used in the training dataset (i.e., was a *member* of the training dataset).
  - **Attribute Inference attacks**: Used to guess important information about the training data (i.e., its data *attributes*).
    Might include the type of data used to train the model.
    E.g., An adversary can employ against a speech recognition model to guess whether the accent of the speakers was used to train the model.
  - **Model Extraction attacks (Parameter Inference attacks)**
    Used to obtain information about the exact model itself.

Attacks can occur at different phases of the ML pipeline, either during the training phase, when the model is learning ("attacks on the algorithm") or during the production phase, when the model is deployed and in operation ("attacks on the model").

Defence against attack remains challenging because of the growing number of vulnerabilities. As new attack strategies emerge new responses and defence mechanisms are being designed. These are a few examples:

- Defenses against Poisoning attacks:
  - Various hardening approaches: allow a restricted number of users or limited IP access.
  - Cryptography / Homomorphic encryption: These make it possible to process encrypted date without decrypting it.
- Defenses against Evasion attacks:
  - Adversarial training: Include adversarial examples to prepare model to receive attacks.
  - Detecting and cleaning adversarial outputs.
  - Gradient masking: Creates a sharper decision boundary[34].



- Defenses against Inference attacks:
  - Differential privacy: This adds noise to a model's output, making the model appear not precise enough for the attack to extract sensitive information from the training data set.

3.4.2. Strategic and Responsible Use of Artificial Intelligence in the Public Sector[35]

The digital age is driving a continuous transformation of needs and behaviours in economies and societies -the COVID-19 has made this trend more evident. (Government had to become digital overnight to continue providing services). This means that governments have a critical role to play to shape this transformation and the digital ecosystem towards contributing to broader societal outcomes and public interest.

Revitalized digital government is an imperative because mature digital governments are able to balance risks and opportunities to shape public governance, and achieve a more human-centred, fair, and sustainable development and have greater capability to address complex, global challenges.

[34] "Many potential defense mechanisms fall into a category we call gradient masking. These techniques construct a model that does not have useful gradients, e.g., by using a nearest neighbor classifier instead of a DNN. Such methods make it difficult to construct an adversarial example directly, due to the absence of a gradient, but are often still vulnerable to the adversarial examples that affect a smooth version of the same model." Practical Black-Box Attacks against Machine Learning: https://arxiv.org/pdf/1602.02697.pdf.

[35] Barbara Ubaldi, Digital Government and Data Unit Head Open and Innovative Government Division- OECD.

The difference between e-Government and Digital Government is that on the one hand e-Government, means the digitisation of analogue procedures; technology focused; and government-centred services, and on the other, digital government is the re-engineering and re-designing services and processes; uses technology as an enabler; and has user-centred services.

Recommendation of the Council on Digital Government Strategies:

- Openness and engagement:
  - Openness, transparency, and inclusiveness
  - Engagement and participation in a multi-actor context in policy making and service delivery.
  - Creation of a data-driven culture.
  - Protecting privacy and ensuring security.
- Governance and co-ordination:
  - Leadership and political commitment.
  - Coherent use of digital technology across policy areas.
  - Effective organisational and governance frameworks.
  - Strengthen international co-operation with other governments.
- Capacities to support implementation:
  - Develop clear business cases.
  - Reinforce institutional capacities.
  - Procure digital technologies.
  - Develop legal and regulatory framework.

The OECD has developed six dimensions[36] to characterise and measure digital government competence and maturity:

- Digital by design is when a government establishes clear organisational leadership, paired with effective co-ordination and enforcement mechanisms where "digital" is considered not only as a technical topic, but as a mandatory transformative element to be embedded throughout policy processes.
- Data-driven refers to when the public sector recognizes and takes steps to govern data as a key strategic asset in generating public value through their application in the planning, delivering, and monitoring of public policies, and adopts rules and ethical principles for their trustworthy and safe reuse.
- Governments acts as a platform to meet the needs of users when it provides clear and transparent sources of guidelines, tools, data, and software that equip teams to deliver user-driven, consistent, seamless, integrated, proactive, and cross-sectoral service delivery
- Open by default occurs when the government data and policy-making processes (including algorithms) are available for the public to engage with, within the limits of existing legislation and in balance with the national and public interest.
- A user-driven government is when more user-driven by awarding a central role to people' needs and convenience in the shaping of processes, services, and policies; and by adopting inclusive mechanisms for this to happen.
- Proactiveness represents the ability of governments and civil servants to anticipate people's needs and respond to them rapidly, so that users do not have to engage with the cumbersome process of data and service delivery.

OECD AI Principles

- Inclusive growth, sustainable development, and well-being: Trustworthy AI has the potential to contribute to overall growth and prosperity for all.

[36] The OECD Digital Government Policy Framework: Six dimensions of a Digital Government: https://www.oecd-ilibrary.org/docserver/f64fed2a-en.pdf?expires=1647514615&id=id&accname=guest&checksum=DE6878433AF83049DB3E1062E37AA00A

- Human-centred values and fairness: AI systems should be designed in a way that respects the rule of law, human rights, democratic values, and diversity, and should include appropriate safeguards to ensure a fair and just society.
- Transparency and explainability: AI systems need transparency and responsible disclosure to ensure that people understand when they are engaging with them and can challenge outcomes.
- Robustness, security, and safety: AI systems should function in a robust, secure, and safe way throughout their lifetimes, and potential risks should be continually assessed and managed.
- Accountability: Organisations and individuals developing, deploying, or operating AI systems should be held accountable for their proper functioning in line with the OECD's values-based principles for AI.

OECD recommendations on enhancing access:
- Reinforcing trust across the data ecosystem.
- Stimulating investment in data and incentivising data access and sharing.
- Fostering effective and responsible data access, sharing, and use across society.

OECD Good Practice Principles for Data Ethics in the Public Sector:
- Manage data with integrity.
- Be aware of and observe relevant government-wide arrangements for trustworthy data access, sharing and use.
- Incorporate ethical considerations on data into governmental, organisational, and public sector decision-making processes.
- Monitor and retain control over data inputs, in particular those used to inform the development and training of AI systems and adopt a risk-based approach to the automation of decisions.
- Be specific about the purpose of data use, especially in the case of personal data.
- Define boundaries for data access, sharing and use.
- Be clear, inclusive, and open.
- Publicly available open data and source code.
- Broaden individuals' and collectives' control over their data.
- Be accountable and proactive in managing risks.

Governments are using AI as a tool to determine patterns of behaviour of public and private actors, detect risks and vulnerabilities in public contracting, and cross-reference sources of information for better auditing and public transparency. For example, in Mexico the Tax Administration Service of the Ministry of Finance and Public Credit has tested AI algorithms that automatically identify pattern disruptions in their registries, allowing them to detect companies conducting fraudulent operations.

3.4.3. Ethics and Artificial Intelligence[37]

Together with the infrastructure, economic, political, and social challenges of AI, decision makers must also introduce ethical considerations for the use of AI tools. The need for international and national policies and regulatory frameworks to ensure that these emerging technologies benefit humanity as a whole, should part of policy frameworks that regulate any future AI developments[38].

The speaker proposed the following premises on Ethics and AI:
- AI ethics are very/truly important.
- AI should be based on moral values.
- AI should seek the common good.
- AI should seek individual autonomy.

[37] Alan Ramirez, Telecommunications, and ICT Specialist, MTC –PERU.
[38] https://en.unesco.org/artificial-intelligence/ethics

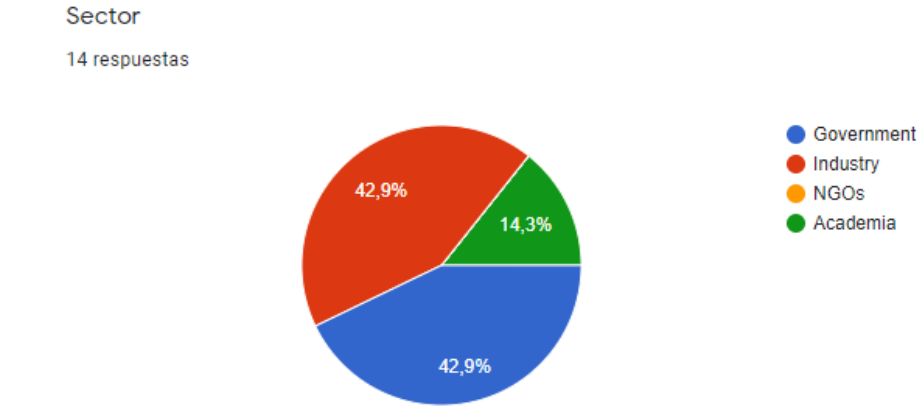
- AI should be aware of the gender gap.
- AI should focus on human rights.
- Multidisciplinary approach is recommended.

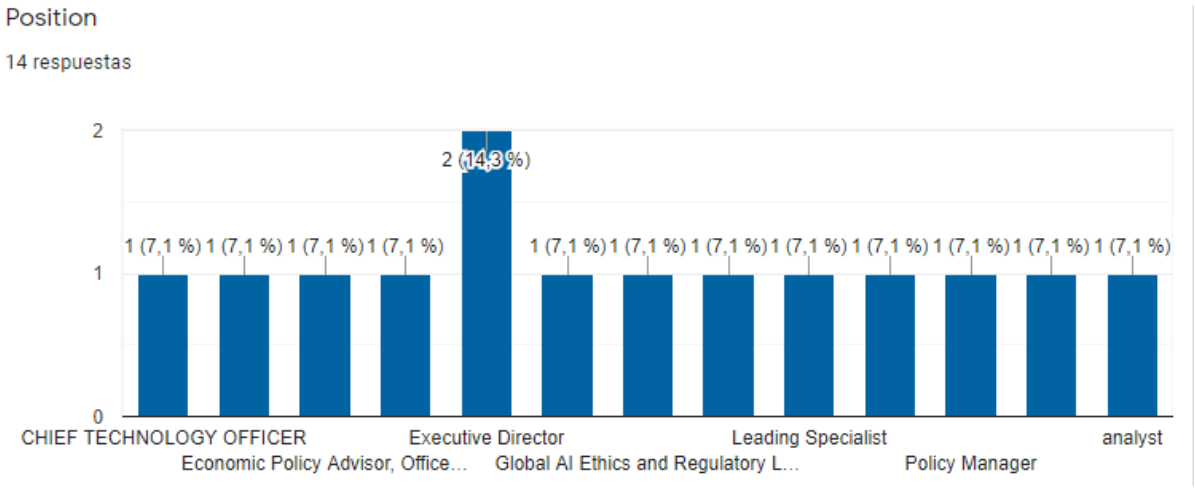
AI policy paradox:

- AI can broaden the gap between the connected and the unconnected, as economies with greater resources have the human and economic resources to introduce AI tools faster.
- Developing economies will be challenged to a larger degree to participate in a race with limited resources.
- There are 2.9 billion people offline in the world in 2021.
- There are 4.9 billion people online in the world in 2021.

4. Workshop survey results

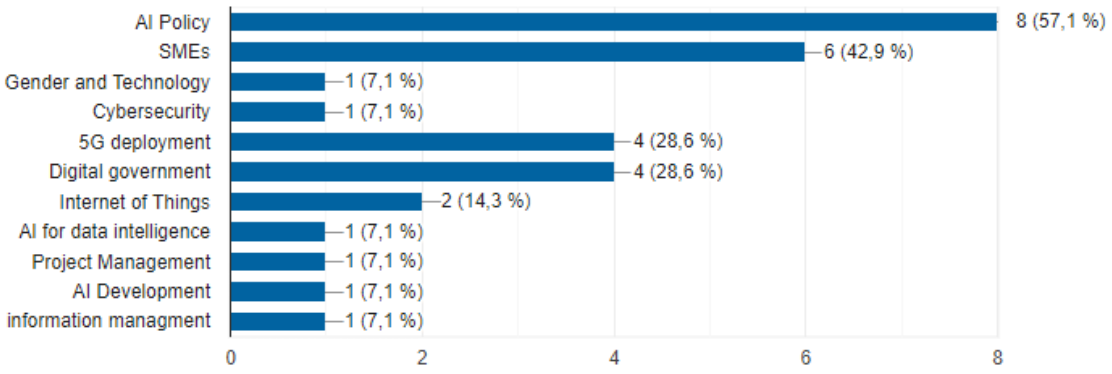
- Participants of the workshop:





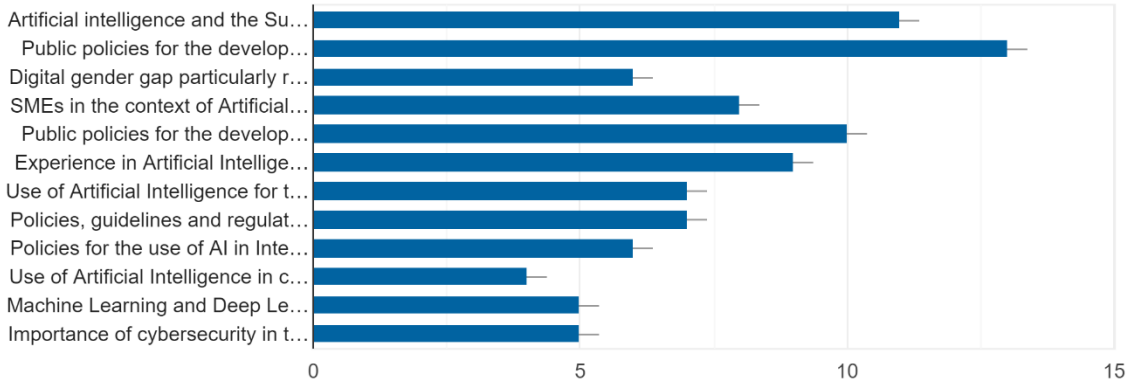
Your responsibilities are related to the following:

14 respuestas



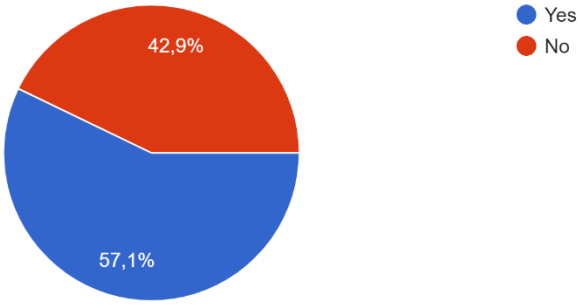
What are your main interests?

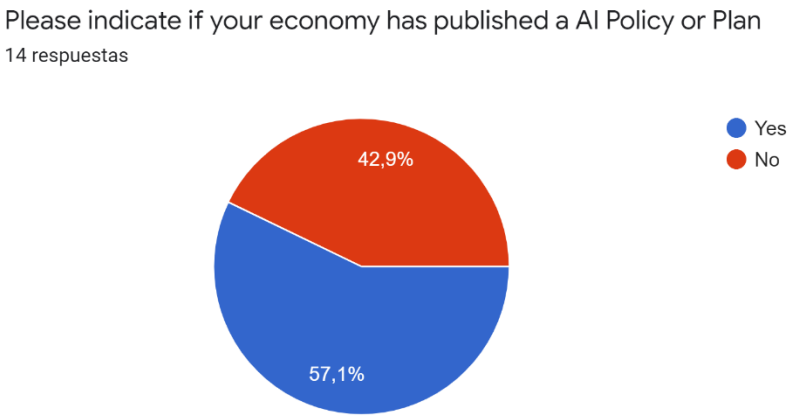
14 respuestas

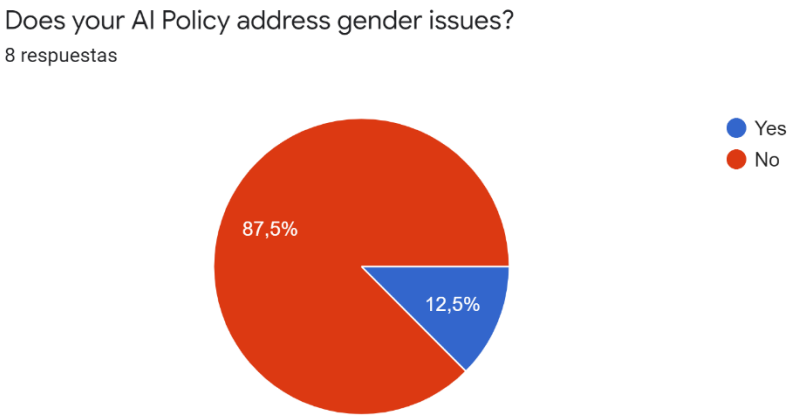


Do you have a specific cybersecurity regulation to protect data governance?

14 respuestas







5. Best practices and discussion contributions

- It is important to have a comprehensive benchmarking mechanism to understand what other international organisations and companies are doing in relation to public policy and AI. This will allow APEC to define how to engage with its economies and focus in providing the latest recommendations for consideration. As a result, this workshop has provided an opportunity to hear from CAF, the Development Bank of Latin America, the OECD and ITU, which have evidenced the opportunities, challenges, limitations and risks those economies face, and the detailed recommendations those organisations have prepared to provide tailored solutions.

- One of the issues identified during the workshop was the level of engagement, openness and trust society has towards AI as a concept and AI companies in particular. In this sense, the Japanese experience in developing guidelines through the Conference toward AI Network Society offers an important social engagement mechanism to generate public policies on AI involving various stakeholders and has been the main platform to build the legal and policy framework for AI development in Japan. This level of engagement with different stakeholders provides an inclusive mechanism that helps empower developers and receive inputs from academia, industry, and government.

- The pandemic has forced large numbers of workers to engage in remote work, establishing a familiarity with online tools for group deliberation and decision making. This experience can provide a gateway towards greater digital engagement with citizens

by government (at all levels). Video conferencing tools, for instance, can be used to engage with citizen groups who would be highly unlikely to join physical public consultation gatherings that are limited to specific locations.

- Federal agencies (such as Small Business Administration in the United States) can and should have programs that assist SMEs in developing AI - SBA has many programs that help small businesses export and find financing. Universities can also step in and often partner with government in "SBDCs" - small business development centres that can include AI training, etc.

- Government can provide SMEs clear guidance on best practices for the governance and procurement of AI systems and data management, and to help SMEs have certainty on establishing trustworthy processes for the use of AI.

- Including connectivity for both urban and rural areas is important, which means digital literacy needs to be commonplace and considered “soft” infrastructure.

- The partnership between the Indian economy and Google has evidenced the competitive advantage government institutions have and can contribute to developing of AI models that have social goals.

- As AI advances and becomes a crucial part of government processes and services, there is a greater need to study how these systems are vulnerable to attacks and the ways those attacks are conducted. Governments retain sensitive information that depends on public trust, which means that as vulnerability increases, the greater the public will distrust AI solutions.

- Governments are using AI as a tool to determine patterns of behaviour of public and private actors, detect risks and vulnerabilities in public contracting, and cross-reference sources of information for better auditing and public transparency.

- Artificial Intelligence and Machine Learning can identify cost, time, and resource efficiencies that exceed those of teams of people working in traditional methods. On the other hand, by using big data analytics and machine learning to digitally model specific use cases, better returns on investment (RoI) will be achieved along with a better overall business outcome.

- By applying analytical capabilities of AI to data collected by the IoT, companies can identify and understand patterns and make more informed decisions that impact companies and users. Some examples of data that Internet of Things devices can collect include health data from medical devices, data from industrial machines that provide information on production processes, and data from smart home appliances that deliver vital business information.

- Ethics oversight and review should be an integral part of the governance process. This can take the form of ethics review panels or ethics officers in the management structure, but most importantly the organization should integrate ethical concerns into their business processes and not view them as hindrances.

6. Annex

PROGRAM

Day 1	**ARTIFICIAL INTELLIGENCE FOR DEVELOPMENT. RISKS AND OPPORTUNITIES** Moderator: Lucia Bellido, Telecommunications lawyer with experience in government and industry
19:00 – 19:15	Opening ceremony
19:15 – 20:00	Artificial Intelligence for Development: Risks and Opportunities María Isabel Mejía, Senior Specialist in Digital Government and Public Innovation, Digital Innovation in Government Department CAF, Development Bank of Latin America
20:00 – 20:45	Public policies for the development of Artificial Intelligence. The role of the government Yuichi Homma is the Principal Researcher, Institute for Information and Communications Policy (IICP), the Ministry of Internal Affairs and Communications (MIC), Japan.
20:45 – 21:30	Digital gender gap particularly related to Artificial Intelligence (AI) Pilar Vanessa Hidalgo Leon, researcher with special interest in the integration of Data Sciences with Social Sciences in gender studies
21:30 – 21:45	Report of the day

Day 2	**PROPOSALS FOR THE DEVELOPMENT OF SMEs** **WITH AI** Moderator: Ing. Mario Chong Ph.D. – Universidad del Pacifico
19:00 – 19:45	SMEs in the context of Artificial Intelligence Habib Baluwala, Chapter Lead, Commericial Data Chapter Area, Spark. New Zealand
19:45 – 20:30	Public policies for the development of SMEs and Artificial Intelligence Enrique Zapata, Principal for Data Intelligence and New Technologies at the CAF - Development Bank of Latin America
20:30 – 21:15	Experience in Artificial Intelligence – APEC economies

	Jan Da Silva – President and CEO of Toronto Region Board of Trade - ABAC
21:15 – 21:30	Report of the day

Day 3	**ARTIFICIAL INTELLIGENCE FOR THE DEPLOYMENT OF 5G NETWORKS AND THE INTERNET OF THINGS** Moderator: Ing. Cesar Santivañez, Professor at PUCP
19:00 – 19:45	Artificial intelligence and the Sustainable Development Goals Dan Altman – Senior Policy Adviser Google
19:45 – 20:30	Policies, guidelines, and regulations for 5G deployment using AI Carlos Lugo, International Officer at International Telecommunication Union ITU
20:30 – 21:15	Policies for the use of AI in Internet of Things use in public environments Dr. Sangwon Ko, Senior Research Fellow, Korean Information Society Development Institute (KISDI) - Policies for the use of AI in Internet of Things use in public environments.
21:15 – 22:00	Report of the day

Day 4	**IMPLICATIONS OF ARTIFICIAL INTELLIGENCE FOR CYBERSECURITY**
19:00 – 19:45	Hacking AI Caroline Baylon, Research Affiliate at the Centre for the Study of Existential Risk at the University of Cambridge.
19:45 – 20:30	Strategic and Responsible Use of Artificial Intelligence in the Public Sector Barbara Ubaldi, Digital Government and Data Unit Head Open and Innovative Government Division- OECD
20:30 – 21:15	Ethics and Artificial Intelligence Alan Ramirez, Telecommunications, and ICT Specialist, MTC - PERU

21:15 – 21:30	Report of the day
21:30 – 22:00	Closing ceremony