Google

An AI Opportunity Agenda for Pakistan

Foreword

We stand at a pivotal moment in the development of artificial intelligence. The choices made by governments, industry, and civil society at early stages of technological development shape its trajectory. Now is the time for policymakers and communities to come together on a **comprehensive AI opportunity agenda**, based on common interests across the scientific and research community, workforce and economic priorities, public health, and global development.

Together we must ensure that AI makes lives easier, helps solve complex challenges, and enables us to reach big goals. To date, there has been a strong and appropriate focus on addressing potential future risks from AI. We have seen governments take important steps together with companies and other civil society stakeholders to address and mitigate these risks.

But to fully harness AI's transformative potential for the economy, for health, for the climate, and for human flourishing, we need a broader discussion about steps that governments, companies, and civil society can take to realize AI's promise. We must focus not only on the harms we want to avoid and the risks we want to mitigate, but on the potential we want to achieve.

A decade from now, we want to have developed AI boldly and responsibly, in partnership with governments, other companies and industries, and civil society. If we get this right together, AI will have helped solve pressing societal issues, advanced our work in fundamental sciences, and created enormous productivity gains across all sectors of the economy. We will make this more likely by investing responsibly in innovation and keeping humans at the center of AI collaboration.

This paper proposes a three-part agenda for policymakers, companies, and civil society to deliver AI's benefits to as broad a range of people as possible. We have a once in a generation opportunity to strengthen our economies, to create new jobs, and to drive startling breakthroughs in health and science.

To achieve this, we must work in partnership to:

1. **Invest in AI infrastructure and innovation** by supporting research and compute capacity and ensuring legal frameworks support responsible AI growth;
2. **Build an AI-empowered workforce** by investing in human capital, education, and training systems; and
3. **Promote widespread adoption and universal accessibility** by helping governments, small businesses, and all sectors of the economy adopt and use AI.

This paper builds on our three-pillar agenda for responsible AI progress – unlocking **opportunity**, promoting **responsibility**, and enhancing **security** – and offers focused recommendations on how policymakers can harness AI to create new scientific and societal opportunities. While countries and regions around the world may emphasize different elements, we hope this paper will provide an overall blueprint for those who see the promise of AI and want to make it work for their communities.

Introduction

The Promise of Artificial Intelligence

Throughout history, there have been pivotal moments of innovation and technological change that have profoundly impacted the course of human development, shaping the way people live, work, and interact. The development of writing systems allowed humans to communicate and record information over long distances and across time. The invention of the wheel enabled transportation and trade, while the steam engine mechanized production and propelled the growth of cities and new industries.

We stand at a similar moment in history with AI. **AI has the potential to fundamentally change the ways we live, work, and learn**, through its capacity to assist, complement, empower, and inspire people in almost every field of human endeavor. It is already opening up new possibilities by enabling people to communicate across languages and abilities, helping people stay safe with fire and flood forecasting, reducing energy emissions, and improving our ability to detect and treat cancer and other diseases.

Just as the technologies propelling the industrial revolution enabled humans to leverage our physical capabilities more effectively, AI is opening up new ways of thinking, working, and connecting.

Take AlphaFold, Google DeepMind's AI system that uncovered the 3D structure of 200 million proteins – the building blocks of life. That single initiative is accelerating research in nearly every field of biology, speeding up progress on important real-world problems including finding new drugs to treat liver cancer, developing fully effective malaria vaccines and breaking down single-use plastics. The development of the world's first human pan genome reference – a resource that better represents human genetic diversity – will open doors to more inclusive and equitable genetic testing and treatment globally, enabling more accurate diagnoses and development of new therapeutics.

Similarly, organizations in Pakistan have made significant strides in revolutionizing the healthcare sector with the introduction of cutting edge artificial intelligence technology. One institution spearheading this transformative initiative is the National Center of Artificial Intelligence (NCAI). NCAI labs have unveiled solutions that help in early detection of brain tumor, tuberculosis, breast cancer, cancer diagnostic tools among others. Further, leveraging datasets available on Open Data Pakistan, individuals have garnered solutions for issues related to healthcare, such as developing a dashboard that provided citizens in Punjab with data on hospital bed availability during COVID-19. These initiatives show the transformative potential of AI in bolstering healthcare, paving the way for a more data-driven and responsive healthcare ecosystem in Pakistan. With the help of strategic partnerships, technological innovation, and a commitment to leveraging data for public good, Pakistan can further harness the full potential of AI to address evolving healthcare challenges and improve health outcomes for its citizens.

Pakistan has a population of 240 million as of 2023, the fifth largest in the world, and which is predicted to reach 365 million by 2050. Despite a low literacy level in Pakistan (estimated to be currently around 62.3%), efforts have been made to promote education of AI,

such as the Higher Education Council's (HEC) implementation of AI learning in educational systems, aiming to contribute capacity building in public and private sectors.

Pakistan's large population generates sizable amounts of communications traffic. Over 79% of its population of 224 million have mobile phone subscriptions, and an estimated 111 million of the population uses the internet. An estimated fifty operational internet providers, and four mobile operators serve this demand.

Additionally, Pakistan's IT sector is growing: according to the Board of Investment, there are more than 25,000 IT graduates entering the market each year, with more than 2000 local IT companies present. Pakistan is already the third largest market for freelancers, with its young IT professionals contributing valuable IT services and support to the global IT sector, driving export revenue in the process.

Given its population size, fast growing communications and IT sectors, and developer and user appetite for AI, the rapid deployment of AI could yield substantial benefits for Pakistan. These benefits are already being reaped by institutions like the Information Technology University Lahore's Intelligent Machine Labs, which developed a building-detection solution using satellite imagery in combination with AI deep learning to map and calculate building densities in Punjab, Pakistan. This solution was used by the government of Punjab to expand the reach and efficacy of its vaccination programs in the Punjab province, by detecting communities in deserts and mapping vaccination activities.

AI is also **helping people in more tangible and immediate ways** – the Punjab government has introduced AI to streamline traffic, helping to improve the climate by cutting down on carbon emissions, and allowing everyday people to avoid the frustration of being stuck in traffic. University-led efforts are also starting to be made in Pakistan, such as the Artificial Intelligence Technology Centre, which was established under the National Center for Physics at Quaid-i-Azam University, the Center for Excellence in Artificial Intelligence at Bahria University, and the Artificial Intelligence Research Lab at UET Lahore. These are important steps to build local expertise and capacity and should be encouraged by the government.

We believe AI can do so much more to help address some of the defining challenges of our time. The possibilities are immense: from tackling major public health challenges to boosting living standards and re-invigorating economies struggling from a lack of productivity. And we're just now scratching the surface of what's possible.

The Challenge of Unlocking the Opportunity of AI

As we've learned from prior waves of technology, these benefits are not automatic. Unless people trust the technology, it will not be adopted at scale. And unless we make responsible choices around the technology, it can create both harm and good.

There is a lot of uncertainty about the impact AI will have on the economy, on the workforce and on society. People are concerned that AI will make mistakes, spread false information, and exacerbate inequality. Governments want to know they can trust AI systems to make good, fair recommendations that reflect human values and act in ways that are helpful to individuals and society.

We need to acknowledge and address that uncertainty. We must be critical, thoughtful, and inquisitive, to understand AI's potential impact and ensure that we can work collectively to maximize potential and minimize harm.

We must also learn from the experience of prior technologies. It is critical to address potential pitfalls and externalities up front, and not just assume that these risks will be resolved on their own. **Industry leaders in AI are already taking actionable steps to promote responsibility, security, safety, and accountability** – and policymakers, industry and civil society must govern AI in a way that reflects and advances these goals. As the first company to develop strong AI principles, Google has sought to be a leader

in this space – and we have been heartened by how quickly governments and international institutions like the OECD, the UN and G7 have led the way forward as well. Indeed, the fall of 2023 may be remembered as a constitutional moment for AI governance, when governments began to outline the contours of how to regulate AI.

However, even as we embark on major efforts to drive AI security and accountability, we can't lose sight of the incredible opportunities that AI can bring to our societies.

If we want to fully harness AI's transformative potential, we must focus our attention on what we want to achieve, not just what we want to avoid.

In this respect, Pakistan's 2023 draft National AI Policy (Draft AI Policy) is commendable. It clearly demonstrates the Pakistan government's appreciation of how AI can help the country sustain its national competitiveness and improve the lives of its citizens by outlining a wide range of developmental initiatives necessary for awareness and adoption of AI, reimagining the transparent and fair use of personal data using AI, and stimulating innovation through industry-academia collaborations and investments in AI-led initiatives.

AI awareness is rising among Pakistan's general public. The country ranks fourth with 76% of people being aware of ChatGPT, according to Stanford University's AI Index Report 2024.

Pakistan has also seen several private-sector led initiatives to create even more awareness of AI. For instance, Karachi.AI is recognized as a premier community for Applied AI practitioners. Established in 2017, the community proudly hosts over 10,000 members representing various domains. Its mission revolves around three central pillars: raising awareness, promoting engagement, and driving execution. Karachi.AI hosts regular meetups in Karachi, which are also live streamed on its YouTube channel, along with other educational content about AI.

The Need for an Affirmative Policy Vision

To harness AI responsibly for all citizens of Pakistan and to ensure it reaches its fullest potential, companies, governments, and civil society must all come together to:

- **Invest in infrastructure and innovation:** meeting the moment of this technology by investing in AI research and development, digital infrastructure and global compute capacity, and policies to convert ideas and data into new discoveries, products, and services.
- **Build human capital and an AI-empowered workforce:** investing in our people to make sure they can use and benefit from AI, from students to workers, and from small businesses to traditional industries.
- **Promote widespread adoption and universal accessibility:** harnessing AI across governments and all sectors of the society to address major societal and economic challenges and ensure the benefits of AI are widely shared, while adopting a regulatory framework that supports a healthy AI ecosystem.

No single person, no single industry, and no single company will be able to build the AI future on their own. It will take collaboration and deep engagement from all sectors of Pakistan – industry, civil society and government – to find solutions and maximize AI's emergent potential while minimizing its risks. We will only succeed together.

While the Draft AI Policy represents an important step in Pakistan's journey and in bringing all the relevant stakeholders on the same page, it is just the first step in helping to drive both government and private sector initiatives on AI.

Investing in AI Infrastructure and Enabling Innovation

Countries have historically excelled when they support technological change and harness it to improve living standards.

As per a report by Statista, the AI market in Pakistan is projected to grow by 22.3% between 2023-2030, resulting in a market volume of USD 2,693 million in 2030. To meet this projection, it is important to have the right policy conditions in place for AI adoption:

- The government, industry and civil society in Pakistan have a critical role to play in **investing in R&D and AI infrastructure**, including cloud infrastructure, compute capacity, and data, to ensure that researchers, technologists, and businesses have access to the tools needed to research, build and deploy AI. While countries have been focused on national-level approaches to this challenge, we should also think globally – and ensure that AI innovation is not the domain of only the richest countries and richest cities and regions. Countries should establish a Global Resource for AI Research.
- In addition to investing in AI infrastructure, policymakers in Pakistan must also adopt strategies to enable researchers and innovators to convert ideas and data into new discoveries, products, and services. This will require advancing **pro-innovation legal frameworks** that spur dynamism across the entire ecosystem.
- Finally, because AI is by its nature a cross-border technology, individual policy efforts must be tethered to **strong trade and investment policies** that support trusted international collaboration on AI, including cross-border data flows essential to AI development and deployment.

Investing in R&D and AI Infrastructure

The Pakistan government can support scientific and technological competitiveness by investing in long-term R&D and standing up new public-private approaches to build out AI infrastructure. Policymakers should tailor these efforts to make AI tools accessible to as many entrepreneurs and scientists as possible, allowing more developers to propel AI technology itself and to leverage AI to accelerate discoveries in other fields. And AI accessibility will also require new strategies to reach the millions of people in Pakistan today that are not still connected to the internet.

There is no one AI investment strategy that will work for all governments, but one basic formula for success is to invest in basic and applied research and technologies (such as graphics processing units and supercomputers) at a national or regional level – and then to put in place policies encouraging private sector innovation and product development that builds on top of these foundational initiatives. Such a model can drive innovation leadership by creating a sense of shared responsibility between the public and private sector for developing AI and other emerging technologies.

The United States has already taken important steps to create such a resource, with the proposed National AI Research Resource; the EU and UK are making major investments in AI compute capacity; and Singapore's National Research Foundation provides funding to anchor national capabilities in AI research. Pakistan also has established, in addition to the NCAI, the Sino-Pak Center for Artificial Intelligence (SPCAI), a research facility actively promoting innovative AI-based solutions for complex day-to-day real-life problems. However, we should ensure that academic researchers in a broader range of countries globally, including in the developing world, have access to compute resources – to ensure that they can help advance AI innovation and promote AI research. For this reason, governments should come together to establish a **Global Resource for AI Research** (GRAIR) to ensure that we enable AI research globally.

The GRAIR would serve as a shared AI research resource and clearinghouse to make compute, data, and software resources available to academics, start-ups and small and medium enterprises conducting AI development and research. Beyond providing technical resources, the GRAIR should also provide support for countries at different levels of development to build up domestic AI workforce capabilities, including application developers and researchers.

One model for this work is the Institute for Computer Science, Artificial Intelligence and Technology in Sofia, Bulgaria. Google helped launch this Institute by investing in cloud infrastructure to run high-performance machine learning models, and the Institute worked in partnership with Swiss technology universities to attract leading AI researchers and engineers. Public-private partnerships may be effective in accelerating research and creating shared resources across the AI ecosystem. Both governments and industry can help support academic and civil society researchers through programs like tech transfer frameworks, fellowships, and direct support for research. These efforts must also broaden the range of participants beyond the usual suspects in academia and industry, reflecting the geographic, linguistic and cultural diversity of national and global communities.

Having access to comprehensive and diverse data sets is also critical to AI innovation. Access to such data sets would allow for more effective training of AI models, increase the scope and accuracy of AI applications, and advance innovation in the field. In this respect, Pakistan's Draft AI Policy observes that different government agencies in Pakistan possess heterogeneous datasets and recognizes the importance of data standardization and data sharing, and commendably recommends measures and guidelines to standardize and digitize data and to facilitate data sharing, while ensuring appropriate protections for the data being shared.

Pro-Innovation Legal Frameworks

AI is too important not to regulate – and too important not to regulate well. At this moment, the challenge faced by all policymakers is **how to govern AI in a way that mitigates risks and potential harms without impeding beneficial innovation**. There is a risk that misaligned and fragmented regulatory approaches will block innovators and governments around the world from harnessing trustworthy and beneficial AI applications to achieve strengthened economies, find cures for cancer, and ensure longer, better lives for billions of people.

Many countries have already embarked on meaningful and coordinated approaches to address AI risks. And there has been remarkable global progress on AI governance – from the G7 Code of Conduct to the White House's Executive Order.

But as we improve our collective capacity across industry and governments to address AI risks, we must also turn to the comparably important challenge of building and optimizing policy frameworks that unleash new opportunities from AI.

Pakistan's Draft AI Policy stresses the importance of pro-innovation legal frameworks. It calls for the formation of an AI Regulatory Directorate (ARD), which will be constituted under the National Commission for Personal Data Protection (NCPDP), a body which will be established if Pakistan enacts its Personal Data Protection Bill. The ARD is expected to organize an agile regulatory mechanism to support the objectives of the NCPDP, in addition to providing regulatory support regarding various AI-related issues.

A move towards pro-innovation legal frameworks in Pakistan must have buy-in from all relevant policymakers. This is also noted in the Draft AI Policy, which stresses the importance of bringing all relevant regulators onboard. For this purpose, the ARD has been tasked to work closely with other domain regulators on regulatory issues pertaining to AI. This is an important element, to ensure that any disparate, sector-specific hurdles can be addressed in a consistent manner.

To ensure that over-regulation does not inadvertently stymie Pakistan's ability to leverage AI, it is imperative to conduct comprehensive audits of existing regulations related to AI across various sectors. This analysis will help identify actual regulatory gaps and areas of redundancy or inconsistency that should be addressed to promote responsible, secure, safe, and accountable AI innovation and adoption in Pakistan. The audits should encompass federal and provincial regulations, as well as sector-specific rules, to ensure a thorough understanding of the regulatory environment. These measures would be in line with the ARD proposals in Pakistan's Draft AI Policy.

We believe there are four major universal policies that policymakers should consider to ensure AI researchers and innovators can convert ideas and data into new discoveries, products, and services.

1. First, as a general principle, given the cross-cutting nature of AI, it is essential that governments avoid siloed approaches to AI regulation. While we need case-specific answers for the unique issues of each sector, it will often be true that a regulatory debate on an issue like data will implicate multiple equities and interests within a government – agencies responsible for privacy, cybersecurity, economic growth, trade, law enforcement, health, and finance all may have a reason to weigh in on the issue. Pakistan will need to **build an interagency apparatus that can effectively represent and balance these competing equities** – leaving a critical element of AI policy to one agency, without weighing trade-offs, risks an overall AI strategy that is misaligned with the public's broader interests. The ARD proposed to be constituted under the Draft AI Policy could potentially serve this function, helping bring the various agencies on the same page when it comes to AI regulation.

2. Second, in terms of substantive rules, a **copyright framework that supports innovation and cumulative creativity – including limitations and exceptions that allow developers to train AI models on publicly available data –** is one strong predictor of whether a country will be a leader on AI. Pakistan's current copyright legislative framework does not contain such limitations and exemptions, potentially hindering developers in training AI models based on publicly available data. The Draft AI Policy does not reflect any policy intent to amend the Copyright Ordinance, 1962 to include limitations and exceptions that would enable developers to train AI models on publicly available data without legal liability. For AI systems to learn from and engage with diverse information sources and datasets, copyright frameworks must allow for broad usage of data inputs. And to ensure that copyright frameworks achieve these goals, governments must ensure that users, scientists, innovators, researchers, and the creators using these tools are fully represented within the policymaking process.

3. Third, adopting a **risk-based approach to AI regulation** is crucial to provide clarity to developers, deployers, and regulatory agencies about which uses are disallowed, and to encourage alignment around addressing the most severe concerns related to AI. A risk-based approach also allows regulators to identify which parties (developers, deployers, or users) are most likely to have control over harm prevention and mitigation and therefore should be held accountable.

4. Finally, policymakers should encourage **privacy and security by design** principles so that individuals' personal data is safeguarded, they are given appropriate notice and controls related to their personal data, and the outputs of AI systems protect individual privacy. At the same time, privacy frameworks should continue to preserve the ability to process publicly available data, while supporting privacy preserving technologies throughout AI systems. Privacy is also one of the key areas of concern outlined in the Draft AI Policy.

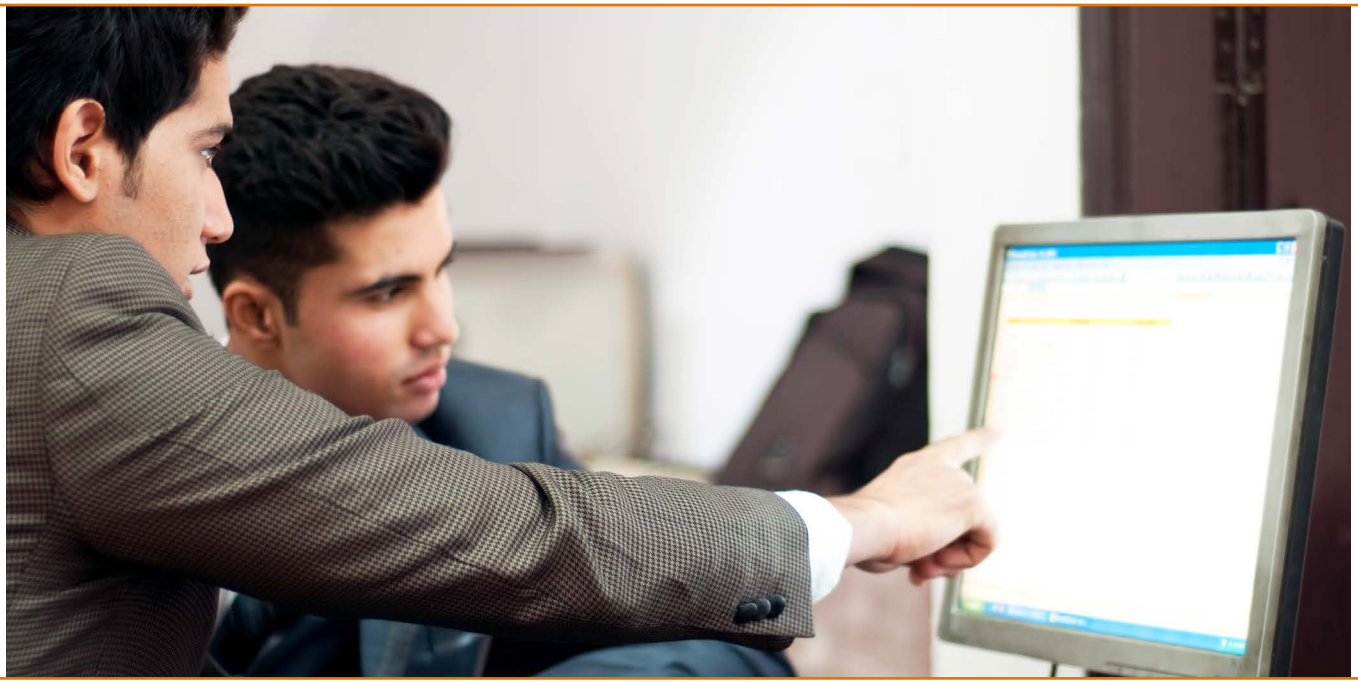
Beyond the substantive areas highlighted above, countries like Pakistan would benefit from having a comprehensive and clear view of the *existing* regulatory landscape by undertaking holistic audits of regulations relevant to AI across the ecosystem. Such a survey will be helpful to identify both regulatory gaps and areas of regulatory overlap or inconsistency that can impede innovation. This audit should be undertaken at federal and provincial levels and also of sector-specific regulations. The ARD proposed under the Draft AI Policy may potentially benefit from this.

Strong Trade and Investment Policies

Given the cross-border nature of AI, enabling trade and investment frameworks will be essential for the development, deployment, and governance of AI.

One of the most meaningful steps that trade policymakers can take to support responsible AI is by **committing to support trusted cross-border data flows**. Data flows enhance the capability of partners to work together to ensure AI systems are trained on demographically and geographically diverse datasets, which helps mitigate potential bias in these systems and makes them more useful and relevant to users around the world.

The G7, OECD, ISO, and other international bodies have already developed a series of principles, commitments, and standards on AI that can help guide its safe, secure, and responsible development. Countries like Singapore, Australia, Chile, New Zealand and the UK have pioneered new trade agreements that support international alignment of AI frameworks and facilitate the cross-border use of AI technologies.



However, recent developments indicate a potential departure from data flows and digital rules in upcoming trade agreements and frameworks. Abandoning support for digital trade norms could result in sharp fragmentation between different national AI models, while damaging the ability of countries to cooperate on the development of resilient and interoperable AI systems.

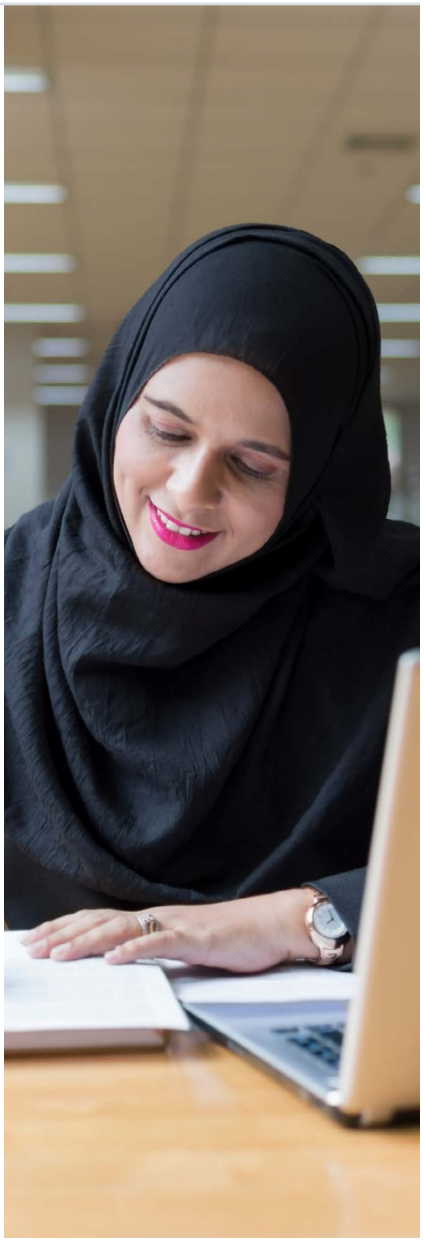
It is urgent to use this moment to **build up, not tear down, key alliances on technology and AI**. This is why we are calling for a renewed focus on AI and digital rules in the Indo-Pacific Economic Framework, at the World Trade Organization, and in other upcoming trade and economic agreements.

In the era of AI, we must connect longstanding trade principles on the free and trusted flow of data, regulatory interoperability, least-trade-restrictive regulation, and non-discrimination to new trade principles such as responsible and ethical standards governing the use of AI and emerging technologies.

The strategic importance of AI should also drive renewed attention to investment strategies, particularly when it comes to building transcontinental AI infrastructure and subsea cables through initiatives like the **Partnership for Global Infrastructure and Investment**. Such initiatives can encourage greater public and private investment in technical infrastructure by conditioning investment on the creation of a stable and predictable policy environment.

It is also imperative that Pakistan reconsider various existing regulations and proposed legislative and regulatory frameworks that restrict cross-border data flows, as such restrictions **will significantly hinder the adoption and advancement of AI within the country**. AI models thrive on access to large and diverse datasets. Cross-border data flows enable AI systems to learn from a wide and global array of information, reducing biases, and enhancing accuracy. They also enable a more global, equitable training set in which AI tools can learn to engage effectively in many languages. For instance, Google Translate leverages AI to facilitate translations between over 200 languages, breaking down communication barriers, a feat impossible without cross-border data sharing. Additionally, by restricting cross-border data flows, collaboration with international partners, including research institutions and technology companies, could be impeded, limiting knowledge sharing and innovation in the field of AI with relevant individuals in Pakistan. This could result in Pakistan falling behind other countries in AI development and deployment, impacting economic growth, competitiveness, and the ability to harness AI for social and developmental purposes.

Building Human Capital and an AI-Empowered Workforce



AI presents immense opportunities to catapult economies forward through increased productivity and economic activity that can benefit everyone. But AI can also be a disruptive force, and it will present unique challenges compared to prior waves of technology that will require new solutions. Given these dual possibilities, the question becomes: **how can policymakers equip the workforce to harness AI** – so that it empowers workers, helps them become more productive, bumps up their expertise level, and makes their skills more valuable? And how can we mitigate any potential risks to the workforce through partnerships between governments, industry, and civil society?

As per a recent analysis by the International Monetary Fund (IMF) on AI's potential impact on global labor markets, while about 60% of jobs in advanced economies may be affected by AI, in emerging markets and low-income countries, the impact is expected to be 40% and 26%, respectively, suggesting fewer immediate disruptions. However, if the lack of infrastructure and the lack of skilled workforces persist, in the longer run, this will lead to inequality, as some workers will be able to leverage AI while others will get left behind.

Building an AI-empowered workforce will require a shared vision – and a shared responsibility – across three sets of stakeholders:

- **Industry** has a critical role to play in **developing new skilling programs** that focus on AI preparedness. But given the transformative impact of AI across all sectors of the economy, individual company efforts will be insufficient on their own – companies will need to stand up new **cross-sectoral AI training partnerships** to ensure workers in all industries are ready to harness AI.

  We have updated our career certificate programs to focus on AI preparedness, and we commit to build up the cross-sectoral Economic Opportunity Coalition to make AI-driven jobs accessible to more people, while supporting similar initiatives globally.

- **Civil society, foundations, and academics** must drive new research to understand what has and hasn't worked in the past in terms of worker preparedness for new technologies, and then apply those insights to **ensure lower-wage workers and rural or underserved communities** are at the center of AI workforce programs.

  We commit to supporting this research globally through our Digital Futures Project and applying these insights to prepare the workforce for AI-enabled jobs of the future.

- And most importantly, **policymakers** must help **scale up AI training programs** so that they reach all communities, while building more effective "trampolines" – to catch workers that are impacted by AI and reskill them so they can quickly bounce back into new and better jobs.

The goal across all of these efforts will be to ensure that AI democratizes access to skills and expertise and **creates a ladder of opportunity** for workers from all backgrounds.

Modernizing Skilling Programs for the AI Era

To tailor policy interventions, **it will be important to understand how AI is both similar to and different from prior waves of technology**. Early research indicates that generative AI may help up-level certain skills, enhance labor productivity, create new occupations, and democratize access to higher paid occupations. But because generative AI can automate non-routine cognitive tasks, it may impact a wider range of tasks and occupations than earlier technologies.

We need to recognize that the way we work is changing. In a wide variety of occupations, about one-third of tasks will be augmented by AI – meaning that people will need to find new ways to do their jobs in collaboration with AI. Indeed, according to a study by analysts at the Lahore University of Management Sciences (LUMS), jobs involving analysis, such as medical diagnosis, legal writing, and HR functions will greatly benefit from AI. As the world's third largest source of IT freelancers, Pakistan is positioned well to become a source of AI-trained professionals.

There exists a huge skills disparity in Pakistan, particularly among lesser skilled workers who face the greatest threat of displacement by AI advancement. This risk is greater for those engaged in freelancing activities related to academic, graphic designing, web development and coding - upon which Pakistan is increasingly reliant. In this respect, the same LUMS study above also emphasizes the importance of education and reskilling initiatives to prepare the workforce for future job opportunities in AI-related fields.

We are still in the process of understanding what kinds of new skills AI-enabled work will require. There are some things we know already – including the importance of workers having basic AI literacy and how eminently human talents like critical thinking, cross-disciplinary problem-solving, effective collaboration, and empathy are likely to increase in value. Industry and governments must adjust existing skilling programs to address those dynamics. But there are other open questions about AI's impact on work that will need further study, such as how AI can best be used to support re-skilling, and how to minimize the risk of "skill atrophy" as routine tasks that previously provided training opportunities for novice employees are increasingly automated. **Companies, civil society, and policymakers will need to constantly evolve skilling programs** to address these questions and manage these transitions.

Education and workforce training programs will become all the more important to help workers and learners apply AI to meet their goals. We need an education and training system that prepares workers to thrive in a dynamic environment and to augment their existing skills and talents with AI. And this must extend beyond the secondary education system – **AI requires a lifelong approach to education** that equips all students and workers with foundational AI skills, treating it as a core component of professional development systems.

This means treating AI as a core component of our education and professional development systems. We must support educators to update curriculum frameworks, double down on STEM education with an emphasis on AI literacy (while avoiding narrow recommendations like 'learn to code' that may be less relevant if generative AI can cover basic coding skills), and emphasize skills-based learning models, including apprenticeship programs. It also means leveraging AI in the classroom to transform how students learn – providing targeted interventions based on the individual needs and capabilities of different learners, and equipping educators.

There is already a strong emphasis on AI education and skilling programs in Pakistan, and the government should continue developing and promoting these to ensure its population is well-placed to capitalize on the benefits of AI:

- The Draft AI Policy states that the Center for Excellence in AI will develop curriculum and management in AI and allied technologies at primary, secondary, and higher education levels for imparting education at the grass-root level. Already, there has been significant work in terms of developing opportunities for education and professional development in AI.
- From 2010 to 2014, Pakistan's education sector demonstrated remarkable growth, producing over 5,000 PhD scholars, according to data released by the HEC, with the number increasing every year. Some in Pakistan are pursuing doctorates in AI and related fields.
- Higher education institutes in Pakistan, recognizing the potential and scope of AI, have also introduced a number of programs for aspiring specialists. As per research conducted in 2022, 47 universities and colleges in Pakistan offer Bachelor of Sciences in AI, 9 universities offer Master of Sciences in AI, and HEC offers 70 international PhD admission in IT, CS, Software Engineering, Data Sciences, and AI. Between 2016 and 2020, Pakistan was also credited with 2600 AI-based publications.
- There are also examples of researchers from Pakistan actively collaborating with international organizations to develop innovative solutions that leverage AI technologies.
- Recently, the importance of AI was recognized in Pakistan's legal sector, when the Chief Justice of Pakistan Justice Qazi Faiz Esa reconstituted the National Judicial Automation Committee which will work towards improving the efficiency of the judiciary in Pakistan and will also seek to introduce AI in the legal processes and research.
- Moreover, to promote digital skills training, the government launched DigiSkills.pk, a training program that offers free of cost online courses in freelancing. Since 2018, over 3.9 million training have been conducted to generate a skilled workforce, resulting in the growth of the digital economy of Pakistan.

To thrive in the AI era, it will also be critical for workers to build a more durable skillset of broader and more fundamental competencies. However, no single employer or policymaker will be able to modernize workforce skilling programs on their own. This is a shared responsibility across governments, civil society, and industry that requires updating and adapting skilling programs across sectors, and building up new public-private partnerships to scale up these programs to reach all workers. There already exist many examples of successful public-private collaborations in Pakistan, which have resulted in the development and deployment of innovative AI solutions. For example, the Punjab Information Technology Board (PITB) and the Pakistan Telecommunication Company Ltd. (PTCL) recently partnered to develop an AI-based solution for predicting electricity load shedding, and inspiration can be sought from such initiatives.

At Google, we have spent the last decade building out digital skilling programs that have reached tens of millions of people. Recently we have built ten career certificate programs including in Pakistan via the Google Career Certificate program, with 45,000 scholarships provided in 2024, additional to 44,500 provided in 2023, 80% of the program's graduates have reported a positive outcome (such as a new job, promotion, or raise) within six months of completion, and 91% have reported an increase in confidence. To further deepen our commitment to the digital workforce, we have partnered with PAFLA to roll-out a freelancer soft skills program, to ensure that our freelancers remain competitive and have the right soft skills to maintain global professional working relationships. Beyond that, we partnered with TechValley and >50 local Pakistani employers to launch Career Kamyabi, a specific program designed to close the employment gap for females, via a dedicated job platform for female GCC graduates.

Moreover, we have also launched a pilot for Gemini Academy, providing AI-related skills and knowledge to >1,000 teachers across Pakistan, to help them to improve their productivity and creativity in teaching. Lastly, we launched new programs focused on AI for developers via our Google for Developer programs, educating >9,300 developers on Generative AI related topics via our Build with AI, and Cloud GenAI Study Jam programs.

We are actively collaborating with government leaders, economists, and think tanks to **develop a workforce transition strategy that will identify the policy reforms needed to prepare workers for the new opportunities created by AI**, while also supporting the transition of workers whose roles are becoming less in demand. And we're revamping our digital skilling programs to meet the new workforce demands created by the AI transformation.

Supporting Workers in Transition

AI is already helping democratize access to skills and expertise such as coding, language and writing skills, and promises to enable more to use productivity strategies that were once the exclusive provenance of workers at the top of the income ladder. By creating more opportunities for more people, AI can help nurses, contractors, teachers, and people in the trades increase their capabilities, supercharge their productivity, and have another arrow in their quiver to get higher pay and better working conditions.

But as we know from history, it's not inevitable that all workers will realize the economic benefits from new technologies. We need strategies for helping workers who are impacted by technologies, and we need to modernize past programs – like trade adjustment assistance – that have been insufficient to prepare displaced workers for the occupations of the future. It's also important to recognize that AI programs must be tailored not only to job seekers, but to all workers who will need essential AI productivity skills.

The Presidential Initiative for Artificial Intelligence and Computing, which aims to promote education, research, and business opportunities in Artificial Intelligence, has developed a four-quarter AI program in data science, machine learning and deep learning.

A challenge faced in mainstreaming AI education is that the majority of high-quality academic materials are only available in the English language. This hinders Pakistani students and faculty who are not well versed in English from accessing such materials. This is something that should be addressed in future initiatives aimed at helping existing workers transition into AI-related roles in Pakistan.

Key steps that policymakers can take to build an AI-empowered workforce and support workers in transition include:

- Establishing a **global AI network** among private sector, governments, and civil society that would include training and support programs to give workers hands-on experience in applying AI to solve new tasks on the job.
- Encouraging companies that have developed career certificate and apprenticeship programs (including Google) to work across sectors to develop **more comprehensive cross-sectoral skilling and certificate programs** that reflect the full spectrum of skills needed for an AI-driven future, and to explore the possibility of translating skilling and certificate programs in local languages.
- Committing to train new researchers within a short timeline (e.g., 18 months) to **strengthen national AI research capabilities** and increase the local supply of AI talent.
- Promoting access to world-class talent by promoting transparent, flexible **immigration pathways for AI experts**.
- Developing an **AI adjustment assistance** program to provide support for workers impacted by AI, with a tailored set of skilling options that can adapt to different worker needs in different geographies, and a focus on lower-wage workers and rural or underserved communities.

Promoting Widespread Adoption and Universal Accessibility

In addition to building AI and preparing students and workers, we ultimately need to ensure that AI is applied and deployed in a universally accessible and useful way. We must harness AI to **help solve real world problems** – in government buildings, in hospitals, and at kitchen tables. To do this, we have identified three key goals:

1. Adopt AI to make people's lives easier and better and address major public priorities
2. Ensure that small businesses and traditional industries are able to adopt AI applications
3. Regulate AI applications in a way that facilitates their adoption across different industries

Governmental Adoption of AI

Governments and the public they serve stand to gain from adopting AI in two ways. First, governments can leverage AI to improve the delivery of services to citizens, which has the additional benefit of familiarizing people with the underlying technologies and building trust that AI can be used in helpful ways. Second, by adopting AI, governments can model a forward-looking approach for their technology sector, and help other sectors understand the importance of AI. The scale of government deployment and investment can ultimately help catalyze a domestic AI ecosystem and, by requiring standards in terms of AI system performance, can also help mature the quality and safety of commercial and enterprise AI products.

To identify the most beneficial uses of AI for their citizens, governments should conduct **national AI opportunity assessments** for public services, particularly in sectors such as health, education, transportation, and other services that most immediately impact people's lives. The first step in such assessments should be to examine existing solutions that are showing promise, such as AI-powered flood forecasting tools in South Asia.

Investing in and scaling up these programs could be one of the **best near-term ways for governments to show progress on AI-enabled solutions** and have a huge impact on people. Already, Pakistan has taken significant steps to increase government adoption of AI. NCAI, SPCAI and the National Center in Big Data and Cloud Computing are all backing initiatives which are working in areas such as smart cities, public health delivery and natural disaster management.

As governments, industry, and civil society identify new areas of AI opportunity, they should work together to plan and execute implementation of AI adoption programs in these areas, and monitor the performance of AI-augmented services to make continuous improvements. Governments can also work with industry to leverage cloud computing to ensure the efficiency of these services and the security of their AI systems.

Additionally, government agencies should **identify barriers to the deployment of AI in key sectors and industries**. Procurement roadblocks are often one of the most significant challenges that governments and industries face when it comes to adopting new technologies like AI. To clear these barriers, governments should adopt cloud-first standards to promote the uptake of AI, and adopt transparent procurement rules that encourage fair competition. Relating to this, the Public Procurement Regulatory Authority of Pakistan has a framework for procurement of cloud hosting services by public sector entities at the federal level. However, this document does not acknowledge a centralized procuring agency, shared service agencies, cloud service pricing models, and appropriate technical evaluation criteria for cloud service providers. Failing to address these specific aspects may undermine the potential for effective and efficient cloud procurement, in turn hindering the adoption and deployment of AI and the realization of its full benefits and potential.

Finally, governments will need more AI expertise to effectively harness AI and address challenges to its adoption within the public sector. These challenges include adoption, monitoring of AI utilization, and training for public sector workers. Like other governments, the Pakistan government is not immune to these issues, and according to Oxford Insights Government AI Readiness Index 2023, the Pakistan government ranks 92nd on the list of governments capable of implementing AI in the delivery of public services to citizens.

To better equip the public sector to embrace and leverage AI, policymakers should **build and scale up "in-house" AI skilling for the government IT workforce**. Governments should also consider creative ways to **bring in private-sector talent**, such as AI Fellows modeled on the Presidential Innovation Fellows program and the UK's Government Digital Service. Finally, while every agency will need some AI expertise, governments should consider establishing a centralized resource of experts that can advise agencies across the government.

Helping Traditional Industries and Small Businesses Use AI

Small businesses and traditional industries have too often lagged behind their peers in adoption of innovative technologies. Policymakers and AI developers must work together to develop aggressive outreach strategies to traditional industries and small businesses – who have much to gain from AI adoption in terms of their competitive posture if they are quick to harness and deploy AI. For example, a recent study showed that 91% of small businesses using AI had success in driving revenue, customer outreach and acquisition, or increasing productivity.

In Pakistan, despite regulatory and economic challenges, larger businesses have adopted AI-based solutions. Khaadi and other retail stores have streamlined their work by the implementation of these solutions. Systems Limited, a Pakistan based IT company provided Khaadi with an enterprise AI solution, resulting in a single, cost effective, integrated solution for supply chain, finance and retail that enabled centralized management and effective decision making in their sectors. Similarly, Tenx AI has developed an automated AI workforce solution, which it states reduces processing time and costs by 90% and which has been adopted by larger businesses. Companies including Addo AI and Red Buffer, while being based in Pakistan, offer their expertise and develop solutions for multinational companies and international corporations.

However, adopting AI may not be the first priority for harried small business owners or industries that are accustomed to taking a "wait-and-see" approach to new technologies. To address this gap, policymakers in Pakistan should consider:

- **Addressing in the Draft AI Policy how to spur AI adoption across industry** – for example, in the U.S., building on recommendations from the National Artificial Intelligence Advisory Committee to "create a multi-agency task force to develop frameworks for small- and medium-sized organizations to adopt trustworthy AI."
- **Identifying priority national sectors that have the highest need and/or the lowest uptake of AI tools**, such as the agriculture, manufacturing, health care, and energy sectors, and work with these sectors on "proof of concept" initiatives to model effective AI deployment.
- **Giving small businesses a "digital jumpstart"** through new models of **technical assistance** and engagement, including digital coaches who can help businesses understand and leverage AI to capitalize on new opportunities.
- **Targeting AI training resources towards small businesses and traditional industries** in underserved communities, including through programs like the Small Business AI Innovation and Commercialization Institutes contemplated in the recent US executive order.
- **Improving access to capital**, including through low-interest loan and grant programs designed to support AI-driven transformation.

Enabling Regulation

At the same time, governments need to ensure that their regulatory frameworks empower and do not frustrate small businesses and traditional industries seeking to adopt AI. Without pro-innovation legal frameworks, programs to promote adoption of AI will be running uphill. Regulators should not only ask how they can address risk proportionately; they should consider what regulation will facilitate the adoption of AI, including adoption by small businesses with fewer resources.

The Draft AI Policy aims to facilitate AI development and accessibility while establishing a robust regulatory framework. This policy aligns with a wide range of national objectives, structured around four key pillars: promoting AI awareness and readiness, enabling an AI-friendly market, creating a progressive and trusted regulatory environment, and fostering the transformation and evolution of the AI ecosystem. While this demonstrates Pakistan's commitment to building a forward-thinking and secure environment for AI development by addressing regulatory challenges and enabling innovation, Pakistan should ensure each goal mentioned in the Draft AI Policy can be achieved in relation to small and medium enterprises specifically to ensure a more broad based, inclusive adoption of AI by businesses.

To ensure that AI is accessible to all, Pakistan's government should:

- **Adopt a proportionate, risk-based framework** focused on applications, recognizing that AI is a multi-purpose technology – and regulatory requirements should be calibrated to the particular risk and use case.
- **Ensure parity in expectations betwee non-AI and AI systems**, recognizing that even imperfect AI systems can improve on existing processes.
- **Promote use of technical standards**, so that where a business is required to show its compliance with a regulatory requirement, it can do so by showing adherence to a common standard – rather than having to meet a bespoke requirement.

Towards an AI Future

As governments around the world look to increase the public's trust in AI, policymakers have a critical role to play in developing AI policy frameworks showing that safety, security, innovation, and opportunity go hand in hand. We look forward to partnering with governments and civil society to build an AI-driven future that works for everyone.