BUILDING AI ECOSYSTEM IN PAKISTAN

Leading the AI Frontiers

by S&T Cluster, BIPP

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Summary

The S & T Cluster at BIPP proposes to develop a central AI Valley in Pakistan to provide a complete ecosystem for AI based products and services. The youth of Pakistan will find the opportunity to capitalize on the emerging technology, offer products and services to the fast growing global market of trillions and help Pakistan to increase 10X export and double GDP within five years. The AI Valley needs to be connected with countrywide AI Incubators set up in the universities, trade bodies, R&D organizations and other places to avail facilities given in the central AI Valley. The central AI Valley along with hundreds of AI incubators will revolutionize Pakistan tech ecosystem and help Pakistan catch the tech race of the world. Pakistani youth will get global AI Jobs, initiate their own startups and increase industrial productivity many fold. AI ecosystem will reduce inequality, drive AI to improve livelihood of marginalized communities and upskill millions of youth of rural areas for gainful employment.

The aim of BIPP is to provide a national AI advocacy platform to drive growth through policy, governance, diffusion framework and insights for AI led implementation.

I. The Rise of AI in the World

The exponential rise in the world is palpably evident from the following facts:

Global Impact of AI

1. *Economic Growth:* AI is expected to contribute $15.7 trillion to global GDP by 2030 with lion share in health care, manufacturing, and the finance industry. (PwC's Global Artificial Intelligence Study, n.d.)

2. *Productivity Gains:* AI is likely to produce up to 40% overall productivity gains in some sectors reducing low-value, administrative work to increase the proportion of high-value creative work. (Accenture Report, 2017)

3. *Healthcare Advancements:* Diagnostic AI and other predictive AI solutions are expected to generate more than $100 billion in a year in the healthcare industry at the global level by 2025. (Lamb et al., 2024)

4. *Environmental Impact:* Regarding the environmental impacts, the use of resources, effectiveness of usage and unnecessary wastage it has been attributed to global emissions cut by 1.5% across farming, transport, and energy sectors among others. (Data and AI for Sustainability, n.d.)

5. *Investment by States:* There is rising investment in AI with government's mainly concentrating in the research and development and adoption of AI systems. For instance, the latest federal budget of USA to AI is $1.7 billion where defense, healthcare, and education sectors are taken into action. Along the same line, the EU has proposed under its Digital Europe Programme to commit €2bn for AI projects by 2027. China is still ahead in the provision of funds to AI infrastructure and plans to increase its AI related financial outlays to $15 billion by 2030. These investments also indicate a billion-dollar advanced focus in AI for future strategic growth and global competitiveness 2024 (McKinsey & Company, 2024, World Economic Forum, 2024).

6. *Venture Capital in AI:* Artificial intelligence is still an emerging industry, but the amount of money that venture capitalists around the world are investing in AI startups will reach more than $ 80 billion by the year 2023. The United States accounts for 40% of the AI VC funding, but China and Europe are catching up quickly. Subjects like generative AI, predictive analytics and automation technologies are the most popular. For instance, OpenAI, recently closed its funding above $10b, while Europe is coming through with investments in ethical AI (World Economic Forum, 2024; CB Insights, 2023).

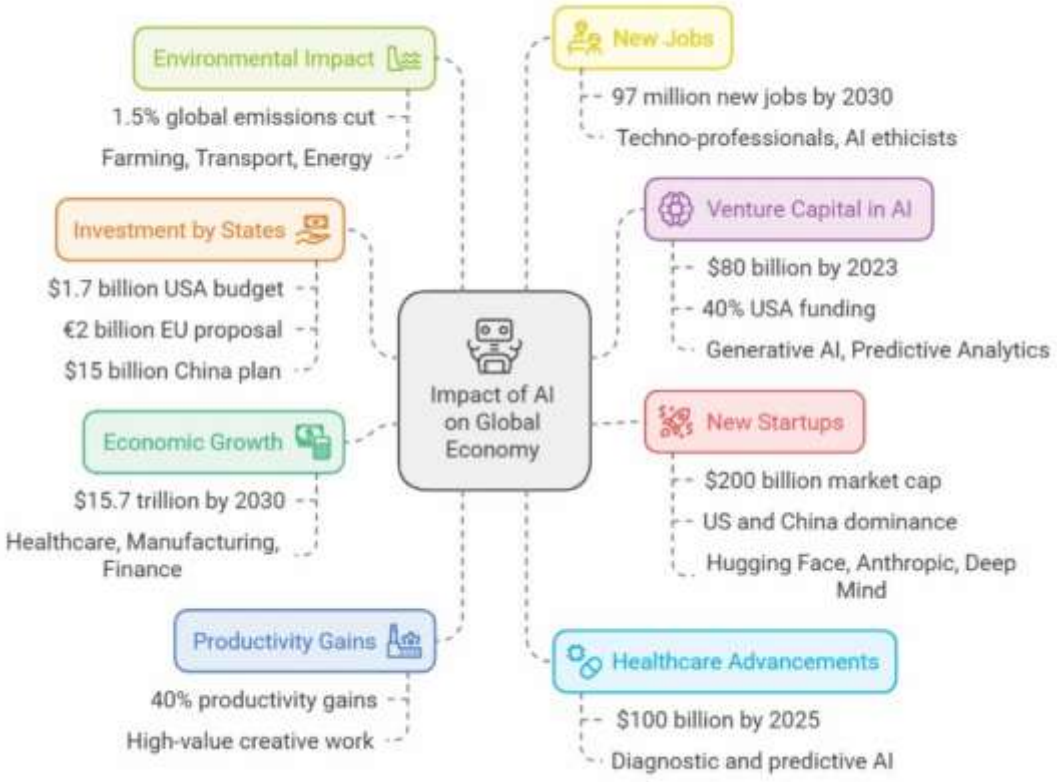
7. *New Jobs:* The IR4, further augmented by IR5 through AI, are transforming the job market by extending opportunities in the development of AI, regulation of AI and the specific domains for applications with human certainty, resilience and environmental integrity at the core. Parenthetically, AI is estimated to generate 97 million new jobs by 2030 with expertise for techno-professionals, cadres, machine learning engineers, data analysts, and AI ethicists. However, reskilling will be important when roles transform as conventional ones are bound to change. To meet this demand, governments and organizations are revamping investment in

multiple forms of education and training for AI (World Economic Forum, 2020; McKinsey & Company, 2024).

8. *New Startups and their Market Cap*: AI-based venture organizations are emerging to become highly functional every day as some have attained the so-called unicorn companies. Specifically, AI startups have brought over $200 billion market capitalization in 2023 only. Strong indications of winnerliness are given by the fact that the US and China control this market but areas like India and Europe are likely to be important in the near future. These range from Hugging Face, Anthropic to Deep Mind among others highlighting the increased investment and movement across industries that deploy AI and develop applications (CB Insights, 2023; McKinsey, 2024).

The following is a brief infographic summarizing the impact of AI and the changes and advancements it's brought around the world across industries.

Figure 1:



II. Case Studies of AI in Countries

a) *United States (Silicon Valley):* One of the world's most technologically advanced regions with hi-tech companies as Google, Facebook and NVIDIA. Silicon Valley evdeavours to achieve the convergence of technological businesses, start-ups and universities to develop self-driving auto, voice command auto and cloud. Other AI centers are Boston, which focuses on AI in healthcare and robotics and Seattle that addresses AI in the context of cloud computing. (Daley, 2024) (Toh, 2019)

b) *Canada SCALE.AI* is a state-supported initiative for providing a cluster for AI innovation in manufacturing and retail. SCALEAI launched by investing CAD 200M in research, nurturing 50+ AI companies and primarily focusing on augmenting Canada's AI strengths and exports. (Daley, 2024)

c) *United Kingdom (AIRR):* AIRR is funded by the Ministry of Defence and DeepMind. This cluster helps strengthen the AI ecosystem in the UK and supports more than 60 startups, contributing to the economy. (Daley, 2024)

d) *Germany (AI Innovation Hub)* emphasizes the idea of connecting AI with major sectors such as auto and medical sectors. Germany's major focus is on the ethical usage of AI and helping create massive-scale innovations from startup entrepreneurs, research institutions, and major players in the relevant industry. (Daley, 2024)

e) *China (Shenzhen AI Cluster)* was Established on AI chips, robots and intelligentizations, supported by various industries including Huawei and Tencent. Shenzhen has a central role in the Chinese government planning system for harnessing AI by the year 2030. (Daley, 2024)

f) *France (AI for Humanity)* created program to enhance the implementation of artificial intelligence in the medical sector, transportation systems, and electricity. France is not only committed to the promotion of safe and socially desirable use of AI technologies but also to foreign investment in the country's AI market. (Daley, 2024)

g) *Singapore (AI Singapore)* focuses on finance, healthcare, and logistics industries and practices the '100 Experiments' model. It links the industries, institutions of learning and the government making it a viable platform for AI development. (Daley, 2024)

h) *South Korea (Pangyo Techno Valley)* promotes AI applications in smart urban environments, automotive, and robotics. Artificial intelligence start-ups in South Korea received financial and policy support from the government to put Pangyo as the destination for AI. (Daley, 2024)

i) *Japan (RIKEN Center for AI)* focuses on AI and robotics with emphasis on healthcare of the elderly population. AI is being developed in Japan via companies such as Fujitsu and Toyota meaning the development of AI has a consideration for its benefit to society rather than its potential harm. (Daley, 2024)

j) *India (Bengaluru AI Hub)* is gradually emerging as a pivotal practice in Bengaluru as it solves problems in finance, healthcare, and agriculture. Recognition and collaborations from government as well as from ITS like Infosys and Wipro are encouraging more innovations and AI systems. (Daley, 2024)

k) *Egypt (Cairo AI Cluster)* primarily works on health, agriculture, learning with ICT talent development, and AI for Egypt digital economy as its main objectives. This emerging AI ecosystem is incubated by government and international support. (Daley, 2024)

l) *Nigeria (Lagos AI Hub):* Fintech, healthcare and education are among the key areas for Lagos' AI hub to encourage young people to embrace entrepreneurship and AI skills. The Nigerian government and international organizations support this effort to increase the supply of AI talents in Africa. (Daley, 2024)

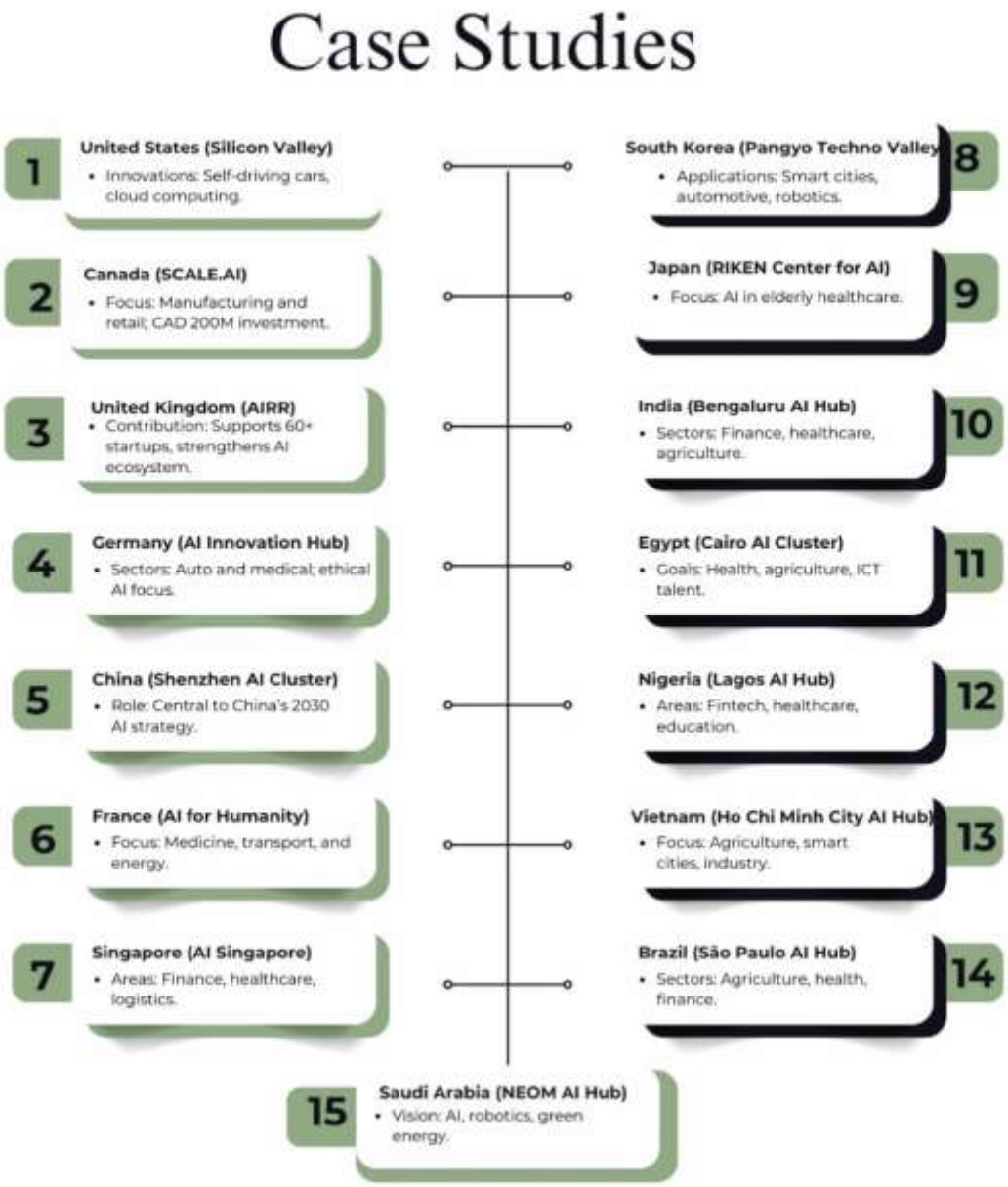
m) *Vietnam (Ho Chi Minh City AI Hub):* Specializing in applications of AI in agriculture, smart cities, and industry business. Vietnam, another growing digital economy in SouthEast Asia, backs the hub to foster AI competency and advance technology startups. (Daley, 2024)

n) *Brazil (São Paulo AI Hub):* There are AI clusters in various regions such as São Paulo, setting its sights on agriculture, health, and finance while focusing on research and development besides the development of AI talent. It should help place Brazil on the map of AI developers in Latin America. (Daley, 2024)

o) *Saudi Arabia (NEOM AI Hub):* Currently, Saudi Arabia has the NEOM project to attain advanced AI, a futuristic city that would incorporate artificial intelligence, and robotics, as well as embracing green energy. The strategic goal is to develop an internationally competitive AI industry and attract more investment attention and technological innovation in different fields. (Daley, 2024)

The following figure illustrates main facilities and specialization of AI hubs in different countries and their strategic goals in the form of the infographic.

Figure 2:



III. AI Potential for Pakistan

a) AI and Economic Growth

Pakistan is left behind many nations in economic and development indices. AI is the great catchup opportunity for Pakistan to leapfrog its growth. Pakistan can target 5X growth in next 10 years through AI led economic growth with GDP size growing from US$ 382 Billion (projected for 2024) to approximately US$ 2 trillion and exports from US$ 30 billion to US$ 150 billion. The AI can also increase per capita income 5X from US$ 1587 to US$7500 in just the next 10 years. This will also drive social development, decrease poverty level, increase income inequality and put Pakistan on a road to prosperity. AI can thus serve as a game changer and transforming catalyst for Pakistan socio economic development if capitalized holistically and coherently with the lead role of the private sector.

b) Job Creation

The technology history of the world has replaced old jobs with new, old industries with new, old skills with new and resultantly, human society has renewed itself after every century. The horse ridden transport was replaced with automobiles after the invention of the steam engine. The skills related to horse riding were replaced with the large and multiple industries of the automobile sector. Likewise, AI entails a new skill-set and also presents huge potential to create millions of new jobs for every country by inter alia, replacing the existing ones. The proposed AI valley in Pakistan will set these examples of new job creation and multiple employment opportunities especially for the university graduates.

c) Startups

The AI wave in the 21st century will create a totally new IT industry with many fold increases in speed, automation and productivity. This will lead to the birth of new startups operated on different business models. Pakistan needs to leverage this AI startup opportunity. It has millions of IT graduates and youth bulge that can provide a backbone for the AI startup movement for which a robust AI startup ecosystem is essential to take

the AI advantage These AI startups will serve the global fast changing market through AI based products and services and create a new economy, generate new jobs and bring much needed foreign exchange for the country.

The figure 3 sums up the promise of AI for Pakistan by presenting the major areas of economic development, new job opportunities, and startups.

Figure 3:

IV. AI Ecosystem of Pakistan

The following measures and conducive environment constitute the fundamentals for spurring and establishing a robust AI ecosystem in Pakistan:

a) Government Investment

The Government of Pakistan with the help of national and international partners needs to pledge significant investment in the AI sector of Pakistan. The state investment will offer a strong commitment, pave the way for stakeholders to respond accordingly and will serve as a moon shot for AI in Pakistan. This will also inspire the entire nation to espouse a singularly common vision to emerge as an AI nation with multiple streams of technology development and diffusion. This investment will enable development of AI systems, data centers, infrastructure, grants for AI research and technology funding for startups and international collaborations.

b) Venture Capital Funding

The growth of science and technology largely depends on the availability of venture capital in the country. The industrial revolutions from the 1st in the 17th century to 4th and 5th in the 21st century are largely driven by venture capital. Scientific and technological development confronts many challenges before the new idea or scientific discovery is concretized into an operational stream. It is venture capitalist who leads the voyage of science through multiple waves of success and failure and creates new industries and economies. The establishment of venture capital in Pakistan will thus define the specific prospects and achievements of AI projects and advancements. The country needs to launch AI venture capital, develop policy and governance framework and incentivize the private sector to invest in AI technologies.

c) AI Data Centers: Nuclear-Powered

The nuclear-powered AI data centers for large-scale data processing result in reduced resource wastage and increased output in every case. With nuclear energy, such centers can have a constant supply of electricity at any one time, which will have far less adverse impacts on the atmosphere as compared to fossil-fuel dependent electricity generation. Nuclear power thus provides the base load power needed in computation demanding AI applications a need well met in regions where AI applicants a need well met in regions where renewable power may be available but not consistent.

i) The advantages of having Nuclear-Powered AI Data Centers:

- *Energy Efficiency:* One of the nuclear power plants is that it has low operational interruption compared to other sources of energy, and it helps meet a country's energy needs without experiencing a rise in costs in the process.
- *Carbon Neutrality:* Nuclear energy is not incredibly high on emissions of CO2 which makes it friendly to the environment in powering AI operations without necessarily affecting the environment.

- *Cost-Effectiveness:* While setup costs may be high, nuclear-powered centers are cheap to run due to low costs of fuel and the reduced exposure to current shocks in imports of energy.

ii) Global Examples

- *United States:* The U.S. is gradually incorporating small modular reactors (SMRs) in data centers to control the operational expenses through nuclear power reliability.
- *China:* Like most of its experiments involving nuclear energy-based data centers, the Chinese efforts are geared towards AI in such sectors as telecommunications and health technology to reduce the dependence on fossil energy.
- *France:* France has suggested that nuclear power facilities can be used to fuel AI data centers, especially to power the country's AI for Humanity project given that the country has been largely dependent on nuclear power.

In view of AI in Pakistan, a nuclear-powered AI data center could be essential to develop the technology regime in the country. These centers have possible support with existing nuclear facilities but if sited in areas such as Skardu where cooling can be naturally obtained without additional cost overhauls. The associated benefits are:

- *Cost Savings:* Combining nuclear power with Skardu's cold climate effectively could significantly lower energy and cooling expenses needed for data centers and thus create a cheap AI system.
- *Energy Stability:* Nuclear power guarantees constant generation of electricity which is commendable for carrying out data-intensive processes, app development, deep learning, and other machine learning models, which must be on round the clock.

- *Environmental Benefits:* Nuclear powered AI center is advantageous when it comes to green goals around the globe and has lesser carbon emission than traditional power stations.

iii) AI Data Center- The Northern Areas

High altitude and natural conditions of Skardu gives it a suitable environment for an AI data center. Skardu can act as a cooling source to reduce the amount of energy needed for artificial cooling since its temperature is low over the year. Moreover, Skardu's geographical isolation can provide protection to data and also help in cost-cutting, and thus make Skardu into an essential data hub for artificial intelligence in Pakistan. If nuclear energy cannot be utilized then there are many alternatives including the establishment of an energy centre that is hydro-powered.

Features for creating Skardu AI Data Center are proposed as follows:

- *Natural Cooling:* One example also is that because Skardu has colder climates the cooling of the AI servers is done naturally thereby saving costs and energy.
- *Economic Growth for the Region:* Skardu is waiting, an AI center can generate some local employment, stem the rural-urban drift and boost the area's economy.
- *International Partnerships:* Since, Skardu is close to Shinjan's low-cost region with many climatic benefits, it could provide many incentives to international organizations interested in developing AI at a low cost in a favorable climate.

iv) Data Center Implementation Strategy

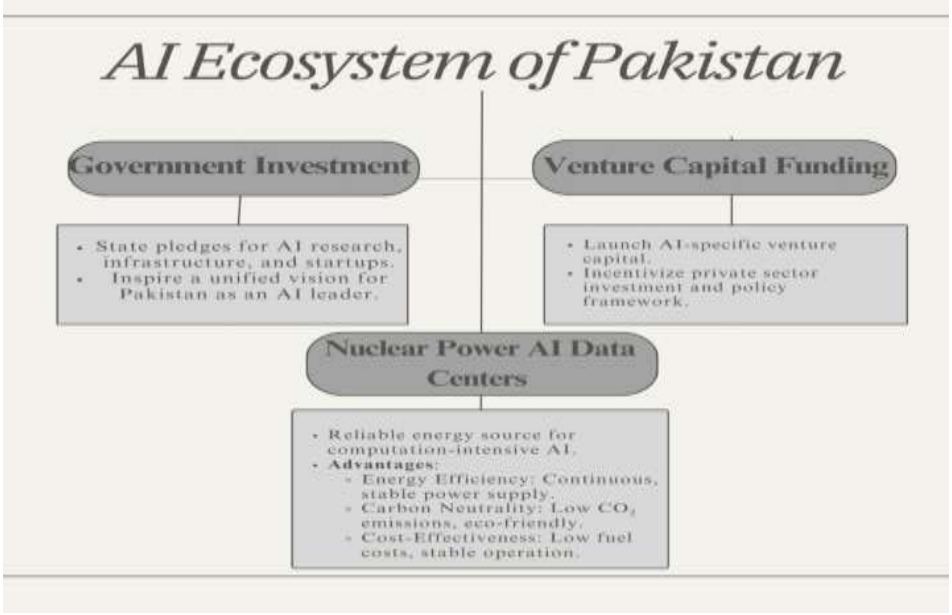
1. *Hydro Power Setup:* There is a proposal that a small hydro power plant should be incorporated to supply clean and stable energy to the AI data center.

2. *Infrastructure Development:* Fast internet access systems together with servers for data processing should be installed with enhanced security to protect sensitive information.
3. *Talent Development Programs:* Implementation of AI needs collaboration with universities and higher technical and learning centers in the local area to create the skilled human capital and provide with the future talents fully equipped and trained to support the center at the same time.

The creation of an AI data center built at Skardu and run on hydro power will put Pakistan on the map for AI and offer long-lasting and affordable solutions. Optimizing natural and technological assets can generate a template for deploying low-cost AI in Pakistan that would have high impact.

The next figure is a brief sketch of the major elements of the Pakistan AI environment including the government investment, the venture capital and the potential disaster or revolution due to nuclear-aided AI data centers for sustainable technology in the country.

Figure 4:



V. The Central AI Valley

Pakistan needs a central large scale AI valley providing an entire ecosystem of AI related R&D and product development. AI valley will serve as an enabling place for all the stakeholders to connect, network, facilitate, develop, test, pilot and commercialize AI solutions for scale-up. The AI Valley will comprise:

- **AI Authority** – a statutory autonomous body to be established by the government and including representatives of industry, academia, social technology experts and technology generating institutions to govern, strategize, regulate, facilitate AI powered solutions and development modules and also ensure integration of ethical considerations in AI related development
- **AI Incubator** - to host, incubate and develop AI related startups providing complete ecosystem from idea to scale up. The institutions and organizations of Pakistan need to develop numerous AI incubators to facilitate development of AI related ideas into products and services. These incubators of various regions will be connected to central AI valley for various facilitations and services available in the central AI valley. The regional AI incubators will attract bright talent and transform them into AI professionals who can compete and sell in the international AI market. The regional incubators need to have co working space with medium level GPU and Data Center Facility.
- **AI Fabrication Lab -** a multipurpose fabrication lab to develop prototypes and pilot projects and test them initially. Fabrication lab will facilitate development of 3D models and working prototypes to be tested on AI
- **Data Center -** a dedicated data center to provide cloud hosting to startups to park their applications and launch their services
- **Central GPU Facility -** a large setup of GPU facility centrally available for all startups to do their processing. The central GPU facility will also reduce a lot of cost for new entrants and indeed encourage youths to venture into developing their products and services and take to the national and international markets.

The infographic bellow shows the outlook and functionality of Central AI Valley based on the proposed components and its functions: AI Authority, AI Incubators, Fabrication Labs, Data Centers, and Central GPU Facilities for AI development in Pakistan.

Figure 5:

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- **The AI Upskilling Program:**

Given the demographic boom and around 64 percent population comprising youth, Pakistan needs to launch an AI upskilling program to create at least 01 million AI skilled professionals who sell their services in the international market since many developed countries and emerging economies have an increasing aging population including China. This AI skill development program will be a backbone of the AI ecosystem in Pakistan. The AI skilled people will earn foreign reserves and increase Pakistan exports

substantially besides engaging in the automation and transformation of the industry into AI factories and enhance national productivity many folds.

- **The Policy and Economic Incentives for AI Ventures**

The integral part of the AI ecosystem is a comprehensive AI policy and accompanying implementation framework embodying, inter alia, the incentives structure essential to inspire and motivate stakeholders to work and contribute in the AI development. Three stakeholders as startups, investors and institutions need significant incentives to dedicate their resources, talent and energies for AI endeavors. The incentives related to tax credit, import duties, interest rates and others will play a significant role in driving people's interest towards AI and AI related ventures. Organizations such as banks, universities, and industries should be motivated to adopt, fund and build AI systems. The AI adoption in the public sector through key performance indicators and obligatory budgetary allocations for R&D could play a catalyst role in promoting AI savvy ethos and stimulating AI development and diffusion.

- **S&T BIPP Services:**

S&T Cluster/Center at BIPP is dedicated to serving S&T development in Pakistan. The aim is to turn S&T from the existing liability sector in Pakistan despite the network of related institutions, the scientific workforce, and foundational infrastructure into an asset for the country that produces significant economic returns and contributes to wealth creation through knowledge, innovation and technological development and diffusion. As an ardent AI advocate in Pakistan, BIPP is endeavoring to mobilize stakeholders for capitalizing on AI developments in the world with a clear focus on policy issues, governance framework, resource and opportunity mapping, feasibility studies and intervention models of AI projects and workable implementation plans. The overall objective is to provide an enabling platform for AI related discourse and dialogue, blending practical knowledge and experience and intellectual reservoir of institutions, entities and experts from government, private sector and academia for future planning and action plans.

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