Pune Knowledge Cluster (PKC)

Established by the Office of the Principal Scientific Advisor to Government of India

PKC AI Incubation & Skill Development Centre

Transforming human lives and creating livelihoods through sustainable AI based interventions

INDEX

Summary

We propose to set up an AI Incubation and Skills Development Centre through the Pune Knowledge Cluster (PKC). The objectives of the centre will be to use (1) use Artificial Intelligence (AI) based techniques to enable livelihood generation, (2) to enable technology development in the AI sector which will also generate livelihoods for certain sections of people (3) provide avenues for AI related skill development. The first two objectives will be addressed by building a strong ecosystem for young entrepreneurs, while the third will be met through hands-on courses and internships preparing graduates from the engineering and science streams for employment. Specific programmes in a few sectors will be undertaken to meet these objectives. Scaling to other sectors and regions will be considered later in the programme. The functions of the Centre will be carried out by a core staff aided by experts from PKC knowledge partners. The main knowledge partner for the incubation will be the Digital Impact Square (DISq) at Nashik, Maharashtra. The PKC will provide coordination, high level oversight, find knowledge partners and will seek funding from various sources. The current proposal is for a five year timeframe.

About Pune Knowledge Cluster (pkc.org.in)

Pune Knowledge Cluster (PKC) has been established by the Office of the Principal Scientific Advisor to the Government of India. The aim is to bring together academia, R&D institutions and the industry of Pune and its surrounding areas, to address the challenging problems of the region through innovative means, using scientific knowledge and engaging highly skilled human resources. Furthermore, PKC aims to foster capacity building and promote skills development and entrepreneurship among the students and professionals of the city. All relevant organizations and experts will be partners and consulted to identify sustainable solutions to the problems of the ecosystem and improve its livability and prosperity.

While the PKC is administered by the Inter-University Centre for Astronomy and Astrophysics (IUCAA), it is a project of and for the entire geography.

The aim of the PKC is to bring together the large talent pool in Pune, brainstorm, discuss, identify projects for the betterment of the city and surrounding region and to execute them through collaborative efforts. The PKC verticals are Environment, Health, Sustainable Mobility and Big Data &AI. The PKC will

- Catalyse projects to help mitigate problems faced by the city
- Provide new opportunities to students, young researchers and professionals to improve their knowledge base and acquire advanced skills through interdisciplinary training programmes conducted by city based, national and international experts.
- Increase employability in knowledge-based industry through an internship programme.
- Provide openings to start-ups and entrepreneurs.
- Enable translation of basic research to innovative products on the commercial scale.

Big Data & AI is a key area of focus for the PKC. Keeping in mind the overarching objective of “Atmanirbhar Bharat” and PKC’s charter for innovation and skill building, an Incubation Center “AI for Social Good” was conceived. This fits in very well with the concept of using AI for livelihood creation.

PKC has embarked on a number of Capacity Building initiatives in Big Data & AI. These programs are delivered in partnership with the Industry and cover topics that go beyond Coursera / Udemy or similar portals

Objectives of PKC AI Incubation & Skill Development Centre

- Build a strong ecosystem for young entrepreneurs, nurture entrepreneurship skills with attention on scalability and sustainability.
- Focus on early stage incubation. Use bottom up innovation and human centric design approach, to solve challenges faced by the region in health, environment , sustainable mobility and livelihood through AI based technology.
- Create opportunities for livelihood generation through skill development.

Collaborators for the Incubation & Skill Development Centre

1. Knowledge Partners – AI
    - Persistent Systems
    - Tata Consultancy Services
    - Icertis
    - Other Institutions with a strong AI Practice
2. Knowledge Partner - Incubation: DISQ: Digital Impact Square
    - An open social innovation centre in the city of Nashik, Maharashtra:
    - Nurtures sustainable and scalable social innovation using digital technologies
    - Since March 2016, 430+ innovators have gone through the DISQ journey. Forty-six of them have transformed into changemakers and continue their journey to sustain and scale their initiatives.
    - Eleven initiatives pre-incubated at DISQ have moved into other incubators for scale-up or are generating their own revenue and impact in society
    - DISQ has been a knowledge partner to the Petronas Foundation, Malaysia. The innovation process SPOT-PROBE and GROW-SCALE was adopted by Petronas.
3. Other Partners
    - IEEE Pune Section
    - Bhau Institute: An incubation centre of the College of Engineering, Pune. It has a special focus on Healthcare, Agritech, IOT and Cybersecurity
    - Venture Centre: A technology business incubator in the area of materials, chemicals and biological sciences & engineering
    - Other institutional and industry partners of PKC

Contribution of Digital Impact Square (DISQ)

DISQ will extend innovation process and guidance to PKC Incubation Centre for running SPOT- PROBE (Problem to Solution FIT) and GROW- SCALE (Product Market FIT) model. DISQ will be key enabler to support PKC incubation centre by contributing in the following ways

- DISQ will extend training for core team: A two week intensive training for the core team is envisaged at Nashik, in the beginning. Subsequent week-long interactions for design & innovation coaches may be planned after 6 months
- DISQ leadership will be member of the “advisory board” and will continue to support the program through this forum
- DISQ will extend mentors network: DISQ mentors will be available for regular consultations & also in the review process.. DISQ will extend strong ecosystem in Nashik Sandbox for PKC incubator

AI Technology for Development

AI enables the adoption of evidence and data based approach to solving problems ranging from the exotic to seemingly simple issues which could be critical for the general well being. AI provides a variety of techniques which can be adapted to specific situations. For example, patterns in rain fall and crop data could be investigated through simple machine learning to find non-linear relationships, diagnostic imaging can be addressed using Convolutional Neural Networks (CNN), one dimensional data like ECGs can use autoencoders, required textual parts from voluminous references can be extracted using Natural Language Processing (NLP) and so forth. The AI techniques evolve constantly in response to the requirement of various applications, and the need to obtain ever more accurate and reliable results with the minimum of computing resources. This evolution is accompanied by equally fast improvements in publicly available codes and developmental platforms, which enable easy use of the techniques.

In the following we describe specific areas to be addressed in the incubation process. The teams which are incubated will be applying the techniques most suitable for the products and processes they develop, under the guidance of the core staff and knowledge partners. They will also gain the confidence to remain abreast of developments and to quickly adapt them to their own applications. On the skills development side, good background of AI and practical skills in it will be provided through lecture courses, discussions and hands-on sessions, keeping in mind the needs of industry, thus increasing their employment potential and generating livelihoods

The PKC AI Skill Development Framework

The Skills Gap

- The need for skilling in Big Data and AI is well known
- PKC has a very strong skill development program lead by a dedicated team. Livelihoods is a key objective of this program. This proposed framework builds on this experience with a key focus on AI.
- Fresh graduates as well as re-skilling opportunities

The Training Programs

- Curriculum design with industry input
- Partnership with Coursera / Udemy / Udacity supplemented with Coaching sessions for standard modules
- Invited faculty from the industry
- Intensive Training with Hands-On Component – 3 months
- Industry Internship – 3 months
- Opportunity for Entrepreneurship
- Employment opportunities with industry
- Assessment & Certifications

- 40 students per cohort. 2 cohorts per year

Collaborators

- IEEE Pune Section – Computer Society
- University of Pune
- Persistent Systems
- Tata Consultancy Services

Talent Sourcing & Cohort Selection

- Cohort Size of forty individuals
- Alumni from Avasara academy to encourage Women in AI
- Bright & needy candidates through NGOs like Atmaja Foundation, SAF India
- Second career candidates
- Regional selection process

The PKC AI Incubation Framework

Possible Themes for the Incubator

PKC has been supported by different ecosystem partners who have a strong background in innovations in the fields of Health, Environment, Sustainable Mobility and Livelihood. Our aim is to discover AI-based innovations and solutions to transform these sectors by addressing knowledge, expertise gaps that limit progress. A few areas for the proposed incubator are as follows:.

Livelihood

- Background & Context
    - AI is rapidly reshaping the way livelihood is generated/done in many sectors including agriculture, education, etc
    - Agriculture is one sector on which livelihood of >65% of Indians is dependent on. There is potential to transform this sector using AI for addressing important problems AI holds the promise of driving a food revolution and meeting the increased demand for food (global need to produce 50% more food and cater to an additional 2 billion people by 2050 as compared to today). It also has the potential to address challenges such as inadequate demand prediction, lack of assured irrigation, and overuse / misuse of pesticides and fertilizers.
- Use Cases
    - Use cases include improvement in crop yield through real time advisory, advanced detection of pest attacks, and prediction of crop prices to inform sowing practices etc
    - Advisory to farmers in the Loni-Kalbhor region near Pune:
        - Collaborators: IEEE Pune Section & MIT ADT University
        - Provide advisory services to farmers leveraging data from a) weather sensors installed at MIT ADT (2) Kisan Call Centre Data (GoI) (3) marketmirchi.com A platform connecting rural markets running in collaboration with MKCL
    - SMART farming aids – SMART Greenhouse, SMART Irrigation system, SMART Onion Storage System
        - Collaborators: IEEE Pune Section, Special Interest Group (SIG) on Agriculture
        - The need for such solutions has been identified by the SIG on Agriculture through workshops and meetings with farmer groups

Diagnostic Imaging

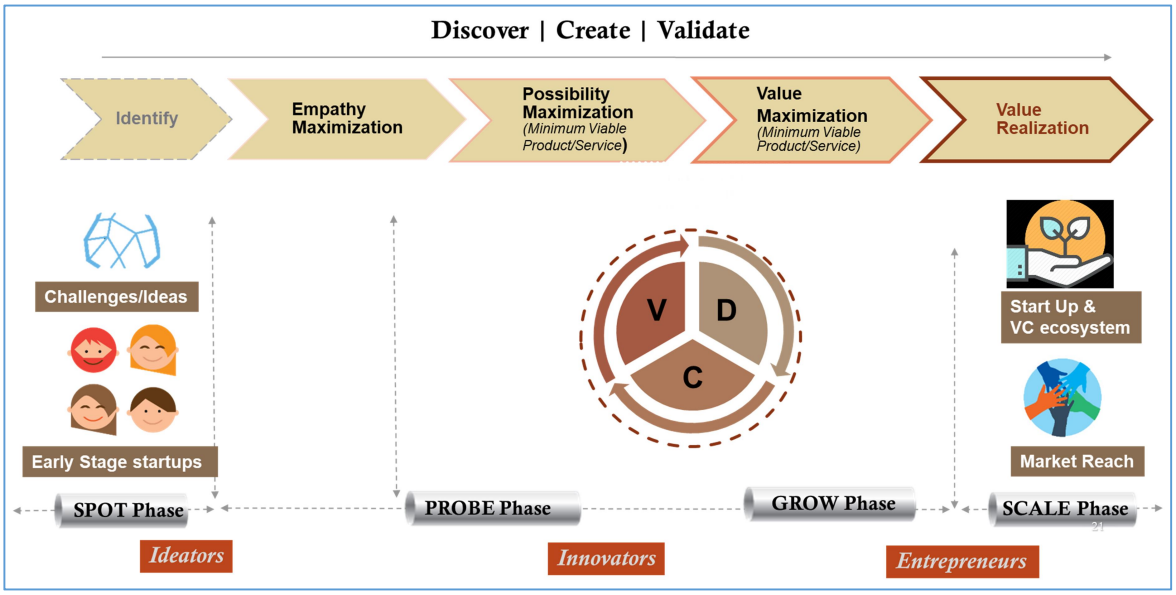
- Background & Context

- Artificial Intelligence offers an unprecedented opportunity to revolutionize healthcare. The opportunities to transform for example medical diagnostics, improve reach to remote areas through digital consultation are immense. The pandemic has further stressed the need for advanced systems that can predict the spread and for managing the response. Use cases for Diagnostic Imaging are given below.

- Use Cases
  - Cardiovascular disease: Early and efficient diagnosis of CVD risk
    - India faces a double burden of communicable and non-communicable diseases. Given the high prevalence of risk factors such as diabetes and hypertension, cardiovascular disease (specially heart disease and stroke) accounts for 25% of all mortality in India. Epidemiologically, CVD mortality is observed at a younger age in Indian population compared to western countries. This is attributed to the complex interplay of biological, social and cultural factors and is a major public health concern. Efficient and faster diagnosis of heart disease risk will help implement preventive measures and ultimately facilitate lowering CVD associated mortality.
    - Heart failure risk can be diagnosed by analysis of MRI and blood tests in combination.
    - Differences in ECG signature that may indicate atrial fibrillation can be detected.
    - Structural disease as well as staging and classification of disease can be conducted using Cardiac Imaging Analysis
    - Collaborators - BJ Medical College and other hospitals to develop a database of CVD patients with clinic-pathological data.
  - Cancer: Aid diagnosis & predict prognosis
    - Cancers account for 9% of the total mortality in India, with breast cancers the leading or second leading cause in 28 states of the country. Lung, stomach, mouth are the most common cancers among men, while breast and cervical cancers are the most common among women. Increased screening efforts to facilitate early diagnosis will thus require increased diagnostic capabilities. Use of AI in detection and characterization of tumors will help develop effective personalized treatment strategies.
    - Digital Pathology - Scanned immunohistochemistry slides can be assessed to determine the presence of tumor cells
    - Medical Imaging of cancer - Low dose CT, MRI and mammography scans can be utilized for detection, characterization and monitoring of tumors
    - Analyze molecular and pathological information

Journey from Ideator to Entrepreneur

The figure below captures the 4 stages of the incubation program – SPOT, PROBE, GROW and SCALE



Mechanisms for SPOT Phase

- Yearly Grand challenge program will be launched to identify these early stage start-ups by leveraging start-up India, PSA's office, premium institutes, innovation and entrepreneurship cell
- Participate / Conduct yearly hackathons / competitions in premium institutes in the country and along with premium startup ecosystem in the country

Entrepreneur Profile

- Early Stage Start-up with at least two co-founders committed and on board full time.
    - Age Group < 30 (Co-Founders)
    - Good academic background from Tier 1 College with degree in Computer Sci, IT and demonstrated expertise in AI Technologies
    - Initial Proof of Technology is in place
    - Preferred – legally registered.

Batch Size - Innovators

- First Year: 20 Entrepreneurs/Co-founders: 5-7 early stage start-ups
- Second Year Onwards: 40 Entrepreneurs/Co-founders: 8-10 early stage start-ups

Types of Early Stage Start-ups

1. Idea Stage (Problem To Solution FIT) : 6 Month Program

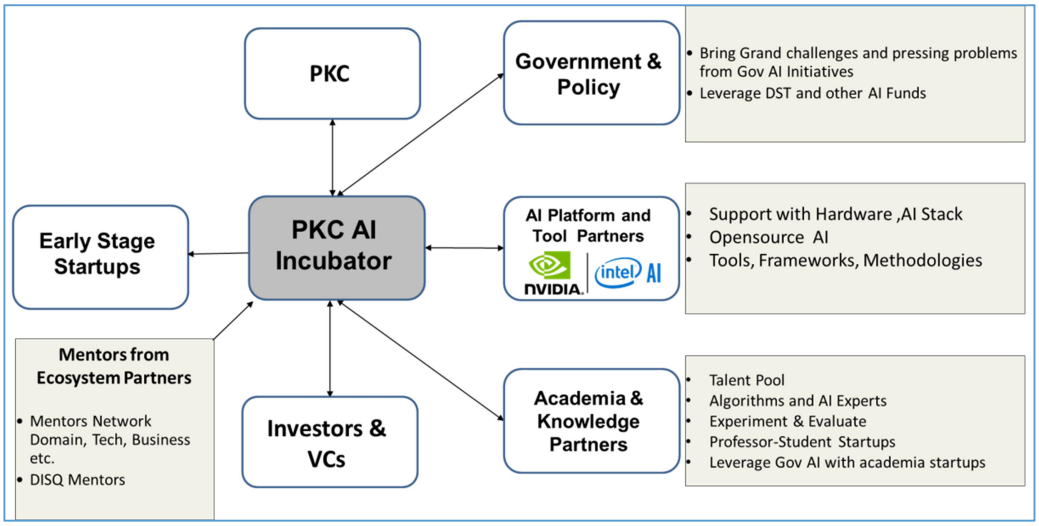
- Provide access to deep field immersion through domain partners for validating problem to solution fit

- Curate program to build human centric design skills in cohort to maximise field immersion opportunity
- Build initial prototype and validate the same on field

2. Pilot Stage (Product Market Fit) : 6 to 9 month program
   - Access to pilot for validating solution
   - Mentorship to build robust product
   - Curate program to build right business model and validate with ecosystem
3. Grow Stage (Product Market Fit) : 6 month program
   - Access to pilot for validating solution and robustness of product
   - Curate program to build right business model and validate with ecosystem
   - Organising Demo Days
   - Access to social impact funders, VCs , grants etc to scale impact

Incubator Ecosystem

The figure below includes three ecosystems that are vital for the successful functioning of an Incubator. These will be nurtured.



- **Innovation Ecosystem:**

Curating high-quality, high-impact deep-science and AI based innovations through technology scouting, research institutes, academic and government partnerships, and several innovation competitions.

- **Deep Field Immersion and validation Ecosystem:**

Building strong domain ecosystem for deep field immersion and validation of opportunity areas (Problem to solution fit), product market fit (business model validations and pilots) .

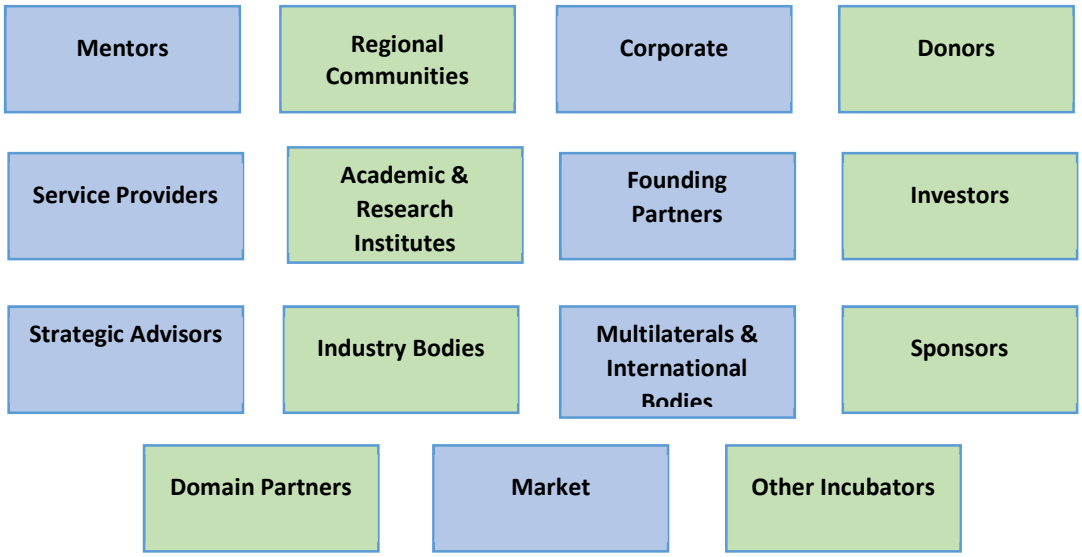
Curate challenges with ecosystem partners and launch grand challenge solving programs

- **Investment Ecosystem:**

Curating program to provide access to seed fund, pilot fund for early stage start-ups and curate ecosystem of social impact funders, CSRs, grant programs to give access to start-ups for scaling impact.

Incubation Center Partners/Ecosystem

Several organizations are doing multiple interventions to support innovation, entrepreneurship, create sustainable social impact. This incubation center focusses on getting all relevant stakeholders together



Incubation Program Support Services

The following types of business support services are typically provided for structured Start-up Incubation.

- Financial assistance: Seed Fund, Pilot fund access
- Access to maker space, co-working space through partners like Bhau institutes etc
- Business Opportunity Identification using design thinking tools and methodologies
- Customized design and business strategy roadmap (from idea definition to market-ready product proposition
- One-on-one session with design and business experts to determine desirability, feasibility and viability of the idea
- Open access to tech, design and business mentors and subject matter experts
- Training and tool kits in lean product development and validation
- Access to prototyping facilities, vendor network for manufacturing and development experts for coding
- Opportunity to meet potential design partners/co-founders
- Exposure to investors nationally and globally
- Company formation support, IPR consulting and legal facilitation
- Free access to workshops and events held throughout the year
- Expert Dialogue competency building sessions, including sessions on Technology domain and Business Model creation
- Community Engagement where start-ups get to interact with each other
- Start-up Pitching Competition to VCs
- Quarterly Huddle and startup clinic programs

Incubation Program Governance and Team

- Board of advisors: Advisors from key PKC leadership, Digital Impact Square leadership, nominee from key partners , influencers
- Core Team: The Core team consists of Incubation Head, Innovation coaches, Design Coaches, Technical Mentors, Community Manager and support staff. The details are provided in the table below

	Roles	Year 1	Year 2 Onwards
Core Team	Incubation Head	1	1
	Innovation Coach	1	3
	Design Coach	1	2
	Technical Coach	1	1
	Community Manager	1	1
	Support Team(HR, Admin, IT)	0	2
Total		**5**	**10**

Program Budget

Assumptions – Incubation Program

- 5 year budget
- Incubation program for 20 innovators (i.e 5-7 early stage start-ups) in the first year
- Incubation program for 40 innovators from the second year onwards
- Mentorship and guidance from DISQ will be at no cost

Assumptions – Skill Development Program

- Laboratory Space for training would be available at nominal cost from Pune University or affiliated colleges
- 2 cohorts per year
- Subsistence allowance for needy students

Budget Details for Incubation & Skill Development

Program	Category	Year1 (Lakh)	Year2 (Lakh)	Year3 (Lakh)	Year4 (Lakh)	Year5 (Lakh)	Total (Lakh)
Incubator	Incubation Program	37	76	76	76	76	
	Operations And Logistics	15	30	30	30	30	
	Outreach for innovation cycles	5	12	12	12	12	
	Grant to participants in India	60	120	120	120	120	
	Rewards and Recognition	2	2	2	2	2	
	Core Team	90	170	170	170	170	
	Total	**209**	**410**	**410**	**410**	**410**	**1849**
Skill Dev	Operations And Logistics	18	18	18	18	18	
	Outreach for Cohort Selection	1.2	1.2	1.2	1.2	1.2	
	Grant to needy participants	4	4	4	4	4	

	Rewards and Certification	8	8	8	8	8	
	Core Team	50	50	50	50	50	
	Total	**81.2**	**81.2**	**81.2**	**81.2**	**81.2**	**406**

Grand Total Budget for 5 years: INR 2255 Lacs (INR 22.55 Cr)