UNIVERSITY INNOVATION CLUSTERS

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Summary

This paper examines the need for seeding, strengthening and sustaining *Innovation Clusters* in Indian Universities. Universities are acknowledged as the knowledge and innovation torch bearers globally. Indian Universities are known to produce some of the brightest minds, yet fall short of expectations when we compare ourselves on innovation intensity and innovation capital with the rest of the world.

Recognizing this, the National Innovation Council (NInC) has undertaken an effort to create *University Innovation Clusters.* This paper highlights the need for such clusters and proposes strengthening the innovation environment with *Cluster Innovation Centres.* These will spearhead multiple activities in the clusters and spur innovation activity, in their environment. The paper also introduces the *Innovation Toolkit* which will aid these innovation centres in their activities.

I.   Introduction

The National Innovation Council (NInC), under the Chairmanship of Mr Sam Pitroda, has been formed to create a roadmap for the 'Decade of Innovations 2010-2020', as declared by the Honourable President of India. NInC has initiated multiple activities to spread the message of innovation across the country and to create an *Indian Model of Innovation* [1]. At the cusp of changing priorities globally, when Western paradigms for growth and development are being revisited; redefining and refining the notion of innovation becomes imperative. Changing times present us with new problems every day; for rich and poor alike. A majority of the benefits of advancements in technology and economic growth are yet to reach millions at the bottom of the pyramid in India and across the world. The world is looking at India to lead in such inclusive innovation, which will reduce this gap. Addressing the above requires innovation to go beyond technology R&D to include new uses for existing technologies, new processes and models [1].

Among the key activities of the National Innovation Council are the creation of State and Sectoral Innovation Councils, an Inclusive Innovation Fund, a National Innovation Portal and the promotion of Industry Innovation Clusters and University Innovation Clusters. These innovation clusters will act as models, which can then be adopted by Universities across the country.

II. India's Innovation Status and Challenges

Various reports by national and international independent bodies; have indicated that although there is an abundance of innovation potential in India, it has not been exploited adequately. The CII & INSEAD Global Innovation Index Report 2009-2010 ranks India at 56 out of 132 countries overall [2]. The index measures a variety of innovation input and output parameters. On quality of educational institutions (rank 22 out of 132) and innovation ecosystem (rank 25 out of 132) India ranks relatively higher, yet, when it comes to overall innovation potential (rank 47 out of 132), knowledge application (rank 47 out of 132), knowledge creation (rank 45 out of 132), and benefits to social welfare from innovation (rank 62 out of 132), there is scope for significant improvement.

A World Bank report, Unleashing India's Innovation: Towards Sustainable and Inclusive Growth, highlights the same, showcasing the need to exploit existing knowledge and to create new knowledge towards promoting *inclusive growth* [3]. The report also details the need for strengthening innovation ecosystems with better skilled human capital, information infrastructure and finance.

III. Innovation Clusters

A *business* or *industry cluster*, as articulated by Michael Porter can take multiple forms depending on the depth and complexity, but a majority of clusters include: companies of a ready product or service of one industry or aligned industries, suppliers, financial institutions [4]. Such clusters affect competition among businesses in three ways [5]:

- By increasing productivity of the companies in the cluster
- By driving innovation in the field
- By stimulating businesses in the field

A *cluster* thus is a grouping of institutions/firms in a geographic proximity that leads to positive impact on the economy of the cluster and their growth.

An *innovation cluster* can then be defined as geographic grouping of institutions/firms which will catalyse and strengthen the innovation culture in the entire ecosystem. The focus is on innovation in products, processes, services and delivery which will in-turn enable growth and development.

While geographic proximity is a necessary condition, it is not singularly sufficient for clusters to foster innovation and thus growth. There is a need for efficient linkage and sharing mechanisms between the various actors and stakeholders in the ecosystem, including the Government and institutions

with aligned interests. There are also examples of *virtual clusters* which are doing well because of strong linkage and knowledge sharing mechanisms notwithstanding geographic distance.

Global examples of University Innovation Clusters

An oft quoted example is that of Silicon Valley, U.S.A. Stanford University played a pivotal role in the historic emergence of this cluster. Starting from Professor Frederick Terman's role in the origin of Hewlett-Packard with the mission being to create local jobs for passing graduates, the area has continuously been a fertile ground for innovators [6]. The strength of the ecosystem, apart from merit and diversity of human capital available, is the presence of professional services including lawyers, accountants and venture capitalists. Formal and informal learning and sharing through various forums of interactions is one of the significant strengths of the region [7].

Another example of University assisted innovation and growth is the Cambridge Cluster, U.K. Cambridge Consultants, an outsourced R&D provider was incorporated to *put the brains available at Cambridge University at disposal of the problems of the British Industry* [8][9]. Later the Trinity College founded the Cambridge Science Park which provided office and research space to technology start-ups. Such proactive initiatives catalysed the growth of enterprise and innovation, which leveraged the available human capital, while attracting other stakeholders to join hands and create thriving innovation ecosystems.

As can be seen from these examples, Universities have played significant roles in the growth of these geographies as centres of innovation. Such examples also exist in countries like Israel, Germany, Sweden, and Japan and more recently in China and Korea. A study of these clusters reveals that their biggest strength is co-operation and collaboration, where all actors and stakeholders are connected in symbiotic relationships. It is the aim of the NInC to create such thriving clusters in the country.

Existing Innovation Setup: Indian Universities & Other Stakeholders

<u>Technology Business Incubators (TBIs) and Science & Technology Entrepreneur Promotion</u>:

The National Science and Technology Entrepreneurship Development Board (NSTEDB) was setup to promote knowledge based and innovation driven enterprises under the Ministry of Science and Technology by the Government of India [10]. Under their aegis various activities, including setting up of Entrepreneurship Development Cells, Science & Technology Entrepreneur Parks and Technology Business Incubators, have been undertaken which have

since led to the percolation of innovation through the Indian academic and research environment. Other departments like the Department of Biotechnology have come out with various schemes which seek to promote and foster innovations in both academia and the industry.

The Start-up Culture, Entrepreneurship and Venture Capital:

Though there has been no dearth of inventiveness in India (*jugaad*), systematization of such effort leading to knowledge or business growth has not been very prevalent [11]. Over the past decade, a lot has changed in this ecosystem with the entry of venture capital (VC) institutions which actively seek to invest in next-generation enterprises. The advent of the *information age* has also led to increased awareness of innovation and entrepreneurship among the academic and business communities alike. Industry organizations like CII, FICCI, NASSCOM and others aided by efforts of institutions like TiE, IAN and others have also been responsible for spurring this activity.

Apart from private players, public financial institutions like the Small Industries Development Bank of India (SIDBI) are also actively promoting and funding initiatives which seek to further both technology driven development and social value generation.

These schemes, policies and availability of risk/investment capital create a framework for the academia to initiate, strengthen and sustain initiatives to exploit their innovation and intellectual capital.

Research Output of Indian Universities:

As seen earlier in Section II, India still fails to utilize its full potential for research and innovation. Reports have suggested a marked increase in patenting activity at a compound annual growth rate (CAGR) of 25% from 2005 to 2009 [12]. This activity is the result of few organizations in select sectors (pharma, etc.). To reach full potential, the activities have to be spread and strengthened across all sectors, and all stakeholders will need to play their parts effectively.

As seen above, various initiatives by institutions, government bodies and individuals alike have been responsible for India to scratch the surface of its innovation potential. To be able to leverage the full potential and to *diffuse* the benefits of innovation, there is a need for concrete and directed ways of connecting the *resource available* to the *need requirements* in symbiotic relationships. Having said so, there is a need for any intervention that will be initiated to focus on the second and third tier institutions to make the growth *inclusive*. It is here that the latent potential of a country as vast as India lies and has to be tapped to take it into the 'Decade of Innovations'. The following

sections, therefore, discuss efforts by the NInC towards strengthening collaboration and fostering innovations across all Indian Universities.

IV. University Innovation Clusters

Learning from global examples and aiming to enhance existing innovation activity, the University Innovation Cluster seeks to build an innovation network with multiple stakeholders like Industry, other Universities, R&D Labs and others. The University will act as the *focal* point of such a cluster and will be able to leverage:

- The technology R&D and problem solving strengths of the University
- The entrepreneurial spirit of the students and faculty
- Collaboration with local industry, NGOs and others
- The teaching and training capabilities of the University
- Infrastructure and capital available locally
- Government policy initiatives more efficiently

By doing so and by bridging demand-supply gaps, these clusters will increase knowledge exploitation while giving birth to:

- Innovations from R&D
- Innovations in business models along with products, services and delivery
- Inclusive solutions for local, regional, national and global needs
- Innovations in curriculum

Thus, a University Innovation Cluster will enable enhancements in multiple aspects of the University, while providing a better environment for innovation to flourish.

V. Strategy for creating University Innovation Clusters

The importance of education and innovation is undisputed in helping a nation become a global leader and in maintaining its leadership [13]. Taking into the account the diverse needs of people from across India, regional growth becomes the foundation for national development. An Innovation Cluster, as noted above, will be able to provide platforms and mechanisms for the actors and stakeholders in the region to interact with each other and thus foster need/opportunity based innovation.

A University in the region, being the knowledge epicentre, will naturally be able to *champion* cluster initiatives. As seen in the examples above, a University can champion a multitude of initiatives to create, exploit and

diffuse knowledge and innovations into its immediate and larger society. To be able to do so in an effective and sustainable manner, NInC proposes the creation of *Cluster Innovation Centres* in Universities. Ideally, these innovation centres will function as independent bodies inside the University and act as cross-fertilization agents between various departments/centres in the University and as a window to the other stakeholders in the cluster. This will open more doors for collaborations and explorations which will in-turn lead to solutions for regional/national/global challenges, while helping percolate the benefits of advancement in science and technology. The NInC will catalyse the creation of at least 20 such University Innovation Clusters by enabling the creation of CICs and providing support for the clusters to bear fruit and sustain.

The NInC will pilot such activity with 4 or 5 academic institutions to begin with, to draw out models for the creation of such clusters across India. The pilots will acts as models which can be replicated with adaptations and support from regional stakeholders where needed. By ensuring a mix of institutions from various streams viz. science and technology, business, agriculture, design, etc., this activity will bring out salient aspects of working in disparate sectors.

However, there is a need for appropriate performance metrics for the innovation centre. These metrics, while helping in measuring the value generated by the innovation centre, will also let competition foster between these centres. Such healthy competition should be promoted by state/central agencies or independent bodies through constitution of various incentives like awards, tax holidays, interest free risk capital, etc.

Cluster Innovation Centre (CIC)

A Cluster Innovation Centre will act as a resource, a guide and an arm of the University to foster, facilitate and further innovation culture and spirit in the University and the cluster. The CIC will act as a consultative agency to create the necessary linkages between the various actors and stakeholders in the cluster. Creating mechanisms for such interactions to happen will be one of its primary activities. These could include organizing workshops, conferences, focused group discussions, lectures, etc. while ensuring participation from University, relevant local/national Industry, research institutions, civil society and Government.

These interactions will potentially lead to sharing, licensing and/or co-development of either knowledge or specific technology between the University and interested parties. The CIC will play the role of a facilitator to spur entrepreneurial activity within the University and in the cluster. Further, the CICs can actively help identify challenges faced by the local community

through continuous interaction. These can then be placed in front of the cluster to resolve, thus leading to direct impact on society.

To safeguard the interests of all parties, it is necessary to put in place intellectual property (IP) management practices, which the CIC will spearhead. The innovation centre will also be able to dig into the repository of IP held by the University and transfer/license/commercialize these, bringing revenue to the institution.

Activities which lead to exploitation of the *innovation capital* will also require access to resources like funds, infrastructure, etc. The CIC will act as a liaison agency which will marry interested parties/agencies for these requirements. The innovation centre will for example be able to connect an entrepreneur seeking funding to a venture capitalist or connect to relevant government agencies which will provide funding for innovative technology R&D in a chosen field.

Thus, the CIC becomes the focal point for the University to be able to leverage its innovation capital and facilitate investment of this capital for growth and development of the region.

While facilitating exploitation of innovation capital, the CIC will also aid in generating the capital at the University. By being the ears and eyes of the University, the innovation centre will provide inputs gathered from various quarters (regional, national and global stakeholders) for adapting the curriculum of the University with changing needs. The CIC will be able to draw experts from the cluster network, in the form of visiting faculty, joint degree/training programmes, to aid in the process.

Further, the CIC will also stimulate faculty to constantly re-define and re-invent the education process, thus enabling the University to become more competitive both at the national and at the global level. The CIC will be instrumental in drawing out the innovation strategy and in creating roadmaps/action plans for the University.

The following is an indicative list of the activities that the CIC is envisaged to undertake:

- Entrepreneurship promotion
- IP portfolio management
- Technology transfer and commercialization
- Collaboration with: industry, other Universities, regional and national stakeholders
- Creation of knowledge sharing mechanisms inside the University

- Training and mentoring
- Innovation in curriculum
- Innovation awareness and outreach
- University innovation strategy and roadmap

The CIC will thus be the *focal* point of the University Innovation Cluster.

Performance Metrics

The following is a non-exhaustive list of items which can be used to measure the performance of and to evaluate a CIC:

- Patents: Applied for and granted
- Research publications
- University spin-offs
- Businesses incubated and success rate
- Average year-on-year growth of incubated start-ups
- Extent or measure of industry collaboration
- Revenue generated through technology licensing
- Curriculum innovation initiatives
- Recognitions and awards received

A weighted sum of the above will form a reasonable indication of the *innovation capital impact* of the innovation centre.

The Innovation Toolkit

The Innovation Toolkit is intended to act as a guide and a handbook to the CICs and innovators alike. While the CIC will act as the nodal centre for the activities of the University Innovation Cluster, there is also a requirement for both literary and handy resources which help them function. Resources like best practises and case studies, policy and regulation guidelines, latest news, etc. will be needed by the CICs to effectively initiate and manage their activities.

Literature on best practices and case studies from across the globe and noted experts will act as a resource aiding the CICs and innovators streamline activities. This will help first-timers and practitioners reap benefits of the knowledge accumulated over the years by peers worldwide.

There are various policies and schemes floated by governments, affiliated agencies and developmental agencies of the United Nations (UN), World Bank, etc. relevant to Universities. Staying abreast of the latest will help the

CIC plan their projects/tasks to avail the benefits offered. Guidelines to be followed for various actions like IP protection, company registration, applying for grants/funding, etc. will also be at ready disposal. Additionally, a listing of various events, conferences and competitions will be made available.

Various kinds of templates for related activities viz. patent applications, business plan templates, project proposal templates, management tools, etc. will be of immense help and will be part of the Toolkit.

One of the key components of the Toolkit will be directories of regional/national/global professional services, institutions and experts. This list, with relevant contact information, will provide easy accessibility, thus opening doors for collaboration between organizations and individuals both regional and otherwise.

Thus, the Innovation Toolkit will be an online repository of:

- Best practices and case studies
- Guidelines and policies
- Event notifications
- Resources and expert directories
- Documentation templates and tools

The toolkit will primarily be available in online form and periodic print versions may also be made available. The print versions could be tailored to specific users and thus provide comprehensive information handbooks.

The nature of the information available in the toolkit is susceptible to change with time making it an evolving/adapting repository. The items being covered in the toolkit, along with changing policies, needs and with generation of new approaches, will need to be constantly moderated and updated.

To be able to gather quality information and ensure information sustainability, NInC will actively partner with relevant agencies/organizations/individuals of repute. They will form formal and informal *feeding* mechanisms to the Innovation Toolkit and will help keep the content relevant to the larger audience of academia and innovators.

VI.   Conclusion

A small yet significant number of cells/bodies which carry out one or more activities, among those listed as typical of an CIC; exist in Indian Universities [14]. Yet, these have to be expanded in scope to perform the full function of an

CIC. Alternatively, multiple cells can also be constituted by the University to perform fully the activities of an CIC.

It is our belief that a large number of such CICs, tailored to the specific needs and strengths of the cluster, supported by sustenance mechanisms and promoted constantly by incentives hold the key for future growth. Localizing the context for these innovations significantly, we believe, will lead to *frugal* utilization of resources and capital while deriving maximum benefit and create *inclusive growth.*

VII. References

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