

Fostering Growth Through Bioclusters

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The state governments are contributing their bit towards developing the biotechnology industry in cities having strength and potential but there are a few missing elements. Once everything is in place, with the coordinated efforts of all industry stakeholders, India will have many bioclusters.

The United Nations Industrial Development Organization (UNIDO) has identified about 388 clusters in India in various sectors from textile to chemicals and pharmaceuticals to food processing. Of these 11 clusters are situated at Cuttack in Orissa, Hyderabad in Andhra Pradesh, Indore in Madhya Pradesh, Thane, Pune, Aurangabad and Mumbai in Maharashtra, Margao in Goa, Valsad/Bharuch, Baroda and Ahmedabad in Gujarat, all dedicated to pharmaceuticals. These clusters are into bulk/basic drugs manufacturing.

The Minnesota Biomedical and Bioscience Network has prepared a list of the life sciences and biotechnology clusters of the world in which it has included Bangalore, Hyderabad and New Delhi as clusters along with New York/New Jersey, Philadelphia, Baltimore/Washington, DC, Research Triangle NC of the US.

Considering all this, the definition of cluster does not remain the same in the present day context. In his classic work on "The Competitive Advantage of Nations (1990)", Michael Porter, a Bishop William Lawrence University professor, based at Harvard Business School introduced the word a cluster as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" where, the "value of the

system as a whole is greater than the sum of its parts".

The changing economics that have become more complex and competitive, evolving business practices have recognized the advantages of locating firms, sectors or industries near each other or near supply sources. Considering these changes, a cluster can be defined as "a geographic concentration of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also co-operate." The Silicon Valley in the US is perhaps the best-known example of a cluster, but there are many other examples in different regions and sectors.

Relevance of Clusters

Clusters are particularly important in knowledge-based sectors like biotechnology, medical biosciences, life sciences, and information technology, despite the trend towards globalization arising from rapid advances in transport and communication and accessible global markets. This is because the type of knowledge that creates competitive advantage often requires proximity or regular face-to-face interactions and trust in order to be effectively communicated.

Earlier studies and analysis demonstrate that clusters can raise innovation and productivity in a number of ways. Companies benefit from sharing knowledge about best practice and reduce costs by jointly sourcing services and suppliers. Frequent interactions facilitate formal and informal knowledge transfer and encourage the formation and efficiency of collaboration between institutions with complementary assets and skills. The critical mass effect attracts further companies, investors, services, and suppliers into the cluster, as well as creating a pool of skilled labor. Local training institutions and infrastructure can provide further benefits for companies. Rivalry between firms can stimulate competitiveness and encourage constant upgrading. Many of these benefits are likely to be more important for SMEs than for larger companies that are more able to capture them internally.

Indian BioClustering definitely has relevance for the Indian biotechnology industry, which has just started moving up the growth ladder.

Rajesh Jain, joint managing director, Panacea Biotec said, "Bioclusters would work in India. Such bioclusters will be successful, provided a close interdisciplinary strategy is adopted by cohesive interactions between excellent innovative science and entrepreneur spirit of business leaders and industry friendly policy of the government. The success of bioclusters will not only result in improving the economic development of the country or marking India a global "hub" of biotechnology, it will also generate excellent job opportunities."

Sharing similar views, Vibhav Garg, principal-business development, Mascon Life Sciences said, "Bioclustering is a good way of looking at the scattered expertise and experience, which could be complementary to each other, under one roof. This approach is already bearing fruits for rest of the world. I do not see any reason why it will not work in India. The approach is certainly going to benefit the industry and the country as complementary nature of the organizations in a given biocluster will bear fruits for all and hence it will be a win-win for one and all."

Rajesh Jain further said, "Bioclusters in terms of development of biotechnology industry have already grown unintentionally as clusters. These clusters are mainly located in the states of Andhra Pradesh, Maharashtra, Karnataka and Delhi. The respective government policies and scientific ambiances have been responsible for the growth of such clusters. A recent example is a cluster of biotechnology and pharmaceutical ventures at Baddi in Himachal Pradesh."

Green represents biotechnology and life sciences clusters.

Indian BioClusters

What Bangalore needs:

- A clinical academic center
- A technology development center, a technology management center and a technology transfer center.

What Delhi needs:

- The capital city has excellent scientific institutions but it lacks greater concentration of biotech industries and a biotech park

What's lacking in Hyderabad and Pune:

- Parts of the cluster in both the cities are weak

What's on the anvil:

- A molecular medicine unit and a translational and clinical research center at CMC Vellore.
- Stem cell center at CMC Vellore.
- Translational research center at NCBS, Bangalore.
- Stem cell cluster in Bangalore which will consist of IISc, NCBS, Manipal Hospital, CMC Vellore and a local company.
- Stem cell cluster in Hyderabad.
- Agribiotech cluster in Punjab.
- World-class undergraduate course in life sciences.
- Translational research institute at Gurgaon.

However, Alok Gupta, country head, life sciences & biotechnology, YES Bank Ltd has different views on this. He said, "The cluster concept in India is still at a nascent stage. I personally feel an area can evolve as a meaningful cluster over a period of 10-15 years. It is premature to say when bioclusters like Research Triangle, Boston, Cambridge and the East England, San Francisco Bay will happen in India. Considering the present biotechnology industry growth in cities like Bangalore, Hyderabad, Pune, Chennai and Delhi, we can say that these cities will emerge as successful bioclusters. But one can see in all these cities one or the other missing factors like availability of capital and regular regional networking for free flow of information. If these things will be in place, then in next 5-10 years these cities will become one of the successful clusters in the world."

Meanwhile the state and central governments have been taking many initiatives to support the biotechnology industry through developing biotech parks, policy initiatives, and announcing incentive packages. "There are some issues that are not in the hands of the governments towards cluster development. It will happen with the involvement and initiatives from all the stakeholders like the suppliers, the scientific community, venture capitalists, government agencies and organizations, individuals and regional networking associations," added Alok Gupta.

Cluster formation is influenced by historical antecedents and the process of building on existing strengths. It takes many years to develop a cluster as factors like exploitation of the research base (covering a strong science base and entrepreneurial culture), company development (covering the ability to attract key staff, supportive physical and transport infrastructure, availability of finance, business support services and large companies, and a skilled workforce), and government support for cluster development (effective networks, and government support at regional and national level) are involved in it.

Besides all these factors, there are other elements also which matter for the success of a cluster. International research has revealed a number of the most important success factors to support regional growth in biotechnology. The factors include strong government leadership, a strong bioscience research base, a strong entrepreneurial environment, a feeder layer of growing companies, clustering around research institutions and between companies, ability to attract key staff either through "natural" attractions or government facilitation, availability of venture capital or other finance, well-funded and accessible infrastructure, good formal and informal networks.

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Rajesh Jain, joint managing director, Panacea Biotec, said, "Bioclusters would work in India. Such bioclusters will be successful, provided a close interdisciplinary strategy is adopted by cohesive interactions between excellent innovative science and entrepreneur spirit of business leaders and industry-friendly policy of the government."

And there is no shortcut for success. One has to wait to taste the fruits of success. According to Rajesh Jain of Panacea Biotec, pools of human capitals with capacity of fulfilling biotechnology technical and operational requirements are the fundamental building blocks for viable bioclusters. Locations that have national research center(s), universities and excellent medical hospital facilities would be ideal for business leaders to set up production and R&D ventures. Such locations may also have a set-up for bioservices facilities like top quality animal houses, pre-clinical testing of molecules and facilities to monitor clinical/field trials. Access to financial market and access to market and suppliers would be essential ingredients for a successful biocluster. The clusters may encompass broadly all disciplines of biotechnology.

Considering the importance and benefits a cluster can provide, governments are working towards developing cities where potential and strength lies.

At present they are still at the biotech center stage as rightly pointed out by Dr MK Bhan, secretary, Department of Biotechnology (DBT). With opportunities opening up in many areas like proteomics, genomics and drug discovery, India can look at developing specific clusters.

On this, Vibhav Garg of Mascon Life Sciences said, "There should be a concerted effort to develop niche clusters like genomics, proteomics. Clusters in India can take shape based on the need or profile/expertise/complementarities. For example if a cluster namely "Drug Discovery and Design" is made, the organizations that understand this business area and are confident of offering the solutions in this field, can be kept in the cluster, while the companies looking for these services should be allowed to join the cluster as guest member."

However, Rajesh Jain has different views on the need for developing niche clusters. He said, "Specialized areas like genomics and proteomics as clusters may not succeed as bio-venture because of lack of available innovative and talented scientific manpower and appropriate per se availability of markets for these disciplines. Such disciplines form part and parcel of modern era of biotechnology and biosciences. One may also consider the bioclusters models that exist across Europe and North America e.g., Cambridge, Oxford, Boston, or Ontario. These clusters have helped in tremendous growth of various start-ups."

Approach towards cluster development

As pointed out by the industry, governments can support and facilitate cluster development in a variety of ways. The governments can create the conditions that encourage the formation and growth of clusters. This can mean, for example, ensuring both national and regional policies do not inadvertently place barriers to cluster development, catalyzing the formation of social interactions and collaborations within a cluster, and ensuring research and innovation support programs build on existing strengths so as to work with the gain of cluster development.

The regulatory and fiscal framework provides incentives that influence company formation and growth within clusters. Innovation and technology transfer support schemes can help to build on strengths. The programs initiated by the DBT like setting up of animal facility, stem cell center, incubation facilities and reengineering the existing institutions would help in the development of bioclusters in places like Bangalore, Hyderabad, Delhi and Punjab.

Cluster Facts

Clusters are a geographically proximate group of interconnected companies and associated institutions in a particular field, including product producers, service providers, suppliers, universities, and trade associations.

Benefits of Clusters

- Raise innovation and productivity
- Help in sharing knowledge about best practices
- Reduce costs by jointly sourcing services and suppliers
- Interactions facilitate formal and informal knowledge transfer
- Encourage formation and efficiency of collaboration between institutions with complementary assets and skills

Factors encouraging cluster development

Strong science base: Leading research organizations, University departments, hospitals/medical schools and charities, critical mass of researchers, leading scientist(s).

Entrepreneurial culture: Commercial awareness and entrepreneurship in universities and research institutes, role models and recognition of entrepreneurs, second generation entrepreneurs.

Growing company base: Thriving spinout and start-up companies. More mature "role model" companies.

Ability to attract key staff: Critical mass of employment opportunities, image/reputation as biotechnology cluster, attractive place to live.

Premises and infrastructure: Incubators available close to research organizations. Premises with wet labs and flexible leasing arrangements, space to expand, good transport links—motorways, rail and international airport.

Availability of finance: Venture capitalists, business angels.

Business support services and large companies: Specialist business, legal, patent, recruitment, property advisors. Large companies in related sectors (healthcare, chemical, agrifood).

Skilled workforce: Skilled workforce, training courses at all levels.

Effective networking: Shared aspiration to be a cluster, regional trade associations, shared equipment and infrastructure, frequent collaborations

Supportive policy environment: National and sectoral innovation support policies, proportionate fiscal and regulatory framework, support from regional development agencies and other economic development agencies, planning authorities.

Source: Department of Trade and Industry, Government of the UK.

Besides, the government can also play a role in catalyzing the development of networking activities and regional biotechnology organizations. This is a missing factor as far as India is concerned. A full-fledged cluster requires effective

networks which allow a rapid flow of information and are able to engage the participation of all those with a stake in biotechnology. The success of a cluster depends on the extent and depth of interactions between constituent members.

In India, we have organizations like the Association of Biotechnology Led Enterprises (ABLE), Association of Diagnostic Manufacturers of India (ADMI), Association of Contract Research Organizations (ACRO), Indian Society for Clinical Research (ISCR), All India Crop Biotechnology Associations (AICBA) and All India Biotech Association (AIBA) working for the growth of the biotechnology industry. Most of these are focused on specific sectors and few of them have regional chapters. We don't have regional associations on the lines of Eastern Region Biotechnology Initiative (ERBI) (Cambridge), Southern BioScience (Surrey), Oxfordshire BioLink (Oxford), BioScience York (York), or Scottish Enterprise activities (Scotland) that have been influential in fostering networking and facilitating a co-operative environment in the UK and in other countries like the US and Germany.

Leading Life Sciences Clusters

North America

- Seattle, USA
- San Francisco, USA
- Los Angeles, USA
- San Diego, USA
- Saskatoon, Canada
- Minneapolis/St. Paul, USA
- Austin, USA
- Toronto, Canada
- Montreal, Canada
- Boston, USA
- New York/New Jersey, USA
- Philadelphia, USA
- Baltimore/Washington, DC
- Research Triangle NC, USA

South America

- Belo Horizonte/Rio de Janeiro
- Sao Paulo, Brazil

Continental Europe

- Brussels, Belgium
- Medicon Valley, Denmark/Sweden
- Stockholm/Uppsala, Sweden
- Helsinki, Finland
- Paris, France
- Biovalley, France/Germany/Switzerland
- BioAlps, France/Switzerland
- Sophia-Antipolis, France
- BioRhine, Germany
- BioTech Munich, Germany
- BioCon Valley, Germany

United Kingdom/Ireland

- Glasgow-Edinburgh, Scotland
- Manchester-Liverpool, England
- Cambridge, SE England
- Dublin, Republic of Ireland

Mid-East

- Israel

Africa

- Capetown, South Africa

Asia-Pacific

- Beijing, China
- Shanghai, China
- Hong Kong, China
- Tokyo-Kanto, Japan
- Kansai, Japan
- Hokkaido, Japan
- Taipei, Taiwan
- Hsinchu, Taiwan
- Singapore
- Dengkil, Malaysia
- New Delhi, India

Source: MBB India/Networking Associations, key individuals can also contribute a lot for the development of a cluster. In this regard, Dr. Swati Piramal (regarding Dr. Swati Piramal) of Nicholas Piramal initiated a move by launching "Maharashtra Bio Yatra" in Mumbai a couple of years back with the support of the Confederation of Indian Industry (CII). But there is no regular and much activity to mention.

Conversely, in the absence of such a network and key individuals/ cluster champions, the level of interaction among the stakeholders of a cluster will be relatively modest or even nil. Hence the members of the cluster are often not aware of the local opportunities for premises, skills and complementary expertise.

Feels Vibhav Garg, "Some nationalized agency (either public or private or co-operative) should take initiative to first design the clustering approach. Then cluster classification could be the next step followed by the individual organizations joining the cluster."

As noted by Alok Gupta, clusters should be business driven and they should be formed due to a variety of reasons, e.g. specialized demand, prior existence of related industries or institutions, or historical antecedent.

The quality of life and other non-economic factors can be equally important in determining growth. Clusters arise from making the most of synergies across and between companies and academic and research based institutions.

Added Rajesh Jain, "The government has to take initiatives in terms of providing attractive concessions and designing a proper strategy keeping in mind the goals and priority of biocluster. It would be the first step to move forward. Biobusiness leaders have also to provide a firm commitment to set up bioventures in a biocluster."

The government may consider launching special programs like biotech cluster innovative program, where R&D centers set up by the industry could be supported by providing competitive research grants with specific objectives tuned to economic development of the country and alleviate human sufferings.

Sustainability of a start-up by appropriate financial assistance by government and financial institutes would be essential. The government and biobusiness leaders could set up business innovators incubator(s) jointly, so as to fine-tune the excellent leads generated by the scientific pools in the universities or research centers. The bioservices units that are set up in cluster should have appropriate accreditation.

The fundamental bottlenecks would be unavailability of highly technical and qualified innovative scientific pool, inappropriate infrastructure and unavailability of financial assistance for early stage developments. Nevertheless, serious efforts in this direction would result in establishing bioclusters in the country.

It is not only the government but also all the individual stakeholders such as suppliers, venture capitalists, universities, research organizations, service providers, networking associations and cluster champions who need to support the development of bioclusters in India.

Narayan Kulkarni and
Rolly Dureha