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Dimensions of Regional Processes in the Asia-Pacific Region

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Contents

Part 3. Risks & Challenges

Introduction

Asia and Pacific's growing importance to the rest of the world is widely acknowledged today. The dynamics of Asian economic development have tremendously impacted global trade relationships and regional cooperation. Thus, it is with great pleasure that we deliver another volume of Research Papers on Asia-Pacific economic issues.

This year we present 19 papers by various authors who examine the Asia-Pacific region from different perspectives. We decided to group them into 3 Chapters:

- Cooperation and trade
- Economy and policy
- Risks & challenges

Papers grouped in the First Chapter describe newly emerging regional trade architecture. You will find there a few analyses of general nature and regional scope (J. Dudziński, A. H. Jankowiak, E. Majchrowska) and some studies on specific trade agreements (A. Klimek writes about Shanghai Free Trade Zone, A. McCaleb and G. Heiduk try to find out what motivates China's cities to establish partner agreements with cities in Asia, B. Michalski analysing U.S.-Republic of Korea Free Trade Agreement, while M. Maciejewski and W. Zysk look for opportunities for Polish exports in the trade agreement between EU and Vietnam).

The Second Chapter is the most diverse one. It is devoted mostly to economic policy issues (including financial sector). S. Bobowski, L. Zyblikiewicz and K. Żukrowska look at the main threads in Asian regionalism. P. Pasierbiak and K. Łopacińska analyse the movements of Chinese capital. M. Dziembała and S. Mazurek deal with the subject of innovation supporting growth and development.

Articles in the Third Chapter are focused on extraordinary events influencing economies and development of the Asia-Pacific region. J. Pera prepared an assessment of risk of APEC countries, based on the country risk classification method and selected indexes of internal stability. A. Kukułka and B. Totleben analyse the impact of natural disasters on gross capital formation in Southeastern Asia. Finally, T. Serwach and M. Grabowski and S. Wyciślak deal with synchronization of business cycles and contagion of crises.

We sincerely hope that all the articles will be of great value to those who want to understand the role of Asia-Pacific economies in the global economy. Through various interests of authors, our volume provides a valuable insight into the problems of this region.

All the papers where submitted for the 8th international scientific conference "Dimensions of Regional Processes in the Asia- Pacific Region" which took place in

November 2015 at Wroclaw University of Economics, under the patronage of Polish Ministry of Foreign Affairs, Ministry of Science and Higher Education and the Ministry of Economy.

We appreciate your time and consideration, and we look forward to the submission of your own good work. We also appreciate the time and effort of our peer reviewers. Thank you!

Bogusława Drelich-Skulska, *Anna H. Jankowiak*, *Szymon Mazurek*

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Dimensions of Regional Processes in the Asia-Pacific Region

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INNOVATION NETWORKS & CLUSTERS OF INDIA

SIECI I KLASTRY INNOWACJI W INDIACH

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Summary: A coherent government's innovation policy is a completely new phenomenon in India. Its formulation is a part of a broader programme designed to develop the economy in India, called Decade of Innovation 2010-2020. Using patterns of developed countries, Indian government intends to base its innovation policy on clusters, where the kernel will be the scientific research institutions. The emergence of such clusters is to be initiated by the Cluster Innovation Centres. The activity of the CICs is to be addressed, both, directly to the business (Industry Innovation Clusters), and to the education sector (University Innovation Clusters).

Keywords: India, innovation, networks, clusters, innovation and cluster policy.

Streszczenie: Spójna rządowa polityka innowacyjna jest w Indiach zjawiskiem zupełnie nowym. Sformułowanie jej założeń jest częścią szerszego programu (nazwanego Dekadą Innowacji 2010-2020) mającego na celu rozwój gospodarki Indii. Naśladując kraje rozwinięte, rząd Indii chce oprzeć politykę innowacyjną na klastrach, których jądrem będą instytucje naukowo-badawcze. Instytucjami inicjującymi klastry będą Klastrowe Centra Innowacyjne (ang. *Cluster Innovation Centres*). Ich aktywność ma służyć zarówno biznesowi (w formie Branżowych Klastrów Innowacyjności (ang. *Industry Innovation Clusters*)), jak i sektorowi edukacyjnemu (Uniwersyteckie Klastry Innowacyjności (ang. *University Innovation Clusters*).

Słowa kluczowe: Indie, innowacje, sieci, klastry, polityka innowacyjna i klastrowa.

1. Introduction

A coherent government's innovation policy is, *per se*, a completely new phenomenon in India. Its formulation is a part of a broader programme designed to develop the economy in India. This programme is promoted as Decade of Innovation 2010-2020. Indian government intends to base the innovation policy on clusters, where the kernel will be the scientific research institutions. This is to lead to the creation of two cluster programmes such as Industry Innovation Clusters and University Innovation Clusters.

2. Institutional context

The administrative system and structure of authorities in India are complicated. India is a federal republic consisting of 28 states, 6 union territories and a National Capital Territory of Delhi [Bożyk and Grzybowski (eds.) 2012, p. 506]. The executive power is vested in the hands of the Prime Minister (most often it is the leader of the majority party[1]) and the Council of Ministers. The President serves the representative function (similarly to the Governors of States appointed by the President). In the individual states, the executive power is exercised by the state governments under the leadership of the Chief Ministers, who, similarly to the Prime Minister, are the leaders of the majority parties at the state level. Only in the union territories, the power is exercised directly by the representatives of the Federal Government (e.g. Delhi or Pondichery).

When analysing the structure of the central government, what draws a particular attention is that a huge number of its members are in the rank of ministers. The government of the incumbent Prime Minister Narendra Modi consists of 26 cabinet ministers, 13 independent ministers and 26 ministers of state [Office of the Prime Minister of India 2015]. The powers of the individual ministries are often very fragmentary (e.g. the textile industry, mines or small and medium-sized enterprises have separate ministers), which does not at all contribute to their clear separation. On the contrary, the powers of the individual ministers sometimes overlap very clearly.

At the state level, the situation is not better. The governmental structure of the individual states does not reflect the federal structure, and as a result the composition of the governments and the distribution of powers at the regional level creates a giant patchwork across the whole country. If we add to this a huge number of specialized offices and government agencies with unique names (sometimes in the form of companies), performing many tasks at various administrative levels, it is easy to become sceptical as to India's ability to create a coherent, long-term and consistent economic policy throughout the entire country.

As for the innovation policy at the central government level, it is possible to find documents drafting a general vision and directions of development. However, adopting them into economic practice through the complicated filter of ministries as well as central and state offices, gives rise to a huge number of uncoordinated, independent and fragmentary programmes.

3. Historical context

Due to the previously mentioned fragmentation of the Indian economic policy and the lack of common denominator for its individual aspects, it is difficult to describe, in a meaningful way, the historical context of the whole innovation policy in this country. Still, it is worth emphasizing several processes which have significantly affected the current situation of India in this respect.

[1] India has more than a hundred political parties, including national, regional and local ones.

Two periods had been distinguished in the economic history of India, after gaining independence in 1947, that have a dividing point at the turn of the 1980s and 1990s. The symbol of the first period is Jawaharlala Nehru, the first Prime Minister of India, who held the office until his death in 1964. The second period was started along with the economic problems at the beginning of the 1990s and runs under the motto of privatisation and liberalisation.

Combination of the socialist economy with a democratic political system was one of the fundamental principles of the policy in the times of Nehru. The economic policy was based on the central planning, which was manifested by the successive five-year plans. According to their objectives, the industrial development was to be based on the public sector and, above all, on large state-owned enterprises in the heavy industry.

Interestingly, despite obvious imitation of the solutions adopted in the Soviet Union, India has never sought to completely replace the market with the activities of the state (which was a result of adopting the democratic system). Instead, the government of India, not eliminating the private sector, had subordinated it (along with the public sector) to a specific system of permits and licenses called the License Raj (or Permit Raj). This system was supposed to enable achievement of all the assumptions of the Nehru's vision [Holmström 2000]:

- creation of a democratic and pluralistic version of the socialist economy,
- rapid economic development based on massive investment in the infrastructure and heavy industry,
- protection of the internal market,
- reducing the excessive growth of the state-owned companies, and further, providing support for the development of the private sector,
- taking care of workplaces in small companies and in rural areas,
- providing welfare to the largest possible groups of citizens.

In the Licence Raj system, the licences were granted in three main areas of the business activity, such as investment, production and imports. It was the state who decided what sources of financing to provide for the investment, who is to produce and what products, and at what price, to sell. Therefore, the energy of the companies was not really focused on improving the operational efficiency or technological development, but rather on acquiring appropriate licences from the representatives of the excessively expanded government bureaucracy (in extreme cases, start of the production could mean the need to obtain permits from 80 institutions [BBC 1998]). The competitive fight was brought down to obtaining a licence to start production of goods that had not yet been produced in the country, and taking care that no-one else was granted such a licence [Krishnan 2010, pp. 68-69].

Further, Nehru's vision comprised modernisation of the state through creation of a strong educational and scientific research sector. A great emphasis was placed on these issues in the five-year plans, which resulted in establishment of many higher education institutions, a network of scientific research laboratories and centres of

excellence [Bijlani 2010]. The network of the Indian Institutes of Technology (IITs), in which professors from the West were teaching, was to provide the industry with the well-educated staff, but had not entirely fulfilled these expectations. The greatest technological achievement of this period was the creation of the Indian nuclear programme and the space programme.

Although the effectiveness of the education and research sector from the Nehru times can be rated in various ways, it must be recognized that the increased emphasis on development of human resources produced visible results several decades later. When considering the current situation of India and the innovation policy, one must appreciate the base for further development, which were and still are well-educated people and an extensive network of the scientific institutions.

Another period, important for India's economic development, was started in the early 1990s. The collapse of the Soviet Union, India's main trading partner, and the war in the Persian Gulf in 1990, resulting in a sharp increase of oil prices, brought an acute crisis to the Indian balance of payments. This was the direct cause to start the package of radical economic reforms by the Finance Minister (and later Prime Minister) Manmohan Singh[2]. They consisted of, inter alia, the privatization of a large number of state-owned enterprises, reducing the number of legal instruments governing the business activity, opening up to direct foreign investment and liberalisation of the foreign exchange market. The Licence Raj system was removed, therefore, at present, the vast majority of the production activity does not require obtaining licences, and foreign investments are approved almost automatically.

Following R.T. Krishnan [2010, p. 72], it is worth noting that in addition to deregulation, the authorities were also interested in the innovation development aspect (which, in a sense, can be regarded a continuation of the modern India's vision by Nehru). On the 24th of July 1991, the government of India announced The Industrial Policy Statement, in which one of the objectives of the economic policy had been formulated as "injecting the desired level of technological dynamism in Indian industry" [Government of India 1991, p. 6] and another one as development of "indigenous competence for the efficient absorption of foreign technology" [p. 6]. The document also expressed hope that the competitive pressure would force the companies to increased, compared to the past, investments in research and development.

Finally, although the reforms had not been carried out fully and consistently, they have brought a clear result. In India, the elements of the centrally controlled economy are still noticeable, especially when analysing the institutional structure of the country, which consists of hundreds, if not thousands of (central and state) offices, agencies and government institutions dealing with the countless number of programs

[2] However, some authors believe that the reforms had been initiated earlier, because already in the early 1980s, and in 1990s they had only grown in strength. Thus, the transition from the system of central planning to the liberal economy gains on liquidity [Singh 2007].

and tasks. In addition, the state has control over a group of more than 500 large enterprises, whose total value is estimated at USD 500 billion, which is ca. 30 percent of the Indian GDP. This is, inter alia, the need to cover the loss of the state-owned enterprises, that causes high debt of the public sector, reaching 70 percent of GDP. Foreign investors still have very limited access to certain sectors of the economy in India. First and foremost, these are retail chains and those trading in shares on the Indian stock exchange [Brzozowski 2012].

Nevertheless, within 20 years, India has transformed from the world straggler to a country much more open to the world, focused on international cooperation and economic development. The result of the reforming efforts could have been probably much better if a coherent and comprehensive concept of economy functioning had been designed and implemented at an appropriate stage. However, no such approach had been adopted, which today is a rather permanent feature of the Indian approach to the role of the state in the economy. Nevertheless, the Indian economy in the recent years, is one of the fastest growing in the world, and its advantages are primarily dynamic entrepreneurs and a huge group of highly skilled engineers and scientists [Dahlman and Anuja 2005].

4. Socio-economic context

The socio-economic context of the economic policy (including an innovation policy) in India is very heterogeneous. This is probably just one of the factors that cause the fragmentation of the economic political programmes. The economic environment is differentiated to the extent that it is not possible to indicate a single dominant business system that would be the point of reference for both the authorities and the entrepreneurs.

Following M. Holmström [2000], 3 dichotomies that shape the business space in India can be indicated:

1. Urban space vs rural areas;
2. Public sphere vs private sphere;
3. Large companies vs. small companies.

Although these divisions are not explicit and may seem to be stereotyped, they are a good starting point for the analysis of the economic space in India that is diverse, variable and full of contradictions.

4.1. Urban space and rural areas

Traditionally, the urban space is in socio-economic opposition to the rural area, which is mainly agricultural. It differs in the style of life and way of management. Although, the boundaries between both spaces are not strict and precise, there are clear differences. The urban – rural conflict is in a sense stereotyped, but it is not possible to escape from such distinction when formulating the economic policy and

running business. The situation in each of these sectors, whether it is from the perspective of the public intervention, or the perspective of the investors, is completely different.

For India, a country with large surface area, large population and rapid economic growth, the processes taking place at the interface of the two spaces are one of the main determinants of the economic policy and development. On the one hand, we have large agglomerations with developed industry, which attract foreign investors as effectively as the residents of the surrounding areas with lower degree of urbanization. This leads to overpopulation, increase in the price of land, energy, water and other media, and other problems arising from rapid growth of population in large cities. Further, the economic development of the agglomeration does not automatically cause spread of the positive effects on the region. What is more, the noticeable difference in the level of life and level of development strengthens the conviction of the benefits arising from the migration and attracts more residents of the countryside.

This situation forces the authorities to focus economic policy on the development of the rural areas. A number of factors supports it. Firstly, it may seem that large agglomerations tend to do well by themselves and do not need additional support, just as their residents. Secondly, the increase in prices on the local market raises the costs of the government support (for example, allocating expensive land for investment or economic zones ceases to be cost-effective). Thirdly, balancing the level of regional development is to stop the deepening of problems that result from the rapid and uncontrolled migration. At a certain stage of agglomeration development, such a way of thinking of the authorities, begins to coincide with the expectations of the business. Entrepreneurs also notice the increasing costs (and other problems) and begin to eagerly invest in the non-urban areas, which, although they offer cheap labour and cheap land, often do not have adequate infrastructure and training centres.

4.2. Public sphere vs private sphere

For historical reasons, as mentioned earlier, the public sector in India is very large and influential, starting from the expanded bureaucracy in the offices, through the countless number of agencies of the central and state governments (often in the form of companies having interesting names), the educational system, the banking sector and finishing with the heavy industry. For many years, successive governments have tried, without giving up the idea of state's participation in the economy, to change its character. With various results, there have been attempts to make the state-owned enterprises more open to the market, more competitive and profitable. Positive changes have gained momentum after the economic reforms of the 1990s, but some companies still face problems characteristic of the state-owned enterprises all over the world, such as nepotism, political connections or ineffectiveness.

From the perspective of the effectiveness of the economic policy, it is important that a huge number of governmental institutions of various nature and diversified (sometimes overlapping) competences function in the socio-economic space. Some of them (especially at the level of the central government, but also at the level of state government) deal with the formulation of the political objectives, and some of them deal with implementation of finished instruments. The wealth of initiatives and responsible entities is not conductive to creating a coherent and complete programmes based on a clear vision of development.

4.3. Large and small companies

The economic policy of India, since gaining independence, actually until the present day, has maintained a clear division between large and smaller companies. Small market players have always been protected against the large ones, although, of course, there has also been the space for the powerful state-owned enterprises. The status quo has been maintained through a complex system of licences and support for small entities in the form of a wide range of subsidies, preferential loans and additional services. It perfectly inscribed in the assumptions of the idealistic economy, centrally planned in the Indian version, where the state had effectively created the economic reality. In the "small scale"[3] sector, microenterprises and quasi-enterprises have been usually distinguished, traditionally operating in rural areas, which, as mentioned earlier, usually have not taken a specific legal form (the so-called cottage industries).

At the turn of the centuries, in both groups of enterprises there have been significant changes. Firstly, the number of small companies has grown rapidly. In 1980, there were 875 000 such companies in India, in 1996, as much as 28 million [Clara et al. 2000, p. 4]. Secondly, the transnational corporations have started to play an increasingly important role in the Indian economy.

The cooperation of large and small entities (especially if we have foreign capital on the one side, and on the other – local companies with low level of development) can significantly affect the economic development of the country. The business relationship between the representatives of these two groups can move towards independence, dependence or interdependence [Holmström 2000]. If the product is simple, its production technology not too complicated, and consumers are on the local market, a small company can cope with the value chain of such goods on its own. A small company can also function on the market as a supplier of parts or components, carrying out single, but sometimes repetitive orders from different (small and large) clients. It is also possible to have a long-term cooperation with a

[3] In some Indian scientific publications, and sometimes in the government documents, it is possible to find the concept of *small-scale industries* (SSI), which is equivalent to the commonly used in the West *small and medium-sized enterprises* (SMEs).

stable partner (most commonly a transnational corporation), which means the inclusion of an enterprise in a larger value chain.

Each of these variants provides the opportunity to develop, gain experience, and also potentially to create innovation. However, it is worth noting that in the absence of the national know-how, actually only the last one may bring an additional effect in the form of natural transfer of knowledge from abroad. In India, this process is particularly noticeable in the ICT sector, where the native entities are getting stronger, while in the global marketplace there are several TNCs of the Indian origin.

However, in India, the cooperation of both: small companies with the large ones and small companies between themselves, is problematic. The main inhibiting factor is lack of trust [Holmström 2000]. In this respect, the business in India sometimes resembles the jungle, where the trust is limited only to the nearest circle of relatives and friends, and the business community integrates around a common religion or caste [Knorringa 1994, pp. 71-83]. Fierce competition, in conjunction with social or religious divisions, makes the Indian entrepreneurs cautious in sharing information and establishing long-term forms of cooperation.

Thus, it is necessary to incorporate instruments in the economic policy which support the creation of good cooperation mechanisms, which will result in establishing consortia or companies offering local entrepreneurs the opportunity to participate in a larger market.

5. New innovation policy with the use of Cluster Innovation Centres

The origins of the innovation system (in a limited scope), as well as the sources of India's success on the IT market, can be found already in Nehru's economic policy. Under his leadership, India had built economic policy of 1950's based on the central planning concept (referred to earlier). The industrial development was based on the public sector and the so-called "national champions", the key enterprises from the heavy industry sector. It was believed that only the state would be able to cope with the burden of the capital-consuming risky investments. The role of the state was also important because of the need to transfer technology from abroad, and the Soviet Union was the main partner at that time. For obvious reasons, the public sector had not fulfilled hopes placed in it. The state-owned enterprises did not develop their own technologies, limiting themselves to the implementation of the solutions obtained from abroad. Isolated from the competitive environment, they did not have the motivation to search for the innovations on their own. Further, the mentality of the workers and excessive bureaucracy, was an obstacle, not help. Export could have been an impulse for changes, but it was not a priority for many years after gaining independence.

In the period of the "national champions", the scientific research sector in India was entirely financed by the state. Partially duplicating the Soviet patterns, Nehru decided to set up a national network of testing laboratories under the aegis of the

Council of Scientific & Industrial Research (CSIR), which were supposed to deliver new solutions to the industry. A fairly simple (and overly idealistic) model was assumed to transfer the scientific research achievements to the companies. It was to help to bring about the vision of the modern, secular India. However, the CSIR laboratories failed to meet the hopes placed in them. They did not have sufficient funds for large-scale industrial projects. Functioning independently from the industry, they had not been able to establish fruitful cooperation. In addition, they competed with the imported technology, because the companies preferred to implement ready-proven solutions, rather than engage in complicated and tedious scientific research processes [Knorringa 1994, pp. 64-65].

It was not until the early 1970's, that the largest Indian companies started to establish their own research and development centres [Krishnan 2010, pp. 62-64]. This was related to the introduction of the first tax incentives. However, it was not until 1991, that the first programmes appeared, which enabled to provide government's direct financial support for the private research and development centres.

Nowadays India has over 380 universities, more than 11 thousand colleges, about 1500 research institutions and second largest in the world group of scientists and engineers. Every year, the labour market is entered by 2.5 million graduates among which there are 300 thousand engineers and 150 thousand IT specialists [India Brand Equity Foundation 2010]. In spite of this, in terms of innovation, India is behind the economies of a similar potential. In the Global Innovation Index Report 2009-2010 [CII & INSEAD 2010], India occupied 56th position among 132 analysed countries. Detailed rating includes 22nd place in terms of the quality of the educational institutions, 25th place when it comes to the quality of the innovation ecosystem, 47th place according to the innovation potential, 47th place for the practical application of knowledge, 45th place for creating knowledge and 62nd place for the impact of the innovation on social welfare. The diagnosis is also confirmed by the World Bank [Dutz (ed.) 2007], pointing to the need to strengthen the local innovation ecosystem, inter alia, by improving the technical infrastructure and better financing of innovation.

Indian authorities also recognize the problems associated with the formation of the national innovation system. Therefore, among other things, the years 2010-2020 were announced a Decade of Innovation in India. In order to implement the new development strategy, in 2010, the government of India established a special think-tank – The National Innovation Council (NInC), whose purpose is to analyse the situation and to prepare the roadmap enabling to implement this vision.

The first activity of NInC was connected with creating the State Innovation Councils and Sectoral Innovation Councils, equivalent to this body, which would be able to better recognize the local needs and industry. Until 2014, the State Councils were created in 31 states. The Sectoral Councils are to be created by all central ministries. Until 2014, 28 of them have been established, among which 8 have

developed the sectoral action plans in the field of innovation [National Innovation Council 2014].

Using the patterns of developed countries, NInC intends to base the innovation policy on clusters, where the kernel will be the scientific research institutions. The emergence of such clusters is to be initiated by the Cluster Innovation Centres (CICs). The activity of the CIC is to be addressed both directly to the business, and to the education sector. This is to lead to the creation of two cluster programmes such as Industry Innovation Clusters and University Innovation Clusters.

5.1. Industry Innovation Clusters

NInC sees CICs as organisations initiating the formation of local innovation ecosystems. Recognizing local needs, based on elements of the already existing innovation system, the available knowledge and resources, they actively solicit partners to create innovation clusters. Then, their task will be to design and implement collaborative innovation model most appropriate for a given environment. CICs are also supposed to take care of the distribution of positive effects to all cluster participants.

Because India has a giant base of clusters of small and medium-sized enterprises [Drelich-Skulska et al. (eds.) 2014, pp. 190-196], use of their potential to build local innovation ecosystems seems to be a natural consequence. In the pilot programme of creating Industry Innovation Clusters, NInC has selected 5 SME clusters from various industries and locations (see: Table 1).

All these initiatives are started within the public-private partnership, where NInC is responsible for the launch of the CIC, and the local industry organizations (or

Table 1. SME clusters participating in the pilot programme Industry Innovation Clusters

Cluster	Location	CIC	Number of companies in the cluster	Employment	Turnover (in million INR)
Brassware Cluster	Moradabad, Uttar Pradesh	Moradabad Cluster Inclusive Development Society	29 000	350 000	25 000
Auto Component Cluster	Faridabad, Haryana	Iam SME of India	4 000	100 000	72 000
Ayurveda Cluster	Thrissur, Kerala	CareKeralam Ltd.	540	20 000	2 250
Bamboo Cluster	Agartala, Tripura	Tripura Bamboo Mission	50 000	220 000	736
Food Processing Cluster	Krishnagiri, Tamil Nadu	Krishmaa Cluster Development Society	73	250 000	7 000

Source: National Innovation Council [2014].

other institutions supporting the local business) for providing the necessary resources. The uniqueness of the model lies in the fact that at the time of starting, it requires only minimal financial expenditure from the participants. A created CIC takes on the role of an active management leader searching for the opportunity to increase the innovation potential of the cluster.

During the first 24 months of the pilot programme aimed at the SME clusters, the initiative was joined by 39 various institutions (not counting companies).

5.2. University Innovation Clusters

A new approach to a stronger and more targeted inclusion of the Indian universities in the Decade of innovation does not mean, in any case, the lack of prior activity in this field. As emphasized earlier, the role of the Indian educational and scientific sector in the economic development of India may not be – historically, and currently – omitted. Unfortunately, (similarly to the other areas), the programmes in which the academic institutions are used to support the economy (particularly in the context of the cluster policy), are very fragmented and overlapping in the field of activity and initiated by various governmental institutions at the central and state level. In the context of innovation and high-tech companies, the following initiatives may be mentioned, undertaken under the aegis of the National Science Technology & Entrepreneurship Development Board (NSTEDB), which operates since 1982 at the Government of India Department of Science and Technology [NSTEDB 2015]:

- Technology Business Incubators (TBIs),
- Science & Technology Entrepreneurship Park (STEP),
- Innovation & Entrepreneurship Development Cells (IEDC).

All these programmes, and units established as a result of their implementation, are located near the existing scientific research institutions, but they have an independent legal form. Their tasks are different. TBIs are typical business incubators accounted for by the number of companies that have been founded and developed there, the number of created jobs, commercialised technologies or obtained patents. The main task of STEPs is to create the scientific research infrastructure available for new companies. Further, (which is why STEPs are located near the universities), the technology parks are to provide the students and university staff with the opportunity of scientific-research cooperation with the enterprises. IEDC programme is focused directly on the development of academic institutions towards closer relations with the business and R&D practice.

The concept of CIC promoted by NInC, changes the approach to the use of universities in the national innovation system, to a more comprehensive and consistent one. Appreciating the multifaceted role of the educational and research institutions in the technological development and NInC innovation, it is postulated to create the innovation centres at each university (Cluster Innovation Centres). These centres will function as independent bodies, but located close to the

administrative hierarchy of the institution. Such a seating in the organizational structure is to provide them with an opportunity to operate effectively as an agent linking the individual departments and other organizational units. It is also used for communication with other members of the innovation cluster, which will be established around the university, called the University Innovation Clusters [Office of Adviser to the Prime Minister Public Information Infrastructure & Innovations 2011].

University CICs are intended to be both the local leader and a connection between all participants of the cluster (Fig. 1). They should actively look for an opportunity to:

- apply the research in the economy,
- conduct joint research with business,
- cooperate with other research and scientific institutions, and
- build relationships with the widely understood environment.

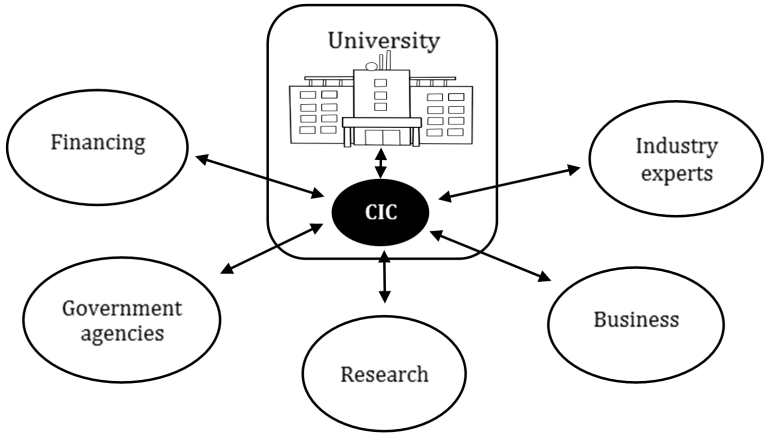

Fig. 1. Role of CICs in the University Innovation Clusters

Source: own study based on [Office of Adviser to the Prime Minister Public Information Infrastructure & Innovations 2013].

In practice, CICs can act as consulting agencies and organize workshops, conferences and lectures. It is important that these activities involve the participation of the representatives of the local world of science, business, government and interested social groups. Because CIC activity is to lead to a common creation of knowledge and sharing it, it is necessary that they take over the management of the intellectual property rights from the institution central for the cluster. In order to make CIC competence complete, their role is also to include cooperation with the organisations financing enterprises and R&D activity, so as to simplify access to funds for the interested parties. All activities presented above are supposed to make

the universities modern units, actively responding to the situation in the environment, offering better educational services and positively affecting the economy in the context of its innovation.

In the first years of activity, as a pilot, NInC intended to initiate the establishment of 4-5 university CICs, which will help to refine the mechanisms of implementing this concept. The first institutions that joined the pilot programme are Delhi University in New Delhi and Maharaja Sayajirao University (MSU) in Baroda. Good rating of these implementations has caused that NInC along with the association Biotechnology Industry Research Assistance Council (BIRAC) have decided to extend it to further 20 universities (in the first phase it will be joined by Anna University in Chennai, Punjab University in Chandigarh, Tamil Nadu Agricultural University in Coimbatore, University of Rajasthan in Jaipur and University of Agricultural Sciences in Dharwad). This will be a sectoral variant of the previously described programme, called Cluster Innovation Centre in Biotechnology (CIC-B). It is worth asking a question of whether such a focus for the development of the CIC concept is not a step back. A consistent, comprehensive programme once again starts to be treated as fragmentary. However, let us keep in mind that the business environment of individual universities has specific needs, from which emerges a dominant research and educational profile of scientific institutions existing at the location.

6. Conclusions

Indian economy in the recent years, is one of the fastest growing in the world, and its advantages are primarily dynamic entrepreneurs and a huge group of highly skilled engineers and scientists. However, in terms of innovation, India is behind the economies of a similar potential and Indian authorities recognize these problems.

Using the patterns of developed countries, Indian government intends to base the innovation policy on clusters, where the kernel will be the scientific research institutions. The emergence of such clusters is to be initiated by the Cluster Innovation Centres. The activity of the CIC is to be addressed both directly to the business (Industry Innovation Clusters), and to the education sector (University Innovation Clusters).

A coherent government's innovation policy is a completely new phenomenon in India. At the central government level, it is possible to find the documents drafting a general vision and directions of development. However, adopting them in the economic practice through the complicated filter of ministries, as well as central and state offices, may give rise to a huge number of uncoordinated, independent and fragmentary programmes. For now, pilot programs were started. If NInC can keep coherent state-wide policy of innovation clusters, they may create the base for strong modern innovation policy in India.

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