

## **PUBLIC POLICY AND THE GROWTH OF SOFTWARE INDUSTRY CLUSTERS IN INDIA: A COMPARATIVE CASE STUDY OF HYDERABAD AND NOIDA**

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### **ABSTRACT**

*This paper is an attempt to study the influence of public policy on the growth of software industry clusters in India by conducting a comparative case study of Hyderabad and Noida. The study investigates how policy initiatives, institutional frameworks, and government support have contributed to the emergence and development of these clusters. By analysing the different approaches adopted by Hyderabad and Noida, the study aims to highlight the important factors that have enabled the growth of software industry clusters in India. By comparing the cases of Hyderabad and Noida software industry clusters, the study offers valuable insights into the role of public policy in fostering the growth of technology-driven regional clusters.*

**Keywords:** Industrial Cluster, Regional Cluster, Software Technology Parks of India (STPI).

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### **Introduction**

The formation and development of industrial clusters have been extensively researched by scholars. To achieve rapid industrialization and economic growth, many nations throughout the world have adopted the cluster approach. Firms in particular or connected sectors are frequently agglomerated in specific geographic areas under the industrial cluster strategy, which has also been used to give regions a competitive edge (Porter M., 1990). Some high-tech industrial clusters, such as Silicon Valley in California, have developed over a long time, while others, such as Hyderabad in India, have developed relatively quickly. We will look at what distinguishes these emerging software industry clusters from the naturally occurring ones that have developed over time in the following sections. What strategies are the newly developing clusters using? How has the government influenced the growth of these clusters? What variables have made it possible for clusters to form? These are only a handful of the topics we attempted to cover in this study. We have studied India's software industry clusters, with a particular emphasis on those in Noida and Hyderabad, to find answers to these questions.

In our discussion on software industry clusters, we delve into a critical Indian government initiative known as the Software Technology Parks of India and its substantial contribution to the development of software hubs. Our primary focus lies in examining the software industry clusters of Noida and Hyderabad. Through a comprehensive analysis, we draw parallels between these two clusters and conduct a comparative study. Our conclusions are derived from this in-depth examination.

In the following section, we introduce the subject of Public Policy and its role in creating industry clusters. Further, we briefly outline the research methodology.

### **Methodology**

Our study adopts the Qualitative Research approach, specifically using the case study method. We chose the case study strategy because it is best suited for ex-post analysis of phenomena beyond the researcher's control (Yin, 2003). Furthermore, we conducted a multiple case study to establish a

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robust basis for generalizations and persuasive claims about the findings' validity. Multiple case studies provide convergent evidence about the mechanisms of cluster formation, making them more reliable than a single case study. This convergence also validates the study's propositions.

In this study, we have utilized secondary sources of information to examine the impact of government policies on the development of software industry clusters in the cities of Hyderabad and Noida.

#### **Proposition for the Qualitative Research**

Based on the discussions above and the research questions elucidated in introductory section above, we have outlined the following proposition:

**P1:** Government initiated public policy measures have positively influenced the evolution of software industry in India and formation of industry clusters in Noida and Hyderabad.

Following the discussion on the methodology and the research proposition, the subsequent section explores the nature and formation of software industry clusters in India. In this context, we have analysed the significant contribution of the government's STP Scheme, as detailed in the next section.

#### **Software Industry Clusters in India**

In various parts of the world, the IT industry, along with other industrial sectors, has shown a tendency to concentrate in specific geographic locations to capitalize on the advantages of agglomeration economies (Saxenian A. , 1994) (Saxenian A. , 2000). The benefits of clustering are well-documented in the context of IT industry clusters. These benefits encompass the typical advantages of network effects, knowledge spillovers, labour pooling, a larger pool of suppliers and customers, and enhanced possibilities for collaboration or co-development of new or complementary products due to the increased density of firms in the region.

In India, software industry clusters grew primarily due to outsourced software and business processes (IT-enabled services). Initially, outsourcing needs were met by sending professionals abroad. However, outsourcing evolved to include offshore development supported by modern communication infrastructure. Multiple software industry clusters emerged to meet this demand, aided by government schemes. such as Software Technology Parks of India (STPI), Special Economic Zones (SEZ), and Electronics Hardware Technology Parks of India (EHTPI).

Several large software hubs exist in India including cities like Hyderabad and Noida. The STP scheme's implementation has been crucial in forming these clusters.

#### **Software Technology Parks of India**

STPI (Software Technology Parks of India) is an autonomous institution established on June 5, 1991, under the Societies Registration Act (1860) by the Indian government's Department of Information Technology. Its creation coincided with broad-based economic liberalisation programs. STPI's primary objectives included:

- Promoting and developing the software and software services industry in India.
- Providing statutory services to exporters by implementing the STP/EHTP Scheme.
- Offering infrastructure facilities, such as high-speed data communication links and other value-added services, to the industry while cost-effectively sharing its facilities.
- Providing project management and consultancy services to domestic and international clients.
- Fostering start-ups in the software sector.

STPI sets up and implements STP Schemes in various parts of the country to provide infrastructure and assistance to IT companies. It organizes training programs, engages in export promotion, and assists state governments in formulating IT policies. Additionally, STPI organizes entrepreneurship development programs and partners with venture capitalists for financing IT ventures.

#### **STP Scheme as the Enabler of Cluster Formation**

STP Scheme is a state-of-the-art export initiative specifically designed for software companies. This scheme combines the benefits and policies of the 100% Export Oriented Units of Export Processing Zones implemented by the Indian government and the widely recognized concept of Science/Technology Parks operating in different parts of the world. The key advantage of the STP Scheme is the provision of Single-Point Contact Services, streamlining the establishment process for software firms and ensuring faster and smoother operations (STPI, 2009).

The Software Technology Parks of India (STPI) scheme offered several significant features:

- **Single Window Clearance System:** This system ensures efficient processing and approval of applications for setting up export-oriented units within designated STPI zones.
- **Foreign Equity Participation:** Firms located within the STPI area were permitted to have 100 percent foreign equity participation.
- **Duty-Free Imports:** STP units can import goods duty-free or procure them locally.
- **Domestic Sales:** STP units were allowed to sell up to 50 percent of their exports in the domestic market.
- **Income Tax Exemptions:** Profits from software exports were exempt from income tax.
- **Minimal Export Obligations:** Export obligations for STP units are kept minimal to encourage growth and innovation.

STPI's designated locations, sector-specific focus, infrastructure, and support services have attracted software firms, leading to cluster formation and benefits like localization economies. The STPI Scheme has been instrumental in fulfilling two fundamental conditions for cluster formation: firm proximity and sector-specific concentration.

### **Discussion on Software Industry Clusters at Hyderabad and Noida**

Several Indian cities are popular destinations for software outsourcing. Six Indian cities including Hyderabad and the NCR of Delhi which includes Noida were ranked among the top eight global outsourcing clusters in a 2009 survey by the Global Services magazine. In this article, we will delve deeper into our study of the Hyderabad and Noida clusters.

#### **Hyderabad Cluster**

Hyderabad is a major IT outsourcing hub in India, with many universities and established outsourcing services. It is expanding to include product development, financial services, and contact center services. Leading IT outsourcing service providers and BPO sectors include IBM, TCS, Wipro, Infosys, Mahindra Satyam (later renamed Tech Mahindra), iGate, and Accenture.

The IT industry in Hyderabad flourished after the establishment of the Software Technology Park in 1991. Government policies in the period 1996-2004 transformed the city into a world-class software cluster. Notably, Hyderabad benefited from the local state government's IT policy of 1999 and the ITES policy of 2002. Thus, strengthening its position as a software industry cluster.

The State government collaborated with the private sector to create world-class infrastructure. It established institutions in IT, biotech, life sciences and other fields, and a financial district for attracting financial companies. The government also launched e-governance initiatives and programs to promote IT literacy. It showcased the state as an investment destination through roadshows and seminars. The Chief Minister's personal interest resulted in captive centers being established, such as Microsoft.

The anecdote in (Ramachandran & Ray, 2003) illustrates the crucial role of leadership in shaping a cluster. When the Indian School of Business (ISB) was considering locations in Karnataka, Tamil Nadu, or Maharashtra, Chief Minister Naidu of Andhra Pradesh took proactive steps to attract the prestigious institution to Hyderabad. Despite the state not being on the short list, Naidu persuaded the ISB team to visit Hyderabad and give him a chance to present his case. His charming influence and welcoming gesture contrasted sharply with the experiences the team had with Chief Ministers of other states. In one state, the Chief Minister kept the delegation waiting for 45 minutes and showed indifference during the meeting, while another CM demanded a quota for applicants from his state. In Hyderabad, Naidu personally greeted each member of the team, made a PowerPoint presentation, and personally served plates at dinner. Many investors who have visited Naidu have had similar experiences. It is noteworthy that within three years of ISB's establishment, the area around the institute, initially on the outskirts of the city, evolved into a thriving IT hub.

The region features several significant IT parks like L&T Infocity, Cyber Gateway, Cyber Pearl, Mindspace IT Park, RMZ Futura IT Park, and Ascendas IT Park, which are dedicated spaces for IT businesses. Additionally, many companies located in the region have their respective campuses in the area, contributing to the region's IT infrastructure.

The Hyderabad software industry began in 1991 with the establishment of a branch of the Software Technology Parks of India. Initially, the growth of the software cluster was slow. However, since

the late 1990s, the Hyderabad software cluster has experienced rapid growth. Several factors contributed to this growth. A proactive government expanded the city's infrastructure, making it more attractive to IT-BPO outsourcing companies. The government also actively promoted Hyderabad as an attractive destination for IT-BPO outsourcing. As a result, hundreds of companies, including top Indian software firms and MNCs, have set up operations in Hyderabad. Software exports from the Hyderabad software cluster have continued to rise over the last decade.

There are several key reasons why software companies are drawn to Hyderabad as a location. Firstly, they benefit from the availability of skilled and qualified workers churned out annually by the city's large and sophisticated network of educational institutions. Additionally, the city offers good infrastructure, excellent residential facilities, and a high quality of life. Finally, the proactive government has provided significant support to the IT industry over the past decade, including through the availability of benefits under the STP scheme.

### **Delhi National Capital Region and the Noida Cluster**

The Delhi National Capital Region (NCR) has emerged as a significant outsourcing hub for various services, including business analytics, finance, accounting, software and product development, engineering services, and contact center services in English. The region consists of three cities: Delhi, Noida, and Gurgaon. While Noida specializes in high-end embedded systems and engineering services, Delhi and Gurgaon are more suited for BPO and IT-enabled services. The region possesses a robust educational system, producing a large pool of employable graduates. Global giants like IBM, Microsoft, Intel, Oracle, Accenture, HP, Amdocs, Capgemini, SAP, Siemens, Dell, and Indian players such as Infosys, TCS, and Wipro all have operations in the NCR. According to the National Association of Software and Services Companies (Nasscom), software and services exports contributed \$40 billion to India's revenues in 2008, with the Delhi NCR region accounting for approximately 17-18 percent of this contribution.

### **NOIDA Cluster**

Established under the UP Industrial Area Development Act on April 17, 1976, Noida (short for New Okhla Industrial Development Authority) is an administrative entity. It, along with Greater Noida, forms one of India's largest planned industrial cities. This satellite town of Delhi has evolved into a significant IT-BPO hub, hosting numerous IT-BPO companies.

Traditionally, office space in Noida has been highly sought after in the country due to its Noida Special Export Zone and the Software Technology Parks of India. While renowned for its IT/ITES sector, Noida and Greater Noida are also home to industries from other manufacturing sectors, including the automotive industry.

Furthermore, Noida is a major film hub for the television and news media industries, with the presence of numerous news channels and studios.

Noida stands out as a major hub for high-end IT outsourcing, particularly in specialized domains. It attracts leading IT-BPO companies from India, as well as numerous multinational corporations (MNCs), which have established units in the city. Notably, some of these companies offer comprehensive, fully integrated services from their development centers based in Noida. The range of IT services provided encompasses VLSI design, embedded systems development, and advanced knowledge process outsourcing (KPO) services.

The IT-BPO cluster near Delhi boasts a significant advantage due to its proximity to the city. Multiple high-quality colleges and institutions abound in Delhi, Noida, and Gurgaon, producing a steady stream of technically proficient graduates fluent in English. This steady stream of graduates meets the IT-BPO industry's demand for high-quality employees. Furthermore, the continuous supply offers an opportunity for future growth in the cluster.

Noida stands out for its exceptional engineering services, catering to diverse industries like telecom, automotive, construction, and industrial sectors. Companies based in Noida contribute to the creation of software products encompassing domains such as ERP, banking, insurance, and finance. In addition to outsourced product development, the region also hosts captive centers engaged in software product development for their parent organizations. Notable captives operating in Noida include Adobe, Perot Systems, Cadence, and ST Microelectronics.

In terms of Semiconductor design, Noida ranks just behind Bangalore. Numerous Indian companies and MNCs based in Noida prioritize the creation of Engineering Design Automation (EDA)

tools, verification, chip design, applications, and methodologies for consulting, design services, and customer support. Noida's advantages lie in the caliber and cost-effectiveness of its workforce, which boasts significant engineering expertise and English language proficiency.

The Noida region is a hub for Information Technology (IT) companies and boasts several prominent IT parks, commonly referred to as IT real estate. Among these notable parks are Logix Techno Park, Advant Navis Park, Tapasya Group, DLF 3C Galaxy, Windsor IT Park, Stellar IT Park, Logix Cyber Park, and Chokhani Square. In addition to these IT parks, many companies have established their own dedicated campuses in the region, further enhancing Noida's status as a significant center for the IT sector.

Noida, a planned industrial town established in 1976 with the specific purpose of attracting industries to the region, received early attention from the government. Its proximity to Delhi contributed to its growth. When a branch of the first batch of Software Technology Parks of India was established in Noida, many firms were drawn to its well-developed infrastructure. The IT/software cluster in Noida has traditionally been a stronghold in high-end IT services and engineering design services. Subsequently, it attracted significant investments in the IT-BPO sector.

Noida's allure stems from a harmonious blend of domestic companies and transnational corporations. The key catalysts for this attraction are the availability of the Software Technology Parks of India (STPI) scheme and Special Economic Zone (SEZ) facilities. Additionally, companies are drawn to the region due to several factors:

- Access to a skilled and qualified workforce
- Robust infrastructure, including a well-developed network of roads and telecommunication facilities
- Competitive rental rates
- Favorable "quality of life" factors due to Noida's proximity to Delhi, the capital of India

The subsequent section delves into a comparative examination between the Hyderabad and Noida clusters. In this section, we explore the commonalities and distinctions prevalent in the two clusters.

### **Hyderabad and the Noida Clusters – A Comparative Analysis**

The software industry is a rapidly growing field, making it easier for new firms to enter or existing ones to expand. The emergence of software industry clusters in various parts of India is attributed to this growth. The rapid expansion of clusters in Hyderabad, Noida, and other cities, compared to well-established clusters like Bangalore, would not have been possible if the industry had matured (Ramachandran & Ray, 2003).

Hyderabad and Noida exhibit similarities in the formation and growth of their clusters. The analysis reveals several critical factors responsible for cluster formation in these regions. Both locations were among the first to establish branches of the Software Technology Parks of India, benefiting from the industry-friendly STP scheme. Additionally, both regions have well-developed educational institutions providing the required skilled workforce. They also boast well-developed telecommunications and other infrastructure, along with decent quality of life factors. While Noida has leveraged its proximity to Delhi for quality-of-life factors, Hyderabad has been rapidly developing these factors over the last decade to attract and retain software firms. In an industry where the quality of people is the key differentiator, it is crucial for firms to operate in locations with adequate quality of life factors to minimize labour migration. These location factors align with existing theoretical constructs about cluster formation, which emphasize different factors for knowledge-based industries compared to traditional manufacturing sectors. For instance, the telecommunication infrastructure requirements for the software industry differ significantly from those of the manufacturing sector.

Upon closer inspection, the development of industrial clusters in Hyderabad and Noida reveals distinct differences. Established in 1976, Noida was initially conceived as an industrial town. With the aim of fostering industrial growth, the government actively encouraged companies to establish operations in the region. For instance, HCL was founded in Noida in 1976, even before the advent of the IT/software revolution. In 1991, the establishment of an STPI (Software Technology Parks of India) branch in Noida further attracted businesses to the region, leveraging the well-developed infrastructure. However, proactive government support for the Noida cluster has been lacking, particularly in recent years. In contrast, the growth of the software industry cluster in Hyderabad commenced significantly later. Satyam

Computer Services, for example, was established in Hyderabad in 1987. Although Hyderabad also received an STPI in 1991, the cluster's initial growth was slow. However, in the late 1990s, the government implemented proactive measures to stimulate Hyderabad's industrial development. With consistent government support, Hyderabad has become one of the most desirable destinations for software companies.

The Nasscom & A.T. Kearney study (2008) indicates that Noida has a higher cost of operation and living compared to Hyderabad, making it less appealing. In terms of infrastructure, the Noida cluster lags behind Hyderabad in two areas: power supply and hotels. Noida struggles with inconsistent power supply and lacks adequate hotels within the cluster, although there are good options in nearby Delhi. Security and hygiene are additional quality-of-life concerns in Noida. It is perceived as a less safe location, particularly for women, and it is not considered a clean city. Hyderabad is seen as superior in both of these aspects.

### **Reconciling Theory with Findings: Important factors for Successful Clusters**

This section examines the software industry clusters, juxtaposing theories with observations from Hyderabad and Noida clusters to enhance understanding. Through this comparative analysis, we aim to harmonize theory and empirical evidence, thereby enhancing our understanding of software industry clusters.

Examination of extant literature indicates some common factors for high-tech clusters' success. Innovation clusters benefit from research universities and firms' ability to absorb and commercialize knowledge. The success of knowledge industry clusters is contingent upon the ability of these firms to assimilate locally generated knowledge and transform it into commercially viable applications and products (Saxenian A., 2000).

This article explores key factors shaping high-tech clusters, including university-industry links, government initiatives, infrastructure, quality of life, and socio-cultural factors. We compare Noida and Hyderabad clusters with established theories of cluster formation.

We analysed key factors crucial for cluster formation and compared them with findings from the Hyderabad and Noida clusters. Key points of reconciliation include university-industry linkages, anchor firms, venture capital funding, local knowledge and skills, and public policies for infrastructure and industry promotion.

### **University Industry Linkages**

Universities contribute to cluster formation, offering technological advancements, incubating startups, and promoting collaboration (Mayer, 2003). This collaboration facilitates specialized research, patenting of inventions, and commercialization (Abdullateef, 2000).

Both Hyderabad and Noida have benefitted from close proximity with a network of Higher Educational institutions located in their respective regions. Noida cluster benefits from its proximity to Indian Institute of Technology, Delhi University, Jawaharlal Nehru University, Delhi Technological University among many other premier institutions operating in Delhi and the adjoining areas of National Capital Region. Hyderabad cluster has its own set of premier institutions like IIT Hyderabad, International Institute of Information Technology, Indian School of Business, Hyderabad University, Osmania University and many other institutions of Higher Education. Apart from providing the required human resource, many of these institutions collaborate for carrying out research on breakthrough technologies and business ideas.

### **Anchor Firms and Mediating Organisations**

Regional clusters often form around innovative companies. For instance, Microsoft served as the anchor firm around which Seattle's software cluster developed [(Porter M. E., 1998) (Porter M. E., 2001)]. Anchor firms' success is crucial for cluster formation, but their closure can lead to startup creation by former employees. For instance, IBM's departure from India led to the creation of the Bangalore software cluster (Heeks, 1996).

Intermediaries, like seminars and exhibitions, can accelerate cluster formation by facilitating technology exchange. They set frameworks that enable collaborative action and foster industry interest. For example, technology transfer offices can link university research to industry. The technology transfer intermediaries at the Massachusetts Institute of Technology (MIT) and Stanford University have played a crucial role in cluster formation in Boston and Silicon Valley, respectively [(Porter M. E., 2001) (Saxenian A., 2000)].

STPI and NASSCOM have been influential in developing software hubs in India, notably in Noida and Hyderabad. IIT's involvement in R&D with the industry has made significant contributions. These examples of intermediaries align with the extant theories of High-Tech Industrial Clusters.

### **Venture Capital Funding**

In return for minority stake, venture capital firms provide funding and support to startup firms, particularly for research and development and product development activities. Additionally, VC firms provide mentorship, guidance, and strategic alliances to firms they invest in and are closely located to monitor performance. These VC firms are drawn to areas with many firms specializing in specific technologies, which attracts more firms and reinforces cluster formation (Cortright & Mayer, 2002).

India has many Venture Capital firms focused on investing in the ICT sector, including IDG Capital, Inventus Capital, and others. The government also supports ICT with Venture Capital initiatives like SIDBI Venture Capital Limited.

### **Availability of a Local knowledge and Skill Base**

Clusters draw in skilled professionals, which attracts firms seeking such professionals. Software clusters thrive on abundant well-educated software professionals, facilitated by robust education systems. For Indian clusters like Hyderabad and Noida, initial attraction was low labour costs, but skilled workforce is now the primary determinant for firm location.

The software industry's most crucial asset is its skilled workforce, including software developers and entrepreneurial thinkers (Sommers & Daniel, 2000). Attracting and retaining talented employees is paramount to a firm's success. Hence organisations make substantial efforts to secure and maintain a qualified workforce.

The existence of a well-established industry in a traditional but related field can greatly contribute to the development of a new industry. A prime example is the Bangalore region, where the presence of public sector firms and research organizations in the high-tech sectors of space research and defense equipment has embedded technological knowledge in the region. This, coupled with the linkages with universities and subcontracting firms, has resulted in the spillover of technological expertise that was harnessed by the emerging software sector. Although to a lesser extent, similar benefits seem to have been accrued in the Hyderabad cluster due to the presence of Electronics Corporation of India there.

### **Targeted Public Policies for Infrastructure and Industry Promotion**

Government policies promoting infrastructure, education, research, and streamlined business approvals impact industrial growth. Governments support start-up firms through technology transfer regimes, tax-free zones, and venture capital funding. Furthermore, streamlining the application process for permissions and approvals can accelerate business operations. Support services from government and private entities attract investments.

Public policies play a critical role in the development of industrial clusters. In India, several software industry clusters, including Bangalore, Hyderabad, the National Capital Region of Delhi, and Pune, have flourished due to supportive government policies. These regions have been designated as Software Technology Parks and have received various policy incentives to attract private sector investments in the software sector. Among these clusters, Bangalore has particularly benefited from favourable policies at both the central and state government levels. Similarly, Hyderabad and the National Capital Region of Delhi have made significant progress due to the government's attention. All these clusters have also gained from the availability of high-quality, publicly funded educational institutions.

Several characteristics are often found in successful clusters. These features include attractive natural surroundings, diverse people from different backgrounds, and a vibrant street life. The cultural diversity and tolerance of these areas attract talented individuals, creating a dynamic and ever-changing environment. People from various ethnic groups express themselves, leading to a continuously evolving social landscape. Despite the diversity, the social environment in these clusters remains stable, fostering continuity and [(Hall, 2000) (Florida, 2002) (Wu W., 2005)].

According to research, knowledge workers in high-tech firms also prioritize certain quality-of-life factors, including amenities for outdoor dining, pedestrian-friendly streets, vibrant nightlife, and opportunities for recreational activities such as urban kayaking and rock climbing (Wu W., 2005). Recognizing this, stakeholders in high-tech clusters like Hyderabad and, to a lesser degree, Noida, have actively catered to these expectations to attract both firms and top-tier knowledge workers to the region.

## Conclusion

In this paper, we explored the research question introduced in the introductory section and proposition P1 mentioned in the Methodology section through a qualitative approach. Specifically, we delved into the role of public policy in shaping the formation and evolution of the software industry in general, with a focus on the Hyderabad and Noida clusters. We successfully addressed this question and confirmed proposition P1, presenting sufficient evidence to demonstrate that government public policy initiatives had a positive influence on the evolution and growth of the software industry in India. The key takeaway from this paper is that even in a high-tech sector like software, late-mover countries like India can have a global impact if government policies are appropriately aligned to foster the growth of a competitive private sector. India's experience serves as a valuable lesson for other third-world countries aspiring to usher in a software revolution within their own borders.

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