

Factors Influencing Geographical Location of Software Industry in India

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Abstract

Software Industry being one of the chief contributors to India's export and GDP, has a vital role to play in shaping India's future. The advent of IT revolution had promised a more equitable development and growth for India, thanks to its ubiquitous resource called Internet. It was believed that the dominance of metropolitan cities would end and new smaller cities will emerge into limelight. Especially in case of Software Firm where there is no fixed raw material this belief got accentuated. In this paper we aim to address the question that - Has India achieved equitable growth through IT revolution? To study this correlation between equitable growth and Indian Software Industry Growth, it becomes important to find out where the established software institutions have placed themselves on the map of India and then to anticipate where the firms will place themselves on the map of India. In this paper we have mapped the Software giants of India and then examined the belief of equitable growth. We had analyzed certain factors that influence the choice of location for a Software Firm in India. These factors could help in attaining a more geographically equitable growth in the country.

Keywords: *Economic Geography, Location theory, Software Industry, Indian IT Industry, Metropolitan cities, Innovation clusters.*

1. Introduction

Where do industries locate? What factors influence the spatial distribution of economic activity of a particular industry within countries and to what extent? Finding answers to these questions has always been at the core of economic geography researches. These researches help us gauge the development potential of sub national regions. In case of developing countries this is particularly more important as they have relatively lower levels of overall investment and economic activity. [Lall et al., 2003]

According to [IBEF, 2017] India's technology and BPM(Business Process

Management) sector(including hardware) is likely to generate revenues of US \$160 billion during FY16 compared to US \$146.5 billion in FY15, implying a growth rate of 9.2 per cent. The contribution of the IT sector to India's GDP rose to approximately 9.5 per cent in FY15 from 1.2 per cent in FY98. India is the world's largest sourcing destination for the information technology (IT) industry, accounting for approximately 67 per cent of the US \$124-130 billion market. The industry employs about 10 million workforce. More importantly, the industry has led the economic transformation of the country and altered the perception of India in the global economy. India's cost

competitiveness in providing IT services, which is approximately 3-4 times cheaper than the US, continues to be the mainstay of its Unique Selling Proposition (USP) at the global arena.

India is also gaining prominence in terms of intellectual capital with several global IT firms setting up their innovation centres in India. The Indian IT sector is expected to grow at a rate of 12-14 per cent for FY2016-17 in constant currency terms. India's internet economy is expected to touch Rs 10 trillion (US \$146.72 billion) by 2018, accounting for 5 per cent of the country's GDP [IBEF, 2017]. Hence it is worth researching the question that where will all that growth take place in India.

Internet was believed to bring revolution in the field of economic geography. The new era promised a more ubiquitous development and growth which was linked to this resource called internet. As internet can fairly be assumed as a ubiquitous resource along-with electricity, it was believed that the dominance of metropolitan cities will end and new smaller cities will come into limelight. Especially in case of software industries where the major inputs of industry are a) Availability of Internet and Electricity, b) Human resource (Skilled), c) Land and other basic infrastructure [Kagami et al., 2004].

All these major requirements are being readily fulfilled by these smaller cities and are even cheaper in comparison to the metropolitan cities. Whether it be the availability of affordable open spaces, their cost of construction or the price of electricity. Even the skilled human resource is easily available in the smaller cities as well, owing to the fast developing educational system

and exposure to technology in these cities. The state governments are also giving various incentives to the IT sector, such as, tax subsidies, land grants and other schemes, so that these companies setup their offices in these smaller cities, eventually leading to the development of these cities and the states. So software companies must be choosing small cities. But is this really the case? To understand what drives the decision of finalizing the location, many facts were collected and analyzed. Starting with collecting the office locations of many companies across India and analyzing their reasons for choosing any particular city.

2. Experiments

For this paper, top 100 IT companies were taken into consideration [dqindia online, 2015]. We have omitted those companies that no longer exist, have been merged into other companies or are only IT hardware re-sellers with no R&D centres in India. All the major office locations of these Top 100 companies were pinned on the map. Then analysis was done based on their locations on the map. These locations were then classified into three major sections, a) Whether they are located in Metropolitan city centre, b) Whether they are located on the fringe of a Metropolitan city and c) Whether they are located in a non-metro city. These sections were decided to check the polarization of office choices by a software firm between already established metropolitan cities and the nonmetropolitan cities. The fringe section was added to check whether the offices of the Software firm prefer the city centre or the new upcoming fringe cities of a Metropolitan city.

It is difficult to demarcate exact fringe boundary of a city. Nisha [Nisha, 2015] in her case study of Jammu City has found that the fringe area is not extended in concentric zones around the Jammu city but a star shaped and it extends between 5 Kms to 20 Kms from the city centre. SudeshNangia studied Delhi Metropolitan region and highlighted some of the chief characteristics of the R-U fringe around the metropolis. She pointed out that the fringe area extended over 212 sq km and encompassed 177 villages within its fold [Nangia, 1976].

An ideal method of the delimitation of R-U fringe actually depends upon intensive fieldwork from village-to-village around a limit of nearly 10 to 15 Kms from the central city limits. But the scholars have not yet been able to delimit the fringe of a city based on actual studies from village-to-village, especially in India. Whatever work is being done in this respect it is based either on a sample survey of the villages or it is wholly based on the secondary data of the censuses [Sharma, 2016].

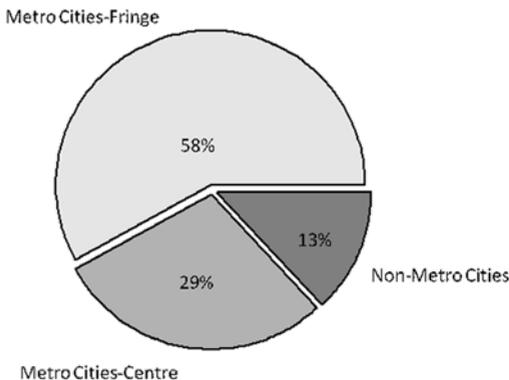


Fig. 1: Pie chart showing percentage wise distribution of various Office locations of top 100 software companies

Hence we have taken 15 Km road distance as Limit for city centre and areas outside it as Fringe Areas of the Metropolitan cities. This road distance is calculated using Google maps. As deciding what is the exact city centre of metropolitan city is difficult, we have taken Zero Kilometre Milestone of each city as its city centre. The Constitution (seventy-fourth Amendment) Act, 1992 defines a metropolitan area in India as, an area having a population of ten lakhs or more, comprised in one or more districts and consisting of two or more Municipalities or Panchayats or other contiguous areas, specified by the Governor by public notification to be a Metropolitan area. During our study we have considered seven major Metropolitan Cities in India- National Capital Region (Delhi, Gurgaon, Noida, Faridabad), Mumbai Metropolitan Region, Kolkata Metropolitan Area, Bangalore Metropolitan Region, Pune Metropolitan Area, Hyderabad Metropolitan Region, Chennai Metropolitan Area [Wikipedia,].

Our research is concerned with the head office, regional offices, development centres and R&D offices, we have not considered the sales office of IT hardware companies.

3. Results

During the research, it was found that out of 670 offices of various IT Companies under study, located in India, only 86 offices were located at places other than the metropolitan cities. Out of the 584 offices located in the metropolitan cities, a majority of 389 offices were located in the fringe areas of the city while only 195 offices were within 15 kms of the city centre. The percentage-wise breakup can be seen in (Fig. 1).

From (Fig. 2), it is evident that out of 670 offices of various IT Companies under study a majority 584 offices lie in metropolitan cities like Bangalore - 133, Mumbai - 108, Delhi - 101, Chennai - 95, Pune - 68, Hyderabad - 46 and Kolkata - 33 (in descending order). Only 86 offices are in cities other than metropolitan cities. This reflects the preference for metro cities over other cities by major IT companies.

From (Fig. 3a see page 248), we can realize that the number of offices outside the 15 km fringe line in Delhi surpass the number of offices inside it, which in is 78 offices outside of the fringe line from a total of 101 offices. In Bangalore (Fig. 3b see page 248), it is 82 out of a total of 133 offices. Similar pattern was found in other metropolitan cities.

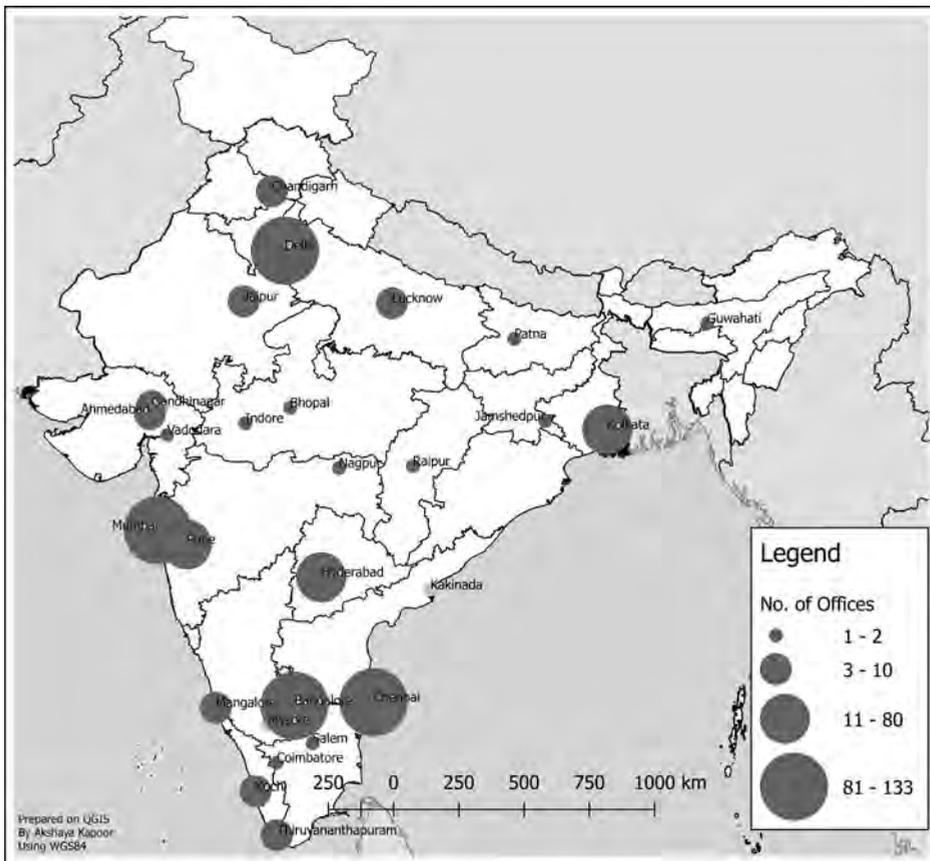


Fig. 2: Outline Map of India showing distribution of software offices under consideration over various cities.

4. Factors determining the Location

The result tells us that the reasons for choosing a location might not be what we discussed earlier in (Section Introduction). Then, what possible factors can influence the choice of location of an IT firm in India, this we have tried to analyze in the following section.

Support services

A software industry requires the support of various other industries in order to run seamlessly, such as, Chartered Accountancy Firms, Law Firms, Financial Firms, Banking Firms, Insurance Firms, PR Agencies, HR Firms, Educational Firms, Consultancies, Hospitality Agencies, Training Institutes, Travel Agencies, Catering Firms, Auditing Firms, Real Estate Firms, etc. These firms play a vital role not just for IT companies but almost all other industries as well.

These firms need a big clientele in order to flourish, and metropolitan cities provide them with such clients. Hence, major firms are located in big cities. As the software industry needs the services of these companies quite frequently, they must be located at a place which is easily accessible.

Although one can use Internet to communicate with these firms. But using Internet lacks the eye to eye contact and co-presence, the two important factors that develop the emotional commitment and trust between the two parties. This trust is very important as the value and intellectual output demanded of these support firms by the software company is of a very high level. Therefore to fulfill this requirement of co-presence through frequent visits, frequent meetings and sometimes direct

communication, settling in each other vicinity becomes important [Leamer and Storper, 2001].

Tacit Knowledge and Atmosphere of Heterogeneity

Today producing standard products using standard methods will not sustain a software firm for long. A software firm must be able to innovate at global level. They must be able to create and commercialize new products and processes that shift the technology frontier, progressing faster than their rivals. For this they need Innovation Environment [Porter and Stern, 2001]. According to [Gertler, 2003] Tacit Knowledge Production has become a synonym for Innovation. Tacit Knowledge as defined by Nelson and Winter (1982) is - To be able to do something, and at the same time be unable to explain how it is done [Nelson and Winter, 1985]. One effect of the ongoing globalization is that many previously localized capabilities and technologies in software firms have now become ubiquitous. What is not ubiquitous, however, is the non-tradable/non-codified result of knowledge creation – the embedded tacit knowledge that at a given time can only be produced in practice. This Noncodified tacit knowledge thus gives the competitive edge to a company in global arena. In order to understand the factors influencing the production of tacit knowledge, we first need to understand how Tacit Knowledge is produced.

In a real life example, when people from varying backgrounds come to work together in an open and friendly environment, there is an extensive exchange of knowledge, work ethics, thought process, etc. which gives a

new dimension to the project. This fresh outlook generates a positive outcome for the team as well as the company.

When this team shares basic similarities in work, common 'codes' of communication, shared conventions and norms, personal knowledge of each other based on a past history of successful collaboration or informal interaction. They start generating tacit knowledge. These commonalities are said to serve the vital purpose of building trust between partners, which in turn facilitates the production and transfer of tacit knowledge between partners.

Therefore, this influences the decision of constructing offices at places where people from varied cultures, languages, caste & creed can come together and live in a safe, peaceful and comfortable environment. Hence, these metropolitan cities influences the primary choice for these companies as they are melting pots of different culture, language, religion, caste and creed [Florida, 2003] [Saxenian, 1999].

This scenario becomes even more important in case of India where there is huge diversity between different states of the country and you can easily see the heterogeneity in the offices. Hinterlands are comparatively less of a melting pot and hence sometime people from other regions find it difficult adjusting to their environment.

Being at the Centre of Innovation

For intellectual production, there is great value in being at the “centre of the action,” where specialized talent and “buzz” are important to keeping up with rapidly changing outputs [Leamer and

Storper, 2001]. This is the reason why most breakthroughs are achieved at the Silicon Valley.

Earlier, if a company wanted to work on a research, it used to find secluded places where research could be been done in peace and secrecy. This is proved by many premier research institutes located at secluded places, like CERN, ISRO, NASA etc. But now this trend has changed its course completely.

Today it is important to be at the centre of everything. To keep abreast with all the latest findings. Being at the centre gives you novel inputs and helps you meet people with similar ideas and intellect. You get an idea about how things are working. You meet new people, make friends. You either live with them or travel together to work. Even a brief conversation in the cafeteria can give you wonderful new ideas to work upon. Today the research world is more about collaboration and cooperation. No corporation wants people to waste time on what has already been done, rather they want researchers to work on new things esp. in software industry. Clusters offer potential advantages in perceiving both the need and the opportunity for invention. A company within a cluster can rapidly source the new software's, components, services, hardware and other elements necessary to implement innovations. Local suppliers and partners also benefit from all these developments, the complementary relationships involved in the whole process are made with participants in the vicinity, as they are easy to maintain [Porter and Stern, 2001]. Reinforcing these advantages for innovation is the sheer pressure — competitive pressure, peer pressure, customer pressure and constant comparison — that is inherent

within a cluster [Porter and Stern, 2001]. Hence, for people in software industry, it is important to be at the centre of already established clusters with a favourable environment for innovation. New firms are opening their R&D centres and offices in established companies' proximity and these already established ones are in Metropolitan Cities. Therefore, all the companies prefer metropolitan cities over others.

Proximity to Government

For a Software Industry, the Government plays a multifaceted role:-

It is one of the biggest clients for the industry. For instance, the projects under Digital India are the among the biggest urban and rural digitization projects. All the companies partnering for these projects will profit greatly.

Government acts as a facilitator or a catalyst as it brings in the projects from all over the globe for Indian Software firms.

It is also the Controller as all the policies and regulations are under the government. It chooses the reforms to be made, the policies that will affect the Software industry directly or indirectly, etc. In totality, all the industries are under the government's jurisdiction.

When we discussed about the support services and how the company prefers a service provider in their proximity and ease of approach, the same way it is with the government. The government will give the projects or understand the needs of the Software industry by observing and understanding those that are near it. It will discuss with the companies that are big and easily approachable. As the companies in the vicinity can cater to the needs of client earlier

than those that are based at far off locations. It is also easier for the government to track the progress of its project if the service provider is near it. The top Government offices are located in Metropolitan cities. Even the Politicians and the cream of bureaucracy resides in Metropolitan cities. Hence, being located in the Metropolitan cities, gives an edge to the company.

Image of the Company

In present work culture, what looks good sells more. Because of this there are so many advertising agencies, PR firms, office interiors firms, etc. working day and night. All this to create an impression on the client. Image branding plays a very important role for all types of companies. In a competitive market like India for Software firms, some firms give undeniably good perks to attract better employees. Their office premises are classy so the client feels that he has invested in a good reputed company. There are all kinds of comforts provided by the company for the employees and the clients to attract them like tennis courts, swimming pools, world class dining area, latest gadgets, etc.

As it is not possible for the foreign clients to know all the cities in India, mostly they are aware of the big and well-established metropolitan cities of India. Hence, company's image in mind of a foreign client get also associated with the city it is situated in.

Even here the proximity and ease of approach principle works with the clients. As these metropolitan cities have much better connectivity and approach with foreign countries in comparison to smaller cities, clients prefer them over other places.

Why fringe of the metropolitan cities than their centres?

As the land and its construction cost is comparatively cheaper in fringe of the cities, it is preferred over the centre. Also the amount of land required is huge for a software firm, hence, they prefer location in the outskirts of the city where space is not an issue.

The government has also constructed SEZ (Special Economic Zones) for these companies, where huge infrastructure, various tax exemptions and other benefits can be availed [Ministry.of.Commerce, 2009]. These SEZ's are mostly in the fringe areas of the metropolitan cities, which is also a compelling reason for the companies to move away from the city centre.

As per [Brezis and Krugman, 1997] during times of major technological change, leading cities are often overtaken by their new fringe areas. When a new technology is introduced, for which the accumulated experience is irrelevant, older centers prefer to stay with a technology in which they are more efficient. New centers, however, turn to the new technology and are competitive despite the raw state of that technology because of their lower land rents and wages. Over time, as the new technology matures, the established cities are overtaken. Similar is what is happening in this case. The fringe areas are taking over the city centre in case of new IT Technology field.

Why smaller cities are losing out? and What can be done.

Even though the government is setting up SEZ in smaller cities, providing incentives [Ministry.of.Commerce, 2009], the companies are preferring metropolitan

cities. Although the infrastructure is there but smaller cities do not have innovation centres, the universities are not producing enough knowledge for breakthrough innovation. We need those University-Industry Linkages and the conducive environment. For example, the striking innovation output of Israeli firms is not just due to more effective technology management, but also to Israel's favourable environment for development, strong university-industry linkages and a large pool of highly trained scientists and engineers [Porter and Stern, 2001]. In a knowledge-driven economy technical education in emerging industries is critical. Both public and private parties can be involved and collaboration between the industry and public educational institutions is important [d'Costa, 2006]. This university – industry relationships have been mutually beneficial to both. Firms that collaborated with universities were more innovative, introduced new products, developed new processes and emerged globally competitive [Siddharthan,]. Hence we should lay emphasis on better and robust university-industry linkages. These strong linkages can develop small cities into innovation hubs.

The public and Government of smaller cities will have to focus on things other than land, electricity and infrastructure, like security, heterogeneity, etc. in order to progress with the growing Software industry.

Conclusion

The findings indicates that the assumption that IT revolution has brought a more equitable development and growth for India in geographical terms was found false (in

case of choice of their office locations). The belief that the dominance of metropolitan cities would end and new smaller cities will emerge into limelight was found false. As the study indicates that the future belongs to the Metropolitan cities. The unnoticed advantages of establishing firm in the metropolitan cities outweigh the obvious advantages of locating it in smaller cities and towns. They will probably become the mega global cities of the future and hubs of IT Innovation.

If we want to change it and bring more equitable development in geographical terms then we really have to develop our smaller cities into vibrant global IT Hubs. For that, the above mentioned factors should be kept in mind while planning. Traditional thinking about the management of innovation focuses almost exclusively on internal factors — the capabilities and processes within companies for creating and commercializing technology. Although the importance of these factors is undeniable, the external environment for innovation is important too. We have to focus on creating external environment conducive to innovation [Porter and Stern, 2001].

The triple helix - Industry, Academia and Government should lay emphasis on better and robust university-industry linkages [d'Costa, 2006]. We have to develop atmosphere of tolerance in our cities, so that heterogeneity is welcome.

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References

- Brezis, E. S. and Krugman, P. R. (1997). Technology and the life cycle of cities. *Journal of Economic Growth*, 2(4):369–383.
- d'Costa, A. P. (2006). *Exports, university-industry linkages, and innovation challenges in Bangalore, India*, volume 3887. World Bank Publications.
- dqindia online (2015). Dq top20: Meet india's top 100 it companies. retrieved from <http://www.dqindia.com/dq-top20-meet-indias-top-100-it-companies/>.
- Florida, R. (2003). Cities and the creative class. *City & Community*, 2:3–19.
- Gertler, M. S. (2003). Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *J Econ Geogr*, 3(1):75–99.
- IBEF (April 2017). It and ites industry in india. retrieved from <https://www.ibef.org/download/it-and-ites-april-2017.pdf>.
- Kagami, M., Tsuji, M., and Giovannetti, E. (2004). *Information technology policy and the digital divide: Lessons for developing countries*. Edward Elgar Publishing.
- Lall, S. V., Koo, J., and Chakravorty, S. (2003). *Diversity matters: The economic geography of industry location in India*, volume 3072. World Bank Publications.
- Leamer, E. E. and Storper, M. (2001). The economic geography of the internet age. *Journal of International Business Studies, PalgraveMacmillanJournals*, 32(4):641–665.

- Ministry.of.Commerce (2009). Incentives and facilities offered to the sezs. retrieved from <http://www.sezindia.nic.in/about-fi.asp>.
- Nangia, S. (1976). Delhi metropolitan region: a study in settlement geography. A revision of the authoress' thesis, University of Delhi, 1973, with title: Patterns of rural settlements in Delhi region: a geographical analysis.
- Nelson, R. R. and Winter, S. G. (October 1985). *An Evolutionary Theory of Economic Change*. Belknap Press.
- Nisha (2015). Delineation of rural urban fringe of Indian cities: A case study of jammu city. *IOSR Journal Of Humanities And Social Science*, 20(4):105–115.
- Porter, M. E. and Stern, S. (2001). Innovation: Location matters. *MIT Sloan Management Review*, 42(4):28–366.
- Saxenian, A. (1999). Silicon valley's new immigrant entrepreneurs. *Public Policy Institute of California*, 32:1991–2005.
- Sharma, S. (2016). Rural-urban fringe: Concept, meaning and characteristics and other details. retrieved from <http://www.yourarticlelibrary.com/geography/rural-urbanfringe-concept-meaning-and-characteristics-and-other-details/40076/>.
- Siddharthan, N. University–industry collaborations asian experience.
- [Wikipedia,] Wikipedia. List of metropolitan areas in india, date of last revision = 26 may 2017 04:34 utc, page version id = 782321258. retrieved from <https://en.wikipedia.org/wiki/list-ofmetropolitan-areas-in-india>.

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