

Intra-metropolitan location for global production: Case of the IT Industry in Bangalore City

Rolee ARANYA

(Dr. Rolee Aranya, Department of Geography, Loughborough University, Loughborough, Leicestershire LE11 3TU, UK, R.Aranya@lboro.ac.uk)

ABSTRACT

This paper, based on qualitative research, presents the scenario of intra metropolitan location of firms of the Information Technology industry in Bangalore. A detailed study of the location history of eight Software and Information Technology Enabled Service firms, with varying attributes such as age of firm, type of work undertaken, ownership etc., is used to create a theoretical model of shifting location within the urban fabric. The findings discussed in the paper are compared and contrasted with those discussed in existing research on location of producer services, in order to differentiate patterns arising from firms which are engaged in globally outsourced production especially in the Information Technology sector.

1 GLOBALISATION OF THE INFORMATION TECHNOLOGY INDUSTRY

Internationalisation of the semi conductor production industry from the United States to East Asia, after the 1960s, was a cost cutting strategy in view of stiff competition from Japanese low cost production. The dispersal of production in this high tech industry has often been cited as the basis of contemporary globalisation. The US semiconductor firms that were, till the 1960s, concentrated in the Santa Clara Valley (later called the Silicon Valley) dispersed labour intensive production to East Asia to take advantage of the cheap skilled labour. The process initiated by Fairchild Computers in Hong Kong gradually spread to Taiwan, South Korea and Singapore (Henderson, 1989). Though the 'Asian Miracle' cannot be attributed to one single factor, 'East Asia succeeded, in part, because it provided strategic, selective and consistent support to industries which were in the best position to facilitate their economies' transition from a labour-intensive to a knowledge-intensive industrial structure' (Hanna et al, World Bank, 1996, p ix).

Success of the IT strategies of the East Asian economies acted as a demonstration effect for other developing countries as strategy to 'leapfrog' into an information society without going through the process of routine industrial growth. This has led to the creation of new technology hubs in the world which don't necessarily lie in the developed world. Regions within developing countries have been promoted as technology hubs and are being linked together in a network for global production of information technology and services. The Human Development Report of 2001 mapped the global network based on a study by the Wired magazine that ranked technology and innovation agglomerations in the world on the basis of a Technology Achievement Index which shows the disparity and marginalisation of economies from the 'IT revolution'. Being set in a developing country context, new regions of technologically advanced production such as Campinas and São Paulo, Brazil; Bangalore, India; Kuala Lumpur, Malaysia; Gauteng, South Africa; and El Ghazala, Tunisia have emerged as players in the global market.

After the East Asian economies, the phenomenal growth of the IT Industry in India is cited as a successful example of tremendous growth and opportunity. The IT Industry that expanded rapidly in India after the 1991 economic reforms has attracted the attention of the global economy for its potential for expansion and rate of growth. 'The industry generated 330 billion Rupees (USD 7.7 billion) in 1999, 15 times the level in 1990, and exports rose from USD150 million in 1990 to nearly USD 4 billion in 1999. One study estimates that this could rise to USD 50 billion by 2008, leading information technology to account for 30% of India's exports and 7.5% of its GDP. Employment in the software industry is projected to rise from 180,000 in 1998 to 2.2 million in 2008, to account for 8% of India's formal employment' (HDR, 2001, p37).

2 BANGALORE AND ITS ROLE AS AN OUTSOURCING DESTINATION FOR IT

Bangalore City, located in the southern State of Karnataka in India has acquired international acclaim in the last 10 –15 years and is often known by its many sobriquets such as 'Silicon City of India', 'IT Capital of India', 'Technology Hub' etc. Its transformation from the 'Garden City' and the 'Pensioners Paradise' to the 'Silicon City' has been a steep curve of change effected in the last decade. The size of the export related IT industry in Bangalore has increased from 13 firms with an export output of 1.19 million USD in 1991-92 to 1322 firms and an export output of 4099.66 million USD in 2003-04. The composition of exports in 2003-04 consisted of Embedded and System Software, Enterprise Application Software and Telecom (76%), IT Enabled Services or Business Process Outsourcing (13%) and Others (1%) (all data from STPI, Bangalore, 2004).

Texas Instruments was the first transnational software firm in Bangalore which set up operations in 1984. Unlike popular belief, the high tech industry is not a remarkable shift for the city. From the early 1950s the city was developed as a centre for scientific innovation, research in aeronautics and electronics and public sector industries that were linked to the research facilities. In addition to this, technical education institutions were located here even before Independence by visionary Maharajas of Mysore (princely state which the city was a part of). The already established scientific milieu, research tradition and skilled manpower from the educational institutions are cited as the factors of advantage for the city which facilitated its shift from a centre of public sector research and production to the global economy (Parthasarathy, 2000). With an established tradition of high technology production in the public sector and education institutions training highly skilled labour, the city was a natural choice for the location of the offshore software production industry (Lateef, 1996; Heitzman, 1999). In evidence of this, Texas Instruments, sourced its initial labour from the scientific pool available at the Indian Institute of Science in Bangalore (Parthasarathy, 2000).

The first transnational firm locating in Bangalore acted as a precursor to other such firms creating confidence in investors to locate in the city. Thereafter agglomeration economies were set in place for future investments. The nature of the industry changed gradually from research and development to execution of software designed elsewhere and most recently to back office services. As a result of the diversification, which is criticised by some as a 'moving down the value chain' (Saxenian, 2000; Parthasarathy, 2000), there is wide variety of firms located in the city. This fact is also illustrated by the composition of exports from the city. A significant development in the IT industry in Bangalore has been the growth of domestic firms such as Wipro, Infosys and Satyam Computers

into large multinational firms as a result of the boom in offshore business coming to India. It is these firms which have moved up the value chain and have taken up end user application products and services.

3 SELECTION OF FIRMS FOR STUDY AT INTRAMETROPOLITAN LEVEL

In order to get a wide mix of firms for the study of intra metropolitan location in Bangalore, the criterion adopted was based on a classification given by India's National Association of Software & Service Companies (NASSCOM). The classification groups firms according to their share in the total software exports from the country.

Segment	Share of Exports (2001 -02) %	Total Revenue (million \$)/ Characteristics	Selected Case Firm	Revenue of firm (2001- 02) (million \$)*
Tier 1 players	33-35	Above 200	Wipro Ltd.	418
Tier 2 players	33-35	20 – 200	I flex #	68
MNC backends	14-15	Captive Offshore Dev. Cen.	IBM	170
Small/ Startup players	14-15	Less than 20	V Moksha Mind Tree Info Quark	10 17 0.08
Focused Service Players	3-4	Focused on particular domain and deriving at least 50% revenue from	First Ring Acusis	8.5 Not completed year of operation at time of data collection
Product + Service Players	3-4	More than 50% revenue from software products	I flex #	

* Calculated at exchange rate of 1USD= Rs. 47, # Included in two segments because of nature of production

Table 1: Segments for Case Study Selection (Adapted from NASSCOM, 2002)

As illustrated above, the firms for case studies have been selected as per the export segments in the existing pattern of the industry in the country. The 8 case studies vary according to the level of revenues, ownership, and types of products. They are all export oriented firms with the majority of the production being for an external market. In that sense they may all be considered 'global firms'. All the firms have a considerable presence in Bangalore with their Head Quarters/ India Head Quarters located in the city. The oldest firm is Wipro Ltd. which began operation in the Software sector in 1983 and the newest being Acusis which began operation in late 2001.

For the purpose of clarity 'firms' in this paper will be distinguished by the nature of their production – *Software* firms include all such firms that undertake production of programming applications for end users or do production of applications/ parts of applications on contract by other firms. *IT Enabled Service*(ITES) firms are those firms that provide services enabled by communication technology for labour intensive back office operations. These operations may involve direct contact as in the case of Call Centers, Customer Service or may relate to back office functions for bookings, medical transcription etc.

4 LOCATION PATTERN OF THE IT INDUSTRY AT METROPOLITAN LEVEL

History of the IT industry in Bangalore in its present export oriented form can be traced to the mid 1980s. The firms as well as the business has since expanded and transformed with 4 major identifiable shifts brought about change in communication infrastructure, public policies and establishment of the credibility of India in the world market. The four phases of growth have been: Phase of initial MNC location (mid 1980 - 91), Phase of 'body shopping' firms (1991-96), Phase of Offshore Development Centres (1996-99), Phase of Product Development and ITES (1999-present).

Each of these phases has been characterised by location diversification in the city. In the first phase, the concentration of offices was in the CBD. This was the location where most office space was available and the rents were affordable to firms. In the second phase, when space was constrained in the CBD and the wireless technology used in the Satellite station required clear sight access for contact, dispersal of firms took place to the South and South East of the city. Secondary Business Districts (SBDs) also developed around the main CBD. In the third phase, after a crash in real estate prices and large over supply of space, high quality office space developed by the government in the form of an advanced Information Technology Park began to attract firms. Smaller firms which could not afford the high rents in the CBD, SBD and peripheral Technology Parks started to locate in residential properties which were converted to office space. Thereafter, the slowdown in the global business environment has made firms as well as developers more cautious. Large firms are still consolidating offices by opting for campuses in suburban locations. Developers are entering into more innovative lease agreements which ensure that space is leased and the construction is built to suit the needs of the lessee.

When the spatial typology of agglomeration of firms is analysed, four major areas of concentration can be identified each of which represents a unique urban pattern. These areas are:

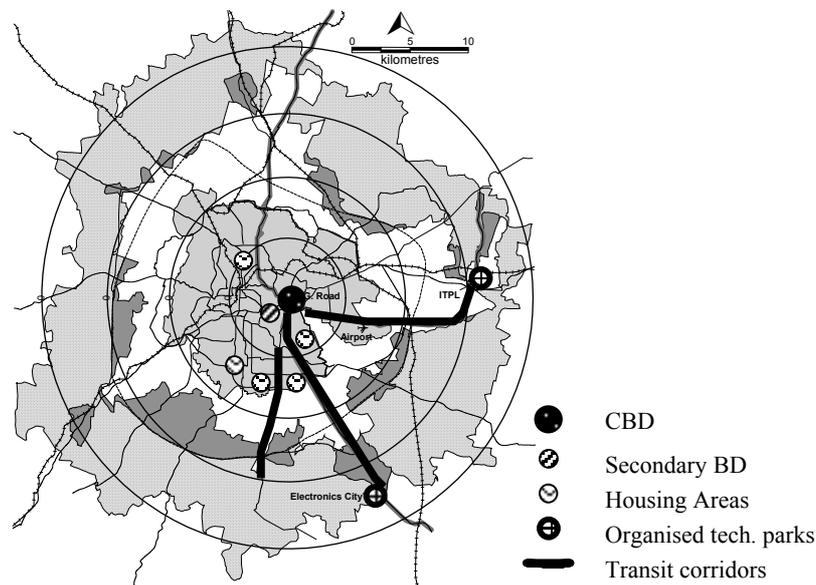
CBD and the SBDs

Municipal area in the South and East Quadrant

Along major highways leading out of the city (suburban)

Special zones or locations in the periphery (peripheral)

The CBD and SBDs are characterised by multipurpose office complexes which might be occupied by single or multiple tenants which are not necessarily IT firms. While the CBD is also a recreation and shopping destination, SBDs are primarily locations for offices and ancillary support services. Municipal areas in the south and east quadrant are planned residential neighbourhoods developed during the 1960s - 80s by the Bangalore Development Authority. Plots planned for single unit row housing have been modified by IT firms and are used as office space. The strip development along major highways leading out of the city mainly in the South and South East direction is a case of suburban agricultural land bought over by developers and converted to offices in the form of customised campuses for large IT firms. Special zones in the periphery are exclusive developments for the promotion of the IT industry and are linked with specialised incentives and infrastructure. Two existing Technology Parks have already been operational for the last 5-7 years and the State is in the process of extending the localised area of the Technology Parks in the form of an IT corridor. The following Graph 1 illustrates the location of areas of concentration of firms in the Bangalore Metropolitan Area.



Graph 1: Areas of Concentration of the IT Industry in Bangalore

Concentration of firms in the metropolitan area of the city, as well as the development of infrastructure for the IT industry has led to two distinct urban phenomena – these are *Multinucleation* and *Peripheralisation of Commercial and Retail Space*. As firms seek out areas for expansion and dispersed location, the city has changed from a single core CBD to multiple commercial and retail cores. In addition to this, new and high quality development of infrastructure and commercial space (linked to investment incentive) by the State has resulted in increased property prices in the periphery. Land values and rents in these Technology Parks are at competitive levels of the CBD, leading to an increased peripheralisation of offices and retail activities. The following sections of the paper illustrate these processes of urban restructuring with respect to spatial decisions taken in the selected firms. The sequence of spatial decisions taken by the firms studied is used to formulate a theoretical model of location of IT firms at an intrametropolitan level.

5 EVIDENCE FROM SELECTED FIRMS – SEQUENCE OF INTRAMETROPOLITAN LOCATION

From the eight selected firms, the sequence of location of only five are discussed here in detail.. Of these three are Software firms while two are ITES firms. Though the theoretical model proposed at a later stage incorporates spatial decisions in all the case study firms, they are excluded here owing to their shorter time span in the city and hence not displaying a diverse range of location change.

5.1 Spatial decisions and location change in Software firms

The first Software firm selected for discussion is **Wipro Technologies** Ltd. The firm belongs to large business group which diversified into Information Technology in 1983 with the setting up of a subsidiary. The city of Bangalore had been the Head Quarters of the business group for thirty years before the IT firm was set up. Hence, Bangalore was also its natural choice as Head Quarter for the new firm. Initially, the administrative office was located in the CBD and the Software Development Centers in three other Development Centers around the CBD. The period from 1985 - 95 was a testing phase for the firm and no major investment in property was made unless the certainty of growth in this sector was established. Till 1995, the firm had grown from 30 employees to

almost 2000 employees. These were divided by 300-400 persons in the 4 offices in the CBD. The period from 1995-96 brought about a shift from purely Onsite to Offshore software production by Wipro. Once the credibility of the firm had been established clients were willing to totally outsource the projects and increase the Off shore element in the projects. Since expansion in the CBD was restrained by the phenomenally high rental and lack of large floor space, the firm chose new Development Centers in the residential areas while maintaining the corporate office in the CBD. The first significant shift outside of CBD was to two offices in a residential neighbourhood in the Municipal Area. As and when large projects were acquired by the firm, a new space was leased in the proximity of the earlier Development Centers and an ODC (Offshore Development Center) established. The ODC is a model of functioning in which the Offshore Office becomes an extension of the office of the client and all systems are set up as replicas of the client. The office thus is required to be segregated from the other project offices either physically or through electronic security systems. Therefore, Wipro developed a network of development centers in the city and chose even later not to consolidate them in a single physical location. Subsequently, as the IT industry boomed in 1996 and the firm had established its brand name, Wipro started a phase of investing in property in the city. They undertook two major projects - one, to own and develop the largest Development Center in the periphery in Special Economic Zones, and two, land was purchased along the proposed peripheral Ring Road for a consolidation of the Corporate Head Quarters of all the businesses in a single location. In late 2001, both projects were completed and the Corporate Head Quarters of all Wipro companies were moved to the peripheral location about 12 kms. from the Municipal Area boundary.

To summarise the location history of Wipro Technologies in Bangalore, the firm which was set up in 1983, has moved towards a suburbanisation of control functions and dispersal of development centers with its expansion over the last 20 years. The last 4 -5 year period has been marked by a consolidation of the Corporate Head Quarters in the peripheral location of Sarjapur Road from the earlier CBD locations. The Development Centers on the other hand have been further expanded in dispersed locations in the residential areas with an addition of large centers in the special export promotion zones. In the current scenario, the largest development centers are located in the Special Economic Zones with two more Development Centers proposed in the same area. However, excluding the Development Center in the special zone and the CBD, the other 8 Development Centers and the Corporate Head Quarters are all concentrated within a 20 kms. radius of the city. The current size of the firm in Bangalore is 5000 employees and the total built space occupied is 122,629 sq.m.

The cycle of location of the firm can be divided into the following three phases:

- **Phase 1:** Initial location of HQ and Development Centers in the CBD and Secondary CBDs in Commercial Complexes
- **Phase 2:** Expansion of Development Centers into independent buildings and commercial space in Residential Area
- **Phase 3:** Decentralised Development Centers in various locations both suburban and Municipal Areas and centralisation of Corporate Head Quarter in suburban location.

The second Software firm is the wholly owned subsidiary of **IBM** International. IBM which has been in the city for the last 10 years has a number of large offices all over the country but still decided to locate its Head Quarters for the India operations in Bangalore. In 1993, when it started operation in Bangalore, the firm came in as a joint venture between the Tata Group (Large Indian business conglomerate) and IBM International. The firm then occupied an office space owned by the partner firm in a prime commercial complex near the Airport. This office remains until today the Registered Office of IBM India. In 1997, the stake of the Tata Group in IBM was reduced to 20% and IBM Global Services was extended to India. This was the time that software development was taken up in India and the firm leased two office spaces for Development Centers, one each in the CBD and the secondary CBD. In 1998, the ownership was transferred completely to IBM International and the firm became a fully owned subsidiary. At the same time, in order to expand the IBM research and development located in Bangalore, the firm made a decision to consolidate its space in the city. A long term lease agreement was made with a builder and landowner for a space about 10 kms. from the CBD along the corridors leading to the Special Economic Zones. The agreement involved the renovation of an existing building to suit the needs of the firm and a special agreement for future expansion in the land abutting the building. Though the firm had two options for sites for a consolidated campus, the second one being along an alternative corridor at a distance of about 15 kms. from the CBD, the current site was selected due to the easier terms of lease agreement which involves minimum permanent commitment and the choice of employees to stay closer to the city. After the crash of the IT global business, the expansion plans for the construction of a large campus on the site were put on the back burner, but the development centers were mostly moved out to this single consolidated space. Though the office near the Airport and the other two city offices are maintained as a back up space, the Development Centers and the Head Quarters are concentrated in the suburban location.

Summarising the phases of relocation of IBM, the firm which was initially testing the waters in the Indian market, came in as a joint venture with an Indian business group and automatically located in space available with their partners. This prime commercial building is at a distance of 2 kms. from the Airport and about 10 kms. from the CBD. As the firm expanded from purely marketing of its software and hardware products to software development the Development Centers were located in prime commercial space in CBD. The next planned move to relocate came with the change of ownership to a 99% owned subsidiary of IBM International and the need to consolidate its offices in a single location was felt. The importance of creating a new image of the firm in India as a software and research center of the IBM Global Services was another reason to consolidate offices (Interview Rajiv Mathur, Manager Administration). Though the firm maintains two other offices in the city, the exclusivity of projects for a single parent firm do not necessitate dispersed Development Centers. The alternate office space is maintained as sales and marketing centers and alternate location in case of disaster. The firm has mostly concentrated on locations near the Airport and now moved to a single user office along the highway but still within the urbanisable boundary of the city. IBM India has grown from 40 employees in 1993 to 3500 employees in 2002 occupying a total built up space of 22,500 sq.m.

The shifting of location of the firm can be distinguished into three phases:

- **Phase 1:** Initial location near the Airport in leased office in a Commercial Complex
- **Phase 2:** Expansion into prime Commercial Complexes in the CBD and Secondary CBD locations
- **Phase 3:** Relocation to a location along highway into a Single User Occupied Building while original office is maintained.

The last Software firm being discussed is **I flex**. I flex as an independent firm which broke away from the original firm called Citicorp (Subsidiary of MNC Citi- Group) was set up in Bangalore in 1993. From working exclusively on banking related software for the Citi-Corp, the firm was set up as a joint venture between the parent firm and capital raised by the former employees of Citi-Corp. The ownership of the firm still lies 40% with the Citi group but 1998 marked the final emergence of I flex Ltd. as an independent firm selling their banking related software. The original location was a leased office space in a prime Commercial Complex in the CBD. This office was already available to the firm as a part of Citi-Corp. However, with the expansion needs and the rapid growth of the firm by 1998, additional space for the second Development Center was leased in a Commercial Complex in the Secondary CBD. In 1998, the Head Quarters of the firm was also moved to Mumbai to achieve proximity to the Financial Institutions. In the next planned move of the firm, a site has been purchased in a suburban locality which lies in the East, near the Special Economic Zone. The construction of a 12,500 sq.m. building and campus has already been initiated and the scattered Development Centers as well as the Head Quarters is expected to be moved into the new campus by the end of 2003. In the current pattern, the work in the Development Centers is divided on the basis of consultancy projects and product support and customisation of the banking software that the firm markets. The need for maintaining the separation of projects is critical in view of the competition that exists among the clients. The physically segregated Development Centers are used to secure the projects. Even within the campus being constructed for the firm, blocks of buildings would be so designed that the projects can be physically and electronically segregated. The firm has an employee base of 1000 in Bangalore and occupies a total built space of 5,000 sq.m. currently (excluding the campus).

As with the previous two cases, the locational cycle of I flex leads to ultimate suburbanisation and a consolidation of activities in a single campus. Though Bangalore is not the corporate head quarter of the firm once the campus is constructed then Administrative Head Quarter will move to Bangalore. The phases can be distinguished as:

- **Phase 1:** Initial location in a commercial complex in the CBD
- **Phase 2:** Expansion into an additional office space in the secondary CBD
- **Phase 3:** Consolidation of space in a Campus in a suburban location

5.2 Spatial decisions and location change in ITES firms

Having discussed location decisions of 3 software producing firms, I discuss here the same for two ITES firms. There is a clear distinction of locational requirements for production of Software and Internet enabled Services. ITES firms mainly consider two factors that dictate a trade-off for location:

- Rent plus Transport cost/ employee
- Additional costs for speed and reliability of communication networks

Among the Case Studies, **First Ring** and **Acusis** are both Service Firms which provide IT Enabled Services very much dependent on a high speed internet connectivity. The basic infrastructure for these kinds of firms is now available throughout the city with newly laid out Fibre Optic Network and yet they opt for totally opposite locations for their facilities. First Ring is located in the Technology Park almost 15 kms. from the Airport and Acusis is located near the CBD. Differences of locational choice exist between the firms in similar revenue segments and product profiles.

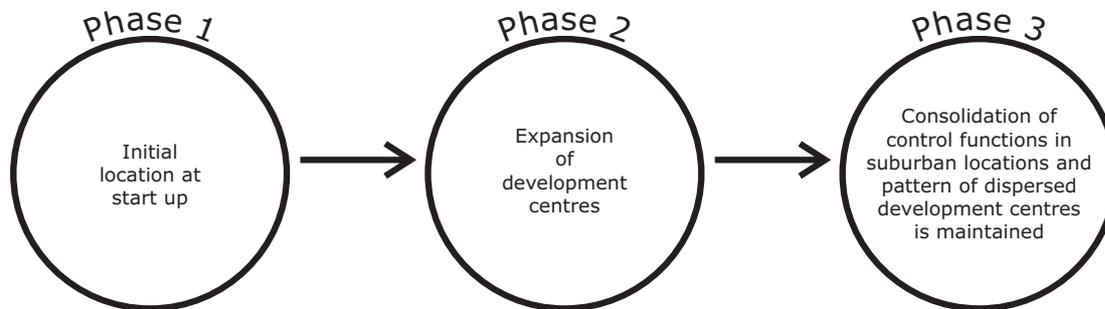
Comparing the locational choices of Acusis and First Ring, the influence of business models on locational choice is illustrated. Acusis which is a Medical Transcription firm relies on high speed communication to get voice data from its clients in the US, which are large hospitals, that has to be transcribed and sent back before the doctors come back to work the next day. The speed of communication and the transcribers is the key to sustaining the business. Similarly, First Ring is also a service firm which offers back office operations such as airline bookings, customer support, call centers etc. which have short turn around times. Both the firms have parent firms which are located in the US through which work is channelled to the main service centers located in India. However, First Ring, prioritising the quality of infrastructure, chose to locate itself in the Technology Park (20 kms. from the city center) and transports its employees working in 12 hour shifts from all over the city to this peripheral location. According to the Personnel Manager of First Ring, the cost of transporting the 900 odd employees is made up by the fact that the communication facilities available in Park are the best in Bangalore and enable high speed business.

On the other hand, Acusis has chosen to locate itself on Lal Bagh Road which is almost in the city center. The firm is based on a model of 'Home Based Transcription' (HBT) which enables the employees to get work at home through a high speed communication network and be able to transmit the output to the head office via the same network. The firm aims to employ about the same number of employees as First Ring by end 2003, but they would not be required to travel daily to the office thereby saving huge costs which have been channelled into having a smaller but centrally located office. The Finance Manager of the firm stated that the central location was selected to ensure that in case the employees involved in the HBT needed to contact the office, they could do so without having to travel large distances thereby saving time and money.

The contradiction in the above locational choices lies in the fact that one firm prioritising high quality communication networks opts for a high rent and high transport cost location whereas a similar firm opts to locate in a smaller and cheaper office in the city and employs technological solutions to minimise transport costs.

6 THEORETICAL MODEL OF INTRA - METROPOLITAN LOCATION

Though there are differences among the firms and all of them are not at the same level of business development, a three phase process of location and relocation can be identified. It is represented in the following Graph 2.



Graph 2: Theoretical Model of Location Change in IT Firms

In the *first* phase, firms select an initial location in the city. The choice of initial location can be dependent on a number of factors. Among the cases studied initial location is dependent on the **ownership of the firm and its existing size**. Large MNC firms who locate initially to explore the market have an image as well as higher affordability as compared to domestic owned local Start Up firms. Image considerations in the market are not an important consideration for Start Up firms having just entered the market. The second factor which had an influence in the case of IBM as that of **local partnerships and initial contacts**. The location office in this case was dictated by the availability of space with the local partners. Not wanting to make immediate commitments in the city, the existing office space available with their partners was selected for initial location. I flex also occupied space available with its parent firm. The **size of initial capital investment** backing the firm is an obvious determinant of the nature and quantum of space selected for initial location. Established firms such as IBM or those backed by large industrial groups such as Wipro have more flexibility to select prime locations in the CBD than Start-ups such as Infoquark. For ITES firms, initial location is also a decision based on a **tradeoff between quality of infrastructure and the cost of transport** for the large number of employees for round the clock shifts. The small profit margins in this low value added sector are very sensitive to marginal cost increases with factors such as the speed of connectivity and the cost of transporting employees to destinations where the infrastructural quality is high.

In the *second* phase, firms expand their Development Centers and start to assume a multiple office patterns in the city. While the original office is retained and most control functions are not moved, the production centers or Development Centers are either expanded or multiplied. In some cases the control functions or the Head Office is also moved to a more prestigious location. This is the phase where a separation of functions within the firm starts to take place. Shift to the second phase takes place when the firms **shifts from onsite production at the clients office to an offshore production**. Offshore production means that project teams would be constantly stationed in the city and more space is required hence the expansion of Development Centers. Once the firm has established its reputation in market and clients can outsource projects completely in offshore destination then the employee strength of firms is increased. The **increase in employee strength** creates normal expansion needs adding to the space requirements. Increase in employee strength in the case of I flex and Wipro was also related to **organisational reorganisation**. As Wipro expanded its internal organisational structure was split into two separate divisions which were handling different markets. This created a need for multiple offices and hence the need for expansion.

Since firms create a specialised niche in the market, they sometimes handle projects of competing clients. For example, I flex which specialises in banking software or Wipro which is specialist in Enterprise Resource Planning (ERP) and E -Commerce, often have projects from firms which are competitors in their own consumer markets. To maintain the levels of project security required to attain client confidence a physical separation of work is required. **Separation of projects from competing clients** thus becomes an additional factor for maintaining physically dispersed Development Centers. This fosters the creation of a network of offices of single firms within the city. The dispersal is maintained either in physical terms or electronically if the Development Centers are consolidated at a later date.

In the *third* phase, firms consolidate control functions and some key Development Centers in user specific campuses while a dispersed pattern of Development Centers is maintained. Because only suburbs and peripheral locations offer the possibility of large campuses these are located outside the city with a high quality of firm owned infrastructure. A campus which was initiated by Infosys (second largest IT firm in India) has become a matter of prestige. Facilities such as large conference halls, video conferencing, employee entertainment facilities, firm owned satellite linkups, complete captive power backups, incubators etc. have become symbolic of a firm's success. Thus **upgraded infrastructure and image** becomes an important factor in this third phase of firm relocation. The motivation behind the suburban and peripheral location for campuses is that large consolidated space is available at an affordable price. The suburbs offer a **good environment** and an option to escape from the over crowded central cities.

Firms such as Wipro and IBM which have reached this stage in their life cycle opt for user specified campuses which they do not necessarily have to own. Like IBM innovative lease agreements are possible with builders. The selection of location for the campus

is based on a **relative proximity to other Development Centres**. To maintain the network of offices in the city, firms set up Local Area Networks and centralised servers where project information is saved and accessed. Despite that proximity adds to the convenience of movement between offices for face to face interactions. As reported by the Manager, Administration Facilities of Wipro Technologies, the functions within IT firms are divided into three areas i.e. *technology, communication and enterprise*. Technology areas are the Development Centres where actual production takes place. Communications is the functions which are required to manage interaction between dispersed offices and Enterprise is related to management and administrative functions. The consolidation and dispersal of these three categories of functions differs from firm to firm but in a relative consolidation takes place in Enterprise and key Communication and Technology functions in a campus.

The maintenance of the dispersed pattern in the city even though some functions are centralised is owing to the earlier discussed factor of maintaining project security as well as a second factor of obtaining **maximum taxation benefits**. Under the Software Technology Parks (STP) scheme of the Central Government individual premises are declared as 100% Export Oriented Units making them eligible for Sales Tax concessions. If a multiple office network is maintained projects can be moved around within the intra city network depending on the level of export segment in the output. Not all premises of firms are registered as STPs and hence are not obligated to achieve the stated goals for export. The logic of multiple offices in the city was also explained by a need to **prevent disruption due to disasters**. In view of the September 11 attacks in the U.S., firms have become conscious of the need to have multiple offices which are able to take over operations in case of destruction of any single office. Backups of key information and multiple links in networks are facilitated by the multiplicity of offices. This was a very significant factor in the case of IBM which has adopted this policy in its global offices. Wipro on the other hand adopted measures for 'disaster recovery' being under pressure from its clients.

The three phase process of location change observed among case study firms can be described as a **dual process** where firms have varying tendencies to both disperse from city cores and to centralise in other locations. The formation of secondary business districts within the municipal area as well as a concentration along traffic corridors and nodes in the periphery, though planned, shows the need to disperse in the former and centralise in the latter case. In a future scenario it is expected that as firms attain a certain size they would increasingly disperse from central city locations to campuses, technology parks and other peripheral real estate development.

However, not all firms among the case studies have gone through the three phases described above. Wipro and IBM which have both been in Bangalore for more than 10 years have shown all three stages. I flex is in the second phase and planning to relocate to a campus soon. Infoquark which is the newest Start Up is still only located in its first office. The factor of where the firm is placed in its **life cycle** is an important determinant of its pattern of location in the city. The ultimate peripheralisation and suburbanisation observed in firm location at city level is produced by firms which have had a certain level of growth over time in order for them to plan campuses and user specific, single owner occupied buildings.

7 EXISTING KNOWLEDGE ON LOCATION OF PRODUCER SERVICES: PATTERNS OR DIFFERENCE ?

Discussing implications of the theoretical model suggested above with respect to existing knowledge on location of producer services, parallels can be drawn to the Multinucleation Model put forward by Daniels (1985). The model suggests an evolution of a multinuclear city pattern through a series of location and relocation by firms from the early 1960s to the 80s in urban areas of America. The process of relocation of producer service firms away from the city centre has resulted in a dispersal of back office functions to suburban location with major control functions remaining in the CBD. A further centralisation of firms in suburban locations has led to the formation of 'suburban downtowns' (Healy and Ilbery, 1990). The 'seed pod model' put forward by Schiller (2001) explains the dynamics of dispersal tendencies from the centre and suggests a cyclical process whereby firms initially locate in prime central locations, expand and then disperse to suburban locations as it becomes too expensive to expand in the CBD. The space vacated by dispersed firms is then taken up by other firms. However, even Schiller points out that certain critical functions such as Finance, Government, Corporate HQs are retained in their original locations. Their reasons range from their ability to pay to the benefits they attain from clustering in the city centre.

Even though a similar pattern of multinucleation, phased shift of location and clustering in peripheral locations can be found among IT firms in Bangalore, a critical difference can be identified. Though firms choose initial locations in the city centre or other locations within the major urban fabric and they follow a path of expansion to finally consolidate in large campuses in the periphery, it is not the management and control functions which are retained in central locations. Unlike other producer services firms, IT firms do not have as many forward linkages to the local urban context and hence do not need to maintain proximity. It is the management and control functions, usually located in the Head Quarter which are consolidated in suburban and peripheral locations. Development Centres which require extensive and affordable space as well as proximity to residential areas in order to enable short commuting distance for the majority of the technical work force are retained in intermediate locations in the municipal area. Higher management staff and senior technical employees have higher mobility and hence can travel larger distances to suburban campuses where strategic control functions and selected Development Centres are consolidated.

The two main aspects of variation from existing theory on urban patterns of office location are: -

- The conversion of residential buildings and land to commercial use for these Development Centres in high income planned residential areas
- The possibility of relocation of strategic control function to suburban locations

In sum, the urban structure created is similar to those discussed in the Multinucleation Model and Seed Pod Models but the distribution of functions among the core city and suburban locations is different.

In contrast with existing theory, strategic functions of IT firms do not require to retain central city locations owing to their export oriented production. Firms which aim to target local markets still retain CBD or intermediate location offices. Other firms after attaining a certain size and having established themselves, seek to consolidate their strategic functions in campuses and single owner occupied buildings. However, even among IT firms, differences exist for IT service firms such as call centers and medical transcription. These firms having predominantly back office operation for a parent firm located in another country have even lesser need to locate in the CBD or even intermediate locations. Their decision for location is based on a trade off between rents and the cost of transporting their larger labour force for round the clock operation. Firms which prioritise larger offices with better communication infrastructure locate themselves in peripheral areas. The limited administrative and strategic functions are still bundled with the service production functions. On the other hand, a completely divergent location choice is made by firms which operate on home based workers and would like to minimise transport cost by locating a smaller but centralised office in the Secondary CBD.

In terms of the spatial form produced and the rent curves, high rise office development in the peripheral IT park has been a State led initiative and more related to establishing a certain image for the city. Private development in the suburban corridors and specialised peripheral centres is still low rise and low density. Land values in the peripheral office developments, though seem to converge with CBD prices. The spatial landscape of Bangalore shows a similar contrast of high rise buildings as compared with the low rise urban fabric. Peripheral high rise development and campuses show another level of contrasts from the surrounding agricultural land and informal urban development as that discussed in the account of American suburban growth but at a much different. Unlike European cities, Bangalore has no strict controls on redevelopment of the colonial CBD and conversion of old structures to high rise office blocks to gain maximum advantage of high land values is common. High rise and high land value in the periphery however, has been artificially created by the higher quality of space and infrastructure investment by public agencies. Planned infrastructure projects such as the Infotech Corridor are likely to increase the pressure on land in the periphery further and create a situation of suburban enclaves of high tech office spaces - a dispersed 'global business district'.

In terms of determinants of location at each phase, existing theory pays great significance to the role of contact patterns of producer service firms (Daniels, 1979, 1985; Goddard and Morris, 1976; Gad, 1979), their substitutability by developments in telecommunication (Daniels, 1985; Illeris, 1996; Beyers, 2000; Castells, 1989) and to a certain extent on organisational change (Dicken, 1998; Gottmann, 1983; Marshall and Wood, 1995; Illeris, 1996). The latter two streams of theory developed after the 1980s in response to the technological revolution brought about by the internet and personal computers and a consciousness of the 'Multi National Corporation' as the centre of globalisation. More recent developments in theory have highlighted 'alternative' factors other than communication and contact patterns as determinants of office location (Coffey, 2000; Leslie 1997; Zhou, 1998).

Findings from the study indicate that in service industries such as the IT industry in Bangalore, factors which are internal to the firm influence decisions more than external influences. However, a clearer distinction of factors with respect to existing theory can be made. The following Table divides the factors at each Phase of location in four categories - Communication factors, Organisational factors, Policy factors and Value preferences.

Communication factors relate to the considerations regarding physical transport and the substitutability of contacts with advanced technology. Organisational factors relate to changes and determinants which are related to the way a firm operates. Policy factors are those incentives and spatial policies which the firms avail of and are subject to in the urban context. Value preferences are socio cultural aspects of location such as the aspiration to a certain image associated with office space and preferences for a better urban environment.

	Communication factors	Organisational factors	Policy factors	Value Preferences
Phase I	tradeoff between quality of infrastructure and transport cost for ITES firms	ownership of the firm and its existing size size of initial capital investment local partnerships and initial contacts		
Phase II	separation of projects from competing clients	shifts from onsite to offsite production increase in employee strength organisational change	maximum taxation benefits	
Phase III	relative proximity to other Development Centers	upgraded infrastructure consolidation of control functions	maximum taxation benefits	image prevent disruption due to disasters better urban environment

Table 2 : Theoretical classification of determinants at each Phase of location

Goddard (1975) put forward the idea of dividing contacts into functional interdependencies (contacts between offices), spatial structure (contacts between employees within a firm) and physical movements of individuals and materials. The findings from the cases suggest that in export oriented IT firms contact within the firms (spatial structural contacts) and to certain extent physical movement of individuals (for ITES firms) form important factors in location decisions. In Phase II, Development Centers are dispersed to sever contacts among employees working in conflicting projects to maintain intellectual security whereas in Phase III a proximity of the strategic control functions and Development Centres is designed to maintain ease of physical movement between the offices. A balance between dispersal and proximity is preferred such that a physical separation is maintained but swift transport for necessary face to face contact for internal meetings is possible. However, functional interdependencies do not play an important role

as other partner firms and clients are located all over the world. The work which is outsourced in Bangalore is routine operations of a larger multinational firm or specialised service outsourced by manufacturing firms, the need for direct regular contact is minimum. Of the office contacts identified by Thorngren (1973) as programmed (routine), planning (implementation of action) and orientation (strategic decisions to maintain competitiveness), programmed contacts with the parent firm are maintained through advanced telecommunications while less frequent planning and orientation contacts are undertaken by means of video conferencing or actual international travel. While analysing the relocation potential of firms in Stockholm, Thorngren suggested that functions of programmed and partly planning contacts could be decentralised. However, the developments of information and communication technology have enabled the decentralisation of programmed functions not only to suburban locations but even outsourced to global locations. Therefore for these firms which are mainly involved in programmed contacts with the parent firm and clients, intrametropolitan contacts are limited to maintain backward linkages and internal organisational contacts among employees of the same firm.

Reflecting on the role of technology in replacing face to face contacts, empirical studies suggest that with the increasing complexity in production networks which have tendency to be globally dispersed the significance of face to face contacts for strategic decisions is only increasing (Storper and Venables, 2002). Beyers (2000) finds that though means of communication and information exchange have multiplied, these only supplement the core role of direct contact. The findings from the thesis point to a confirmation of this aspect of intra and inter firm communication. Even though firms in Bangalore can disperse Development Centres in various locations in the city as well as globally, strategic management and decision making functions are consolidated and centralised in selected locations. Intra firm contacts with Development Centres are maintained through internet communications and information stored and distributed through centralised servers, yet the Head Quarters of large firms such as Wipro has been centralised further. Since the case study firms have limited forward linkages in the local urban area, contacts external to the firm are maintained through the use of communication technology such as e-mails, telephone, video conferencing and infrequent international travel by project teams and decision makers.

From the Table above it can be seen that organisational factors form an important determinant of location change in the case study firms. Theorists such as Dicken (1998) and Marshall and Woods (1995) have suggested that in the new 'service economy', organisations are more flexibly organised as are production processes. Transnational and Multinational firms that form the basic building block of a service economy and of post fordist production operate according to a large number of models (Dicken, 1998). Large IT firms like Wipro, are organised in a way that 'each unit performs a separate part of the production sequence and units are linked across nations in a chain like sequence'. This is the model which forms the basis of operation at an intra city level as well. The most important factor of location change is the shift from 'onsite to offsite production' whereby a firm no longer sends project teams to the clients office but dispersed production centres are established which are responsible for disaggregating the production sequence. This creates the need in Phase II for spatially dispersed Development Centres which are linked to a centralised communication network. Therefore, it is organisational change which is responsible for expansion of the firm in a city and shift toward a 'multiple office pattern'. Organisational changes such as mergers, acquisitions, break away firms etc. have also been factors behind change of location in the case study firms.

In Phase I and III, it is direct organisational demands that determine location. While in Phase I the affordability for prime space and access to space already available to partners are determined by the nature and ownership of the firm, in Phase III, firms size also determines the level of infrastructure required and the complexity of strategic decisions to be made. The choice for a campus which consolidates all management and strategic functions is made when a firm attains a certain size and requires dependable, secure and high level of infrastructure to manage its complex global business network. Other factors such as 'image' and other value preferences also play a part in Phase III.

Recent developments in theory find that as proximity constraints are relaxed due to a large number of factors, 'other' determinants begin to play an important role in office location. These 'other' determinants may be quality of life, taxations and regulation, life cycle of firms, initial contacts, image considerations of Metropolitan Philadelphia (Bondenman, 1998); site attributes and establishment attributes in Montreal (Coffey et al., 1996); sub contracting by federal agencies in Washington D.C. (Campbell, 1997); historical forces and existing physical structure in Milan (Airoldi et al, 1997); creative milieus among advertising firms in New York (Leslie, 1997) and ethnic enclaves and connections among chinese producer service firms in Los Angeles (Zhou, 1998). From the findings of this research, there are two kinds of additional factors which play important roles in determining location - policy factors and value preferences. The multiple office pattern opted for by firms of relatively larger size which reach Phase II in the firm life cycle is related to the incentives offered for sales tax exemptions associated with specific registered production units. The incentives are also subject to export targets which the firms have to state and achieve annually. Hence firms maintain multiple offices such that they can allocate projects to units based on their export/ domestic market classification. In addition to this location policies and incentives of the State Government have had an impact on the selection of sites for campuses in the periphery as well as the supply of space by developers. Through planned developments such as the Information Technology Park where location is linked to infrastructure and fiscal incentives, agglomeration at a city level has been influenced.

But apart from that there are some value preferences such as 'image' and 'better urban environment' which firms make at advanced stages of their life cycle (mainly Phase III). While 'image' of the firm is a consideration for subsidiaries of MNCs, even at initial location, it is more related to affordability of prime space while smaller startups which are not backed by large investments or existing businesses are more involved in establishing their reputation in the market. Image becomes an important factor at Phase III when a campus or a single owner occupied office building is opted for. Image building through the campus is an important consideration for firms that have achieved a competitive position in the global market. Other value preferences such as a 'better urban environment' in peripheral locations also become important at this phase as the firm can rise above constraints of affordability. A suburban location where the firm can establish an office with secure and dependable infrastructure, recreational facilities, synergistic work environments and an image of success is an option exercised to escape the overcrowding of central city locations.

8 CONCLUSIONS

To summarise the discussion on determinants of location, the difference in nature of work and services produced by IT firms and other producer service firms, there are some basic differences in the factors influencing location. Unlike the findings from existing theory and empirical research, the stress is not on factors of communication and face to face versus indirect contact, but on aspects relating to intra firm communication and organisational factors. Since firms located in Bangalore have very little local market orientation, their inter firm contacts are more focused to their parent or subsidiary firms located elsewhere. The firms have more backward linkages with the city than forward linkages. Their primary interaction with the city is in terms of availability of skilled labour. In such a situation, it is organisational and other factors such as policy and value preferences that determine their location at an intrametropolitan level. In a very simplified version, firms locate in the city, expand and multiply offices, expand further and consolidate selected functions in peripheral locations.

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