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Abstract

By adopting a historical comparative perspective,this paper assesses the role of state (both national and subnational) in industrialisation through the growth and policy experience of an 'achieving' sector, the information technology (IT) industry. An attempt has been made to identify key constraints facing the IT sector in a highly competitive global market scenario. The state had created (and continues to do so) an enabling platform by building up a world-class infrastructure base of learning, education, training and networking. This, subsequently, contributed immensely towards India enjoying a dominant position globally. There have been, however, serious lapses in policy that never prepared the sector to engage in hardware manufacturing and India still stands at a lower stratum of the value chain. An interesting development in the sector has been the distinctive role played by a few proactive subnational governments that recognised the emerging opportunities this sector could provide through participation in both the global as well as growing domestic markets.

Keywords : State Policy; Information Technology; Outsourcing; Computer Software; Economic Reforms; Regional Industrialisation

JEL Classification : L63; L86; L22; L88; L53; O38; O25; and R58

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The Context

The case for strategizing economic progress mainly through industrialisation and concomitant urbanization that would spurt national income and employment had been persuasively argued early on by the 1940s (Rosenstein-Rodan, 1943). Subsequently, the post-World War II period witnessed a large body of literature emanating from economists and development practitioners engaging in discourses as to when, how and how long state should intervene in the industrialisation process of a nation. A number of developing countries including Thailand, Malaysia, South Korea and China had designed integrated national policies to build local/indigenous technological capability in those industrial sectors which they deem critical to their progress, as for instance, steel, aviation, petro-chemicals, electronics and energy (Ramesh and Weiss, 1979). In case of the technology-intensive sectors in the developing economies the state's role has been particularly enhanced as it is expected to play the *dual* role of facilitating technology access (through trade negotiations) and help building national/subnational technology capacity by investing in enabling infrastructure as well as actively promoting an innovative ethos in the citizenry. The strategy and approach of the state in achieving the aforesaid dual objectives in a dynamic context would largely determine the maturing of a certain sector over the decades. This is not to undermine the contribution of independent market-responsive actions of the private enterprises which often strengthens a sector's performance beyond the firm level.

With this brief contextual backdrop, this paper attempts to examine the role of the Indian state (both national and subnational) in enabling the information technology (IT) sector in capitalising on the opportunities and in dealing with challenges during the last quarter of a century or so. The choice of the sector could not have been better as the Indian IT industry

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has grown phenomenally and its engagement with the global market has been acknowledged widely. Taking off with the fast globalization of the software industry and increased demand for software following the personal computer (PC) revolution of the 1970s the Indian IT industry has responded to the sustained demand for networking in the 1980s. The commercialization of the internet in the 1990s and other maintenance opportunities subsequently have prompted rapid growth of the industry which, as Parthasarathy (2004a) observes, took advantage of the contemporaneous changes in the political and institutional arena, both globally as also at home. This industry has earned a distinction of being one of the few 'achieving' sectors in India during the post-reforms period. As would be detailed later, this sector has emerged as a globally competitive industry especially in IT enabled services (ITES). It has generated large scale employment opportunities, encouraged innovation and has remained largely non-polluting.

The paper has been organised as follows. Section I delineates the growth and performance of the IT sector in India. Section II provides a critical assessment of the various policy initiatives taken by the central as well as state (subnational) governments. Section III discusses key constraints and challenges facing the sector in a highly competitive global market scenario. Section IV summarises analyses and arguments. The scope of this paper, however, does not include state initiatives in e-governance and e-commerce.

Section I

Rise of the IT Industry in India

The presence of a nascent IT industry could be found during the early years of post-Independence India although it remained an insignificant sector for long. As may be surmised from Figure 1, even by the early 1990s the sector had achieved little to underscore its contribution to the national industrialisation process; even as the state had made immense efforts to build and nurture such knowledge infrastructure that proved the bedrock on which the IT industry prospered during the post 1990s period. This exemplary role played by the state early on must not be undermined. Nevertheless, it has been argued that in keeping with the growing pace of trans-nationalization of business and trade the state had played a proactive role at least during the decade since the mid-1980s (Evans, 1995; Heeks, 1996; and Joseph, 1997). A particular mention may be made of the strong emphasis placed on electronics and telecommunications as a discipline which did pick up rapidly since the early 1980s (in terms of number of seats in public engineering and

technical education/training institutions).[3] Moreover, with the economic reforms formally in place by the early 1990s the preference by global majors for India as an important destination of business process outsourcing (BPO) and knowledge process outsourcing (KPO) had been established. India entered the global IT market by capitalizing on the demand for low-cost but high-quality programming skills (Parthasarathy, 2004a). The establishment of a series of Software Technology Parks of India (STPIs) across several cities during the 1990s (and beyond) was an exemplary initiative of the state akin to affirmative action in promoting an industry.

Besides a favourable domestic policy climate and a highly attractive export promotion scheme, a host of external factors were crucial for the growth of the software industry (Sharma, 2015). Several state-promoted technical and other professional institutes of higher learning contributed to the massive rise in the IT-ITES trained graduates and professionals by introducing various relevant courses in their curricula. The Import-Export Policy (1983-84) and subsequent Foreign Trade Policies of 2004-09 and 2009-14 had clear emphasis on promoting exports from the IT sector. These were supported by the FDI Policies since the early 1990s and initiatives to engage Special Economic Zones (SEZs) for the sector's production for the external markets have indirectly incentivized the IT industry. Deregulation of telecom sector was a big boost for the IT revolution in India. Labour reforms introduced in the recent past have been preferred by owners of capital in the sector as it facilitates easy hiring and firing.

However, as Figure 1 depicts, the growth trajectory peaked strikingly since the turn of the new millennium with the impressive performance of the sector in terms of levels of value of output. This signalled a remarkable transformation of this sector attributable in a large measure to the Indian IT sector's matchless solution to the unprecedented global IT crisis best known as the *Y2K problem* or the *Millennium bug*.[4] It is widely acknowledged that the Indian IT business grew manifold on the basis of the competence displayed in solving this crisis and, subsequently, global outsourcing by prominent MNCs to address financial, legal, logistics, retail and health services came pouring in to the Indian IT sector. In a sense, the Indian strategy and experience with software services is not very different from that of Taiwan or South Korea in manufacturing (Parthasarathy, 2004a).

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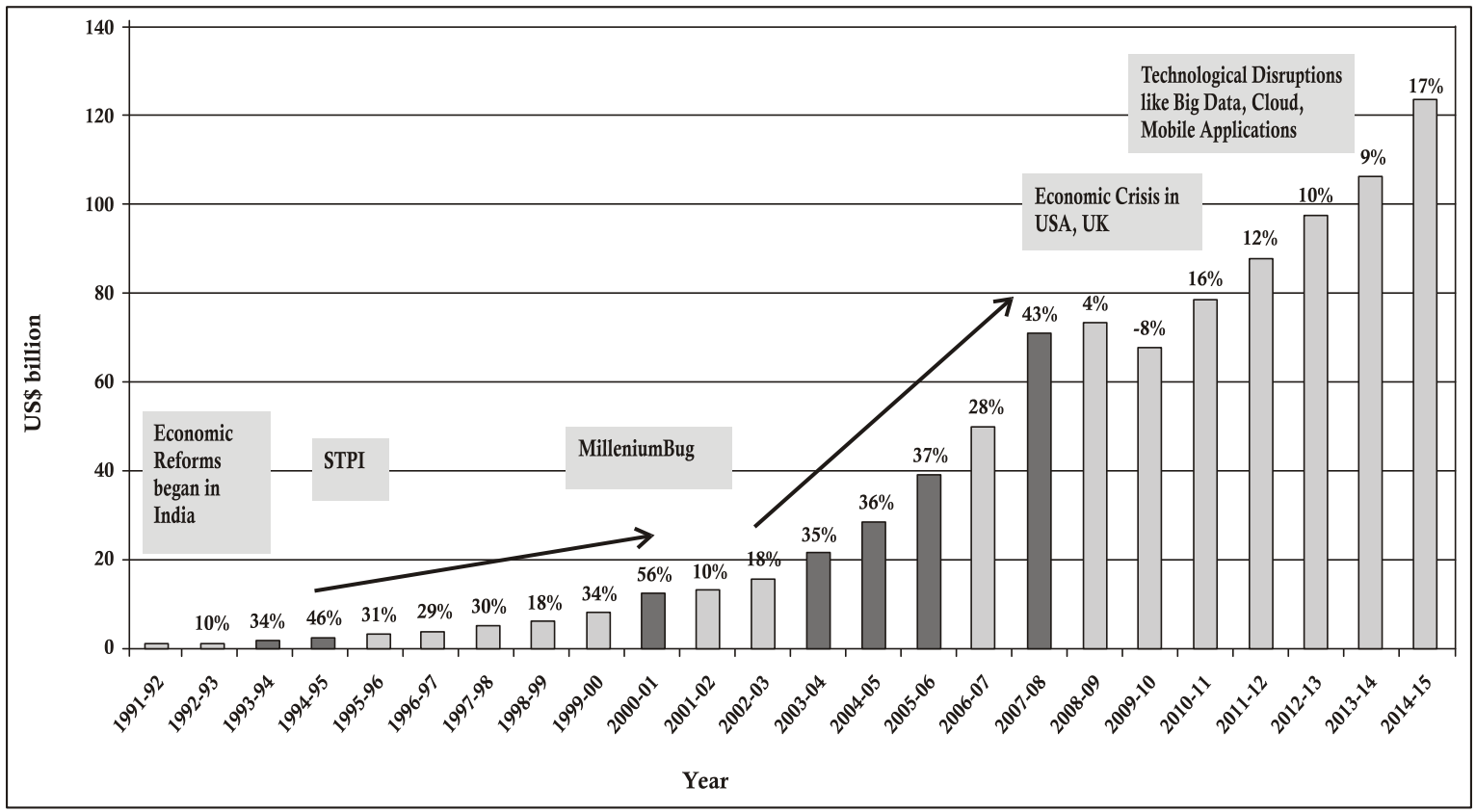
[3] The premier Indian Institutes of Technology (IITs), notably, IIT-Kanpur and IIT-Kharagpur had initiated this process even by the latter half of the 1970s.

[4] Also known as the *Year 2000 Bug*. [http://www.britannica.com/technology/Y2K-bug (Accessed on August 7, 2015)].

Figure 1: Indian IT Output Levels and Growth Rates, 1991-2015

(US $ billion)



Source: Prepared by authors drawing on Heeks (1996 and 2004).

However, the global financial crisis that precipitated in 2007-08 had its adverse impact on the Indian IT industry's prospects; the major MNCs from the United States and United Kingdom, in particular, did constrict their orders. This is apart from the fact that in the policy arena the US was growing listless towards awarding large scale BPO assignments to Indian IT firms. Despite these external challenges the Indian IT services have performed impressively even during the recent years. For instance, in 2015 alone the IT and BPO/ business process management (BPM) business had generated a revenue worth $ 148 billion (amounting to 8.1 per cent to GDP) and had exported to the tune of $ 98 billion. The Indian IT companies have set up over 600 delivery centres across the world and are engaged in providing services with presence in over 200 cities across 78 countries, thus, maintaining its leadership position in the global sourcing arena.[5] Notwithstanding the moving up of India in the value chain in providing ITES over the last one and a half decades, the Indian IT sector is still viewed as a destination of labour cost-saving by major MNCs from the western industrialised nations. This is because still a significant portion of Indian outsourcing industry comprises low-end IT services.

Section II

National Level IT Policy Initiatives

Across several developing economies, such as India, Brazil, China and South Korea the state policy of protection and promotional intervention has helped build technological capabilities including in the IT sector (Heeks, 2004). In an analysis of the nature of state intervention in the Indian IT sector Parthasarathy (2004b) has identified three phases, namely, rigid policy restrictions (prior to 1984), eased restrictions (1984-90) and pro-active promotion of the IT industry. The post reforms policy experience in the Indian IT industry has been congruous with the obvious global shift in development policy thinking from state intervention towards market oriented policies (Harindranath and Liebenau, 1995).

In India, the state has assumed the role of a facilitator and active promoter of the IT industry through several policies directly and indirectly concerning

[5] Indian IT firms accounted for almost 55 per cent of the global sourcing market in 2013 [http://deity.gov.in/content/software-services (Accessed on February 14, 2016)].

the sector and its various facets.[6] In addition to the IT Act of 2000 and the IT (Amendment) Act in 2008 (Ministry of Law, Justice and Company Affairs, 2000; and Ministry of Law and Justice, 2009) it is possible to identify policies, at least since the mid-1980s, which focused on the growth of the IT industry, whether as primary or secondary concern (Table 1). These policies, *inter alia*, simplified procedures and reduced number of documents and formalities required in foreign trade.

Table 1: Selected Policies and their Focus on the IT Industry in India

Policies with primary focus on the IT Industry	Policies that indirectly helped the IT Industry
New Computer Policy (1984), Software Policy (1986), IT Act, 2000 and IT Act (Amendment) (2008), National Electronics Policy (2012), National Electronics Policy (2012), National Cyber Security Policy (2013)	EXIM Policy (1985, 1992-97, 2002-07), Industrial Policy (1991), Labour Reforms Policy, SEZ Policy (2000), Science, Technology and Innovation Policy (2013), Foreign Trade Policy (2009-14, 2015-20), Fiscal Policy, FDI Policy, Education Policy (1968, 1986, 1992, 2015), National Manufacturing Policy (2011)

Source: Prepared by authors on the basis of information obtained from MOSPI, RBI and Ministry of HRD, GoI.

The reforms made import of capitals goods including computer hardware, smart mobile and related accessories cheaper that eventually fulfilled demand for such products needed to fuel the IT revolution in our country. Removal of state controls and regulations and export incentives through series of policy reforms oriented Indian exporters to explore business opportunities in new markets outside India. Macro policies with general growth objectives too helped this industry grow significantly. For example, several Software Technology Parks of India (STPIs) and Electronics Hardware Technology

[6] Some of the important central government initiatives aimed at promoting the IT Sector were as follows: New Computer Policy (1984); Software Policy (1986); Software Technology Park of India (1991); IT Act, 2000 and IT Act (Amendment) (2008); National E Governance Plan (2006); Open Technology Centre through NIC (2007); National Knowledge Network (2010); Modified Special Incentive Package Scheme (M-SIPS) (2012); National Electronics Policy (2012); IT Investment Region /Electronic Manufacturing Clusters (2013); National Cyber Security Policy (2013); National Investment and Manufacturing Zones (NIMZs) (2013); Digital India (2014); Make-in-India (2014); and Smart Cities Mission (2014).

Parks (EHTPs) were set up across the country under EXIM and foreign trade policies. The IT industry also cashed in on several government initiated major projects such as computerization of train reservation and banking operations, networking of government offices, and modernization of telecom infrastructure during 1980s and withdrawal of money through ATMs, use of Unique Identification Authority of India (UIDAI) card for transfer of government benefits to people and e-governance for better public service delivery during last couple of decades (Sharma, 2015). Recent policy initiatives such as Make-in-India, Stand-up India, Digital India and Smart City Mission are envisaged with the progress and role of the Indian IT industry; IT-ITES would be a vital component of co-working of these schemes.

The role of state policy in IT industry particularly in India has been well acknowledged in the literature (Parthasarathi, 1987; Joseph, 1997 & 2007; Heeks, 1996; Chowdary, 2002; Mani, 2001a & 2001b; Joseph and Parayil, 2008). The government had set up or promoted a number of professional and specialised institutions of repute at different stages across the country that immensely helped lay a strong foundation for the IT industry grow. Some of the prominent institutions of scientific and technical excellence are: Indian Institute of Science (IISc), Bengaluru (1909); Indian Statistical Institute (ISI), Kolkata (1931); Tata Institute of Fundamental Research (TIFR), Mumbai (1945); Bhabha Atomic Research Centre (BARC), Mumbai (1957); Council of Scientific and Industrial Research (CSIR), Delhi (1942); National Institutes of Technology (NITs) (formerly, Regional Engineering Colleges) (1955); and Indian Institutes of Technology (first IIT set up at Kharagpur in 1950, followed by the ones in Kanpur, Madras, Delhi and others in recent years, notably, at Roorkee). The specialised IT centres included Computer Maintenance Corporation (CMC), New Delhi (1975), a public sector IT company; National Informatics Centre (NIC), New Delhi (1976), the prime builder of e-governance in India; Electronic City, Bengaluru (1978), one of India's largest electronic industrial parks; National Centre for Software Development and Computing Technology (now C-DAC), Mumbai (1985), a national laboratory for R & D in software technology; International Technology Park, Bengaluru (1992), a government-to-government bilateral initiative of Singapore and India; Software Technology Parks of India (STPIs) (1991), an excellent infrastructure and statutory support aimed at export of software; and Indian Institutes of Information Technology (IIITs)

(first such institute came up in Hyderabad in 1998), institutes devoted to information technology. Without the state's infrastructure during the 1960s and 1970s - designed for import substitution industrialization - the industry would not been in a position to exploit the IT opportunities of 1980s (D'Costa, 2011).

Over the past six decades or so, the central government has provided fiscal concessions such as tax holidays, reduction in excise duty and import duty to promote the IT sector. With gradual import liberalization since the mid-1980s it was rendered easy to import computer spare parts, components and computers for assembling, repair and maintenance of old computers. Trade fairs, seminars and conferences had been organized regularly to facilitate networking to boost the IT sector. Increasing trade and technology related agreements undertaken by central and state governments with other nations and UN agencies had benefitted the IT sector substantially. Further, building up of computer related infrastructure such as IT Parks, Earth Stations, Satellite Links and International Get-ways and setting up of institutions such as Computer Software Export Promotion Council and Software Technology Parks were proactive policy initiatives. Importantly, the government itself has been a bulk buyer of computer hardware and software manufactured by domestic firms to promote local manufacturers. While Single Window Clearance for trade in IT products has been facilitated, state policies on data security, prevention of piracy, content regulation and cyber crimes have been framed from time to time. The central government has incentivized IT firms for obtaining international quality certification such as ISO 9000 and CMM. Similarly, public private partnership (PPP) (e.g., association between NASSCOM and the Government of India) has been encouraged for greater foreign and domestic investment, faster technology transfer and improvement in efficiency. Table 2 provides a summary view of the policy thrust to promote the IT sector in India.

Table 2: Policy Thrust in the IT Sector in India since 1955

Period	Thrust Areas	Inadequacies
1955-70	Early computing	Only individual motivation to the sector
1970-78	Slow growth of indigenous computers	No clear IT policy
1978-90	Hardware manufacturing	Substantial dependence on electronics/computer imports
1991-97	Improved telecom infrastructure, sops and incentives	Confined to select cities
1997-2008	Export promotion, Clusters of IT or STPIs	Unevenly spread across space
2008-14	ITES, software development for export purpose. India becoming Software Superpower	No hardware manufacturing, No pan-India presence, domestic demand untapped, Poor data security
2014 and After	Maturing with diversification ITES, Big data, Cloud computing, E-commerce	No auto-pilot mode, stuck with low-end of the IT services value chain

Source: Compiled from Rajaraman (2012), Sharma (2009 and 2015), Heeks (2004), and Department of Electronics and Information Technology.

The state unwittingly led the IT industry, then allowed the market to follow, but continues to provide fiscal and infrastructural support (D'Costa, 2011). Even as by the 1960s there had been a realization by the Government of India to harness the benefits of computer technology and promoting an indigenous electronics industrial base not much could actually take place due to restrictive trade policies in place (Table 2). While recommendations of the Electronics Committee, 1966 headed by Homi J. Bhabha had outlived the proposal to promote a self-reliant and domestic industry, the refusal to entertain foreign technology (mainly, American) through FDI route to set up an export oriented industry base would not allow the sector to take off during the 1960s and much of the 1970s (Sharma, 2009).[7]

[7] Operation of the Foreign Exchange Regulation Act (FERA) 1973 and Monopolies and Restrictive Trade Practices (MRTP) Act 1969 had prevented any possible foreign collaboration in the electronics sector including manufacturing computer hardware in India.

While, quite significantly, during the 1970s some of the top class science and engineering institutes, viz., IITs, IISc, BARC, TIFR and ISI had engaged in superior IT training and education, the woeful state of production engineering capacity and scientific laboratories to carry out extensive research acted as a major barrier to build up the capacity to manufacture computer hardware and other IT products domestically. There was a definite shortage of skilled professionals as in design development and engineering of production machinery. As Parthasarathi (1987) has argued, this deficiency in the Indian IT sector eventually determined that the domestic industry depended heavily on imported technology and the benefits of facing challenges of technological innovations remained elusive despite an enviable human resource base in IT and ITES spheres. In fact, as a late fall-out of India's war with China in 1962, the Government of India had realized the significance of technology for national security that led to creating a separate Department of Electronics in June 1970.

The policy emphasis on self-reliance through promoting an indigenous IT industry stayed strong throughout much of the 1970s and lasted till almost 1978 by when there had emerged a growing recognition of the potential of imported technology in accelerating the national electronics and computer industry. It is no coincidence that between 1978 and 1984 a host of state and central electronics development corporations were established with the 'state-of-the-art' facilities for manufacturing, training and education. This reorientation in policy perception could be traced through the plethora of 'forward-looking' policies expressing support to this new found dispensation.

The Electronics Commission (1971), New Computer Policy (1984), New Electronics Policy (1985) and Indian Software Policy (1986) were formal initiatives to create a strong base for an outward-oriented and liberalized IT sector in India. Notwithstanding these bold policy efforts, in practice, the dependence on imports of computers, peripherals and other components continued supporting IT activities whether by the state, private sector, universities or institutions. Hence, by around the mid-1980s a gradual but visible shift towards external orientation of the so-far 'protected' IT industry could be noted. Policies to attract investment into the sector, promotion of e-governance and exploring opportunities of application of IT services domestically all point to this shift in policy.

With the economic reforms formally in place by 1991 the IT sector received a major boost during the 1990s through a series of state policies, as the dismantling of FERA and other restrictive regulations; setting up of STPIs and EHTPs; introduction of Single Window Clearance and, importantly, removal of physical controls on imports of most electronics equipment and components (Joseph, 2007). Similar policies were forthcoming in the subsequent decades as well.[8] Moreover, the New Industrial Policy of 1991 and the subsequent state policies to facilitate the IT (including BPO) sector through tax free and fiscally incentivized SEZs and National Manufacturing Investment Zones are recognized as important measures in this direction.

Changes in state policies during the 1980s, which rejected a highly regulated, autarchic development approach, were essential for the rise of a software industry in India (Parthasarathy, 2004a). As Chowdary (2002: 3887) would remark "Luckily, the IT industry was born in India after 1992; were it born in 1960s or 1970s, it too would have been nationalized, that is, taken over by the state and ruined just like any other public sector enterprise, so, to conclude, the IT industry, particularly the software industry is a post-1992 phenomenon and depended on no permits, quotas, licenses and favours of the government".

The major transformation in the nature, intensity and objectives of state intervention in the IT industry after 1991 is obvious (Table 3). During the pre-1991 period, it was only the central government that provided all kinds of fiscal incentives and infrastructure facilities to promote the IT industry in India. Having envisioned the vast potential of this industry in terms of output, employment and exports, the provincial governments too started offering attractive incentives on a competitive basis to set up IT businesses in their respective states. Moreover, the extensive use of IT mainly to improve governance at all levels is a distinctive phenomenon in post-reforms India.

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[8] These include hardware infrastructure and electronics manufacturing (Electronics Manufacturing Clusters, 2013 and National Investment and Manufacturing Zones, 2013), legality of e-documents and signature (IT Act, 2000 and IT (Amendment) Act, 2008), cyber security (National Cyber Security Policy, 2013), digitalization of gram panchayats and select cities (Digital India and 100 Smart Cities, 2014), innovation and development (Make-in-India, 2014).

Table 3 : State Policies in India: Before and After 1991

Pre-1991	Post-1991
Too much of state protection for industry from competition through License Raj and FERA, etc. Too high tax rates	Without protection of domestic industries, Tax rates were reduced substantially, Fewer financial and bureaucratic controls on imports of IT products, technology transfer, etc.
Emphasized more on hardware manufacturing and its exports	Emphasized more on software development and its exports
Fundamental research and development for innovation at public sector academic and research institutes	Value added research and development at both public and private research institutes and only technical support
Import of technology and foreign collaboration for production	Import of computers and spare parts for maintenance and repair services, trade and marketing of IT products
Only central government offered fiscal incentives	Both central and state governments offered fiscal incentives
Proactive role of government at the centre and limited role of the state governments	Less proactive role for Central Government but the provincial governments have been trying hard to get a larger share of the IT sector
Less emphasis on e-governance	Greater emphasis on e-governance
Export bias and ignoring domestic sector	Exploring opportunities in the domestic market

Source: Based on Heeks (2004) and Sharma (2009).

Possibly for the first time, the flipside of import dependence had been articulated in the National Electronics Policy 2012 which underscored focusing attention on building domestic manufacturing or Electronic System and Design Manufacturing (ESDM) capability. Decades of central government intervention notwithstanding the Indian IT sector had largely served the low-end voice and non-voiced ITES and was nowhere near what the global IT giants (as SAP, HP, Microsoft, Google, etc.) had achieved.

Subnational Policy Initiatives

The central government policy incentives included reducing or eliminating import duties on IT products, relaxations of norms concerning both inward and outward investments and foreign exchange related to computer technology and provided world-class telecom and IT infrastructure such as fast and round-the-clock broad-band services, uninterrupted electricity and water supply, better roads, telecom connectivity and drainage system. A distinctive feature of these policy initiatives had been the spatial broad-basing of the IT infrastructure created. The fact that several such facilities were spread across individual states proved to be useful for the provincial state level industry to take off. This was certainly the case since 2000 in a few states which took proactive steps to render this sector dynamic in response to growing global market needs.

Table 4 attempts to compile state level IT-ITES policies highlighting special features in them. While some of the early and successful states (rather the major cities therein) in this sphere have been Andhra Pradesh (Hyderabad), Karnataka (Bengaluru), Tamil Nadu (Chennai), Delhi (NCR) and Maharashtra (Mumbai and Pune) the late entrants include even less developed states as Odisha, Chhattisgarh and Uttar Pradesh. The strengthening of the IT sector in the early starters can be understood as these states witnessed an impressive rise in the employment in this sector. Having experienced the gains from the IT sector, fierce competition ensued among states and even city governments attempted to capture a lion's share of business by offering locationally-rooted capabilities and attributes that were hard for competing regions to replicate and subnational governments were moving to position themselves to attract this investment (Hutchinson and Ilavarasan, 2008). However, as a consequence, the IT-ITES sector has reached a state of saturation in the states of Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra as costs of labour, land and buildings have escalated. Hence, there is every likelihood of the IT-ITES business moving towards other states as Gujarat (Ahmedabad and Gandhinagar), Odisha (Bhubaneswar), Uttar Pradesh (Lucknow) and Rajasthan (Jaipur) with Tier-II and Tier-III cities readying to nurture this sector.

Table 4: IT-ITES Sector Policies in Select States during the Post-Reforms Period

Name of State	IT-ITES Policy or Electronics Policy
Karnataka	*Karnataka Electronic System and Design Manufacturing (ESDM) Policy 2013* aims at making this state a preferred destination of investment. It aims at 10 per cent of ESDM sector worth US $ 400 billion in India and 20 per cent of ESDM export worth US $ 80 billion by 2020.
Andhra Pradesh	*Re-Imagining Andhra Pradesh – Role of e-Governance, Electronics and IT* aims at development of ICT industry in the state for providing good governance.
Gujarat	*Electronics Policy for the State of Gujarat (2014-19)* would attract FDI and latest digital designing technology.
West Bengal	*ICT Policy 2012* aims at transforming West Bengal into one of the three top IT-ITES/ESDM states in India.
Telangana	*Industrial Policy Framework (2014)* aims at complementing the robust IT software sector with IT hardware.
Chhattisgarh	*Electronics, IT and ITES Investment Policy of Chhattisgarh 2015-20* aims at promoting innovation, business incubation, and entrepreneurship in the sector
Maharashtra	*Maharashtra IT-ITES Policy* proposes to promote existing centres and accelerating investment flow to underdeveloped regions of the state by creating new IT parks and hubs and a special focus on attracting BPOs towards rural and semi-urban areas.
Kerala	*Kerala IT Policy, 2012* aims at creating rural IT hubs to attract IT industry towards under-developed regions.
Uttar Pradesh	*UP IT Policy 2012* aims to shift the way daily lives are transacted using digital mediums, even in the remotest areas

Source: Prepared by the authors from official documents on policies of concerned states sourced from websites.

Several Indian states have recognised the potential of the IT sector not only as a catalyst to economic growth but to improve upon governance and public service delivery. The subnational governments recently have increased their budgets for IT related activities. Interestingly, the recent rise in domestic demand for IT has been forthcoming mainly from local governments at all levels through state initiatives in the form of e-governance, digitalization of records, online cash transfer of subsidies, scholarships, and so on. Some of the most successful e-government projects are Computerisation of Land Records (GoI) and Bhoomi Project in Karnataka, Gyandoot (Madhya

Pradesh), Lokvani Project in Uttar Pradesh, Project Friends (Kerala), e-Mitra Project (Rajasthan), e-Seva (Andhra Pradesh), Revenue Administration through Computerised Energy (RACE) Billing Project (Bihar).

The IT policies of subnational governments, it may be underscored, are no duplication of those of the central government. These policies at the state level, typically, offer conducive business environment and additional fiscal incentives to promote a healthy competitive ecosystem. For example, Karnataka is among the pioneering Indian states to frame suitable policies aimed at encouraging and facilitating local firms to look beyond national market. The external orientation of even smaller firms was achieved by creating a strong enabling institutional framework, supporting expansion of productive capacity, and helping exporting firms gain access to the required physical infrastructure (Pradhan *et al.*, 2013). Some of the incentives offered are as follows: full exemption in stamp duty and registration fee, assistance in land purchase, total loan interest subsidy to micro, small and medium enterprises (MSMEs), subsidy in the range of 5-7 per cent to others and full exemption on electricity duty for five years. Interestingly, different states have been emphasizing on specific segments of the IT industry, as, for instance, Karnataka and Gujarat have been trying to attract more investments in the ESDM sector, Andhra Pradesh is concentrating on e-governance and ICT, and Chhattisgarh and Madhya Pradesh on IT-ITES.

As Hutchinson and Ilavarasan (2008) observe, IT-ITES firms in India are exploring Greenfield ITES in the country to mitigate rising wages, high staff turnover, and crumbling infrastructure in the established industrial clusters. Consequently, it has opened a window of opportunity for secondary urban centres or second-tier cities. Hence, eager to capitalise on the benefits that the IT-ITES sector can bring, subnational governments are moving to position themselves to attract this investment to their respective states. They further concluded that conscious of the benefits that hosting a vibrant, skill-intensive, and well-paying industry like the IT-ITES could bring, state and city governments across India were seeking to persuade investors through various schemes. In fact, while states like Gujarat, Rajasthan and Odisha have come up with their own policy initiatives to create IT-ITES clusters in their urban centres leading IT states like Karnataka, Andhra Pradesh, Tamil Nadu and Maharashtra, in order to retain their dominant position, have been offering far more competitive incentives and sops.

The state IT policies, with an eye on export possibilities, attempt to capitalize on improving upon governance through increasing the share of IT sector allocations in the state budget, developing state-wide area network, introducing smart cards for government schemes and department-wise specific management information system (MIS), and promoting IT education in the state. Some of the important incentives/concessions offered include single window clearance, 24x7 power supply, simple licensing procedure, low rate of VAT, lower service tax rate, broad-based internet facilities and cheaper land. Shifting IT activities to Tier II and Tier III cities has the potential of boosting the local economy through employment and income generation. Mysore in Karnataka, Coimbatore in Tamil Nadu and Vishakhapatnam in Andhra Pradesh make good examples of this change (Hutchinson and Ilavarasan, 2008).

Section III

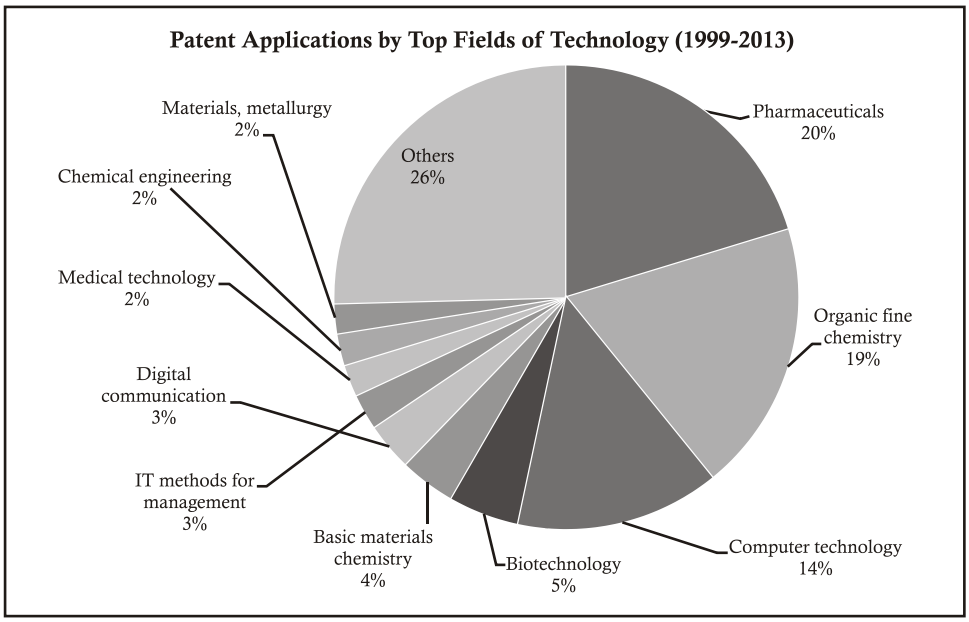
Major Challenges before the IT Sector

A range of policy initiatives notwithstanding, the Indian IT sector has grooved well into the low-end segment that threatens its preeminent IT position enjoyed during the early last decade. Some of the major concerns plaguing this sector have been discussed in the following.

Neglect of Research and Development:

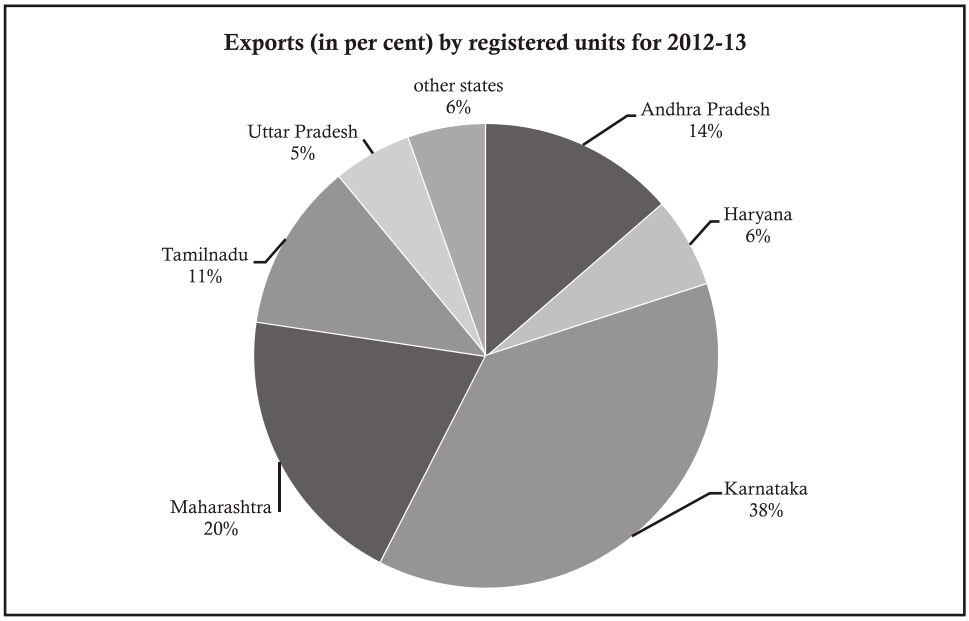
The neglect of research and development (R&D) in the IT sector is evident from the fact that the number of information technology related patents registered from India during the 15-year period (1999-2013) has remained relatively much lower; computer technology (14 per cent), IT methods for management (3 per cent) and digital communication (3 per cent) (Figure 2). While this unenviable record reflects the R&D performance of STPIs which account for much of the software exports from India and it also shows that the non-STPI areas are not just exporting enough. It has been pointed out that the uneven performance of STPIs across states has been an area of concern in promoting R&D. As shown in Figure 3, four states, namely, Andhra Pradesh (14 per cent), Karnataka (35 per cent), Maharashtra (20%) and Tamil Nadu (11 per cent) accounted for 80 per cent of the total exports from registered units with STPIs for 2012-13.

Figure 2: Patent Application and IT Sector, 1999-2013



Source: http://www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=IN (Accessed on February 3, 2015).

Figure 3: State-wise Exports (in per cent) from Units Registered with STPI, 2012-13



Source: www.stpi.in

Neglect of Electronic Hardware Manufacturing:

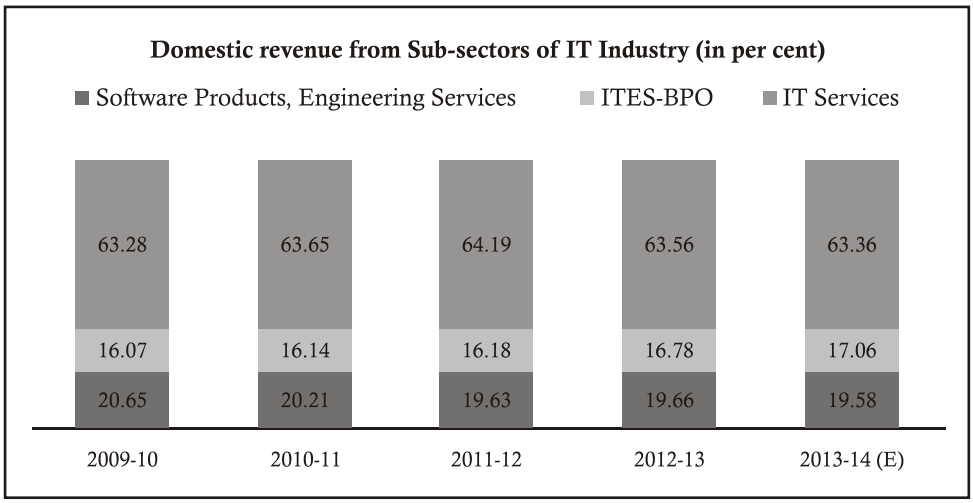
Mani (1995) argues that innovation capability of developing countries in areas of high technologies such as telecommunication equipment sector gets influenced in a significant manner by not only the domestic policies and support systems which favour such activities, but also by the external environment. During the last 10-15 years, countries such as China, Korea, Taiwan, Singapore and Malaysia have emerged as leading global IT hardware and electronics manufacturers/exporters and have contributed significantly to the growth of their economies, whereas Indian electronics industry has failed to keep pace with these countries and it is still in a nascent stage of development (Vijayasri and Rao, 2013). India's current competitiveness in the international IT market may be undermined by the emergence of new players like China which has a solid hardware base and a rapidly strengthening software base (Joseph, 2007).

Too Much Emphasis on Low-end IT Services:

The Indian IT/ITES industry is virtually in a trap providing low-end services in outsourcing. Most of the Indian IT firms provide business-to-business (B-2-B) services and not business-to-consumer (B-2-C) till date. India is yet to see its own corporate IT product company of the size of a Google, Yahoo, Facebook, SAP, Whatsapp or Adobe. However, in recent times the high-end IT segments like cloud computing, big data and mobile applications are also becoming an integral part of IT firms in India. Constant innovation in SMAC (Social, Mobile, Analytics and Cloud Computing) technologies is the biggest factor posing serious threats as well as creating opportunities for the IT industry in India. The ever changing terms and conditions of IT business models coupled with clients' demand for latest IT technologies and technological disruptions are transforming this sector significantly. Although the value of domestic revenue from the IT-ITES industry has been on the rise, the share of the high-end software product and engineering services for the period 2009-14 remained just one-fifth of the total revenue (Figure 4). Moreover, the CAGR for the segment for the same period was 12.72per cent, lowest compared to the rest of the categories such as IT services (14.01 per cent), ITES/BPO (17.18 per cent), and total IT-ITES (14.25 per cent).[9]

[9] http://deity.gov.in/content/performance-contribution-towards-exports-it-ITES-industry

Figure 4: Segment wise Domestic Revenue Trends in IT-ITES Industry



Source: http://deity.gov.in/content/performance-contribution-towards-exports-it ITES-industry.

It is interesting to note that of the 41 IT companies that find mention amongst the Top 500 Indian companies (as per *The Economic Times*) about half (21) are engaged in producing computer software and only two in computer hardware (Table 5*).*

Table 5: India's 500 Top Companies in 2012 and the IT Industry

Nature of companies	Number of companies among Top 500
Computers Accessories/Peripherals	1
Computers Hardware	2
Computers- Software	21
Computers- Software- Training	3
IT Enabled Services	1
Telecommunications- Equipment	2
Telecommunications- Service	7
Cable Power/telephone/other	4
Total number out of 500 companies	41

Source: http://economictimes.indiatimes.com/et500list.cms

With rapid advancements taking place in the IT sphere, cloud computing, big data, website and portal, networking, e-commerce, mobile applications, etc. have emerged as important trends in the sector that have potential to

create good business opportunities for firms. Such developments, however, have posed a challenge before the Indian IT sector to assert its leadership.

Saturation in Select Cities and Neglect of Other Urban and Rural Areas:

The imperatives of the IT industry have led its flourish in the modern infrastructure endowed select cities like Bengaluru, Chennai, Hyderabad, Mumbai and so on which have attracted huge population of 'techies' to cluster. The very absence or short supply of these facilities has rendered other urban areas or even rural areas unattractive in terms of investment in the sector. Additional policy support is needed for the states that have lagged behind in the IT sector, particularly, the North-Eastern states and Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Odisha. With rising real estate costs, overstressed infrastructure and intense competition for skilled labour in major IT cities as Bengaluru, New Delhi, and Hyderabad, IT-ITES firms are looking at smaller and hitherto untapped cities as ITES for new operations (Hutchinson and Ilavarasan, 2008).[10] The government has failed helping establish call centres or ITES related firms in rural areas despite the fact that there exists potential demand for IT-ITES services in rural India as well.

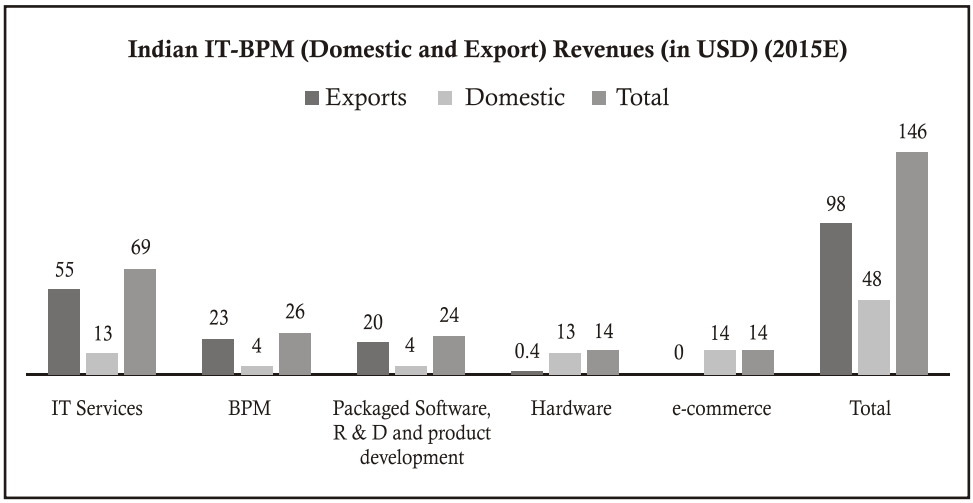
Excessive Dependence on the Export Market:

The revenue derived from exports of IT-ITES in India was observed to be almost three times greater than that from the domestic market (Figure 5). It is the IT services followed by packaged software, R&D and product development that form the lion's share of revenue from this sector. Despite the domestic market offering tremendous opportunity for the IT industry largely it has remained unexploited; especially at a time when India has 12.57 crore bank accounts of LPG consumers linked with more than 100 crore Aadhar cards, 102 crore mobile phone users and 46.2 crore internet users. India is yet to have any policy towards becoming a major ICT consumer by accelerating the diffusion of ICT to different sectors of the economy. Hence, there is a need for a shift in strategy with greater domestic market orientation (Joseph and Abraham, 2005).

[10] The dominance of Indian cities is fast fading away in favour of cities in Philippines for IT/ITES sector. According to ASSOCHAM Eco Pulse (PTI, 2012) in "Medium IT/ITES companies may shift base from Hyderabad, Bangalore to Philippines" Study titled 'Sustaining India's IT/ITES Leadership', the prevailing macroeconomic and sectoral conditions have been resulting in a shifting of ITES/BPO industry away from India to the Philippines, especially from Hyderabad and Bangalore.

Figure 5: Revenue Trends of IT-ITES Sector, 2015*

(in USD Billion)

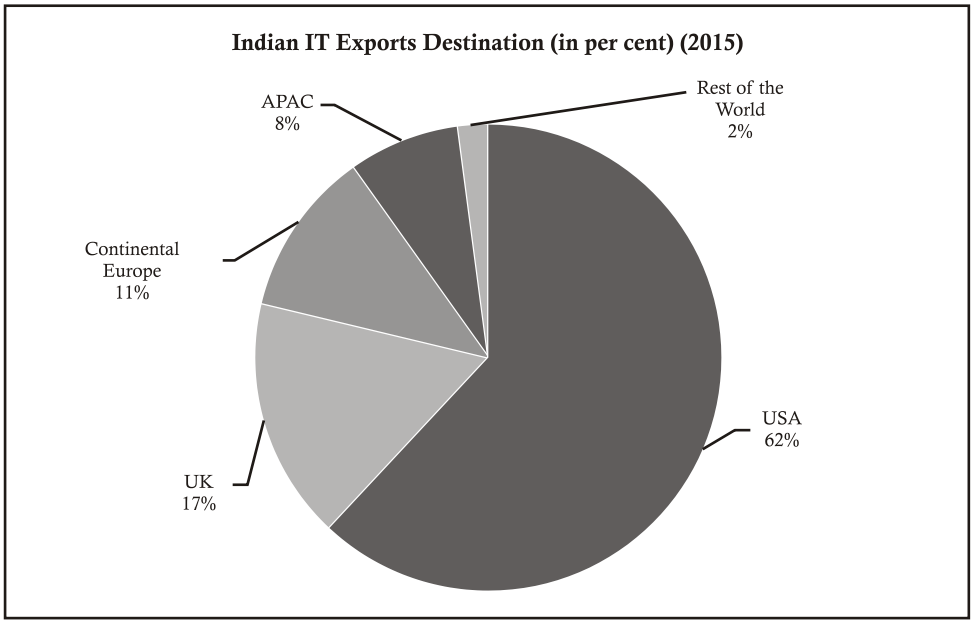


Source: http://deity.gov.in/content/performance-contribution-towards-exports-it-ITES-industry

Note: *Estimates.

Figure 6: Indian IT Export Destination, 2015

(Percentages)



Source: http://deity.gov.in/content/export-destinations

Indian exports have remained highly dependent on markets in the USA (62 per cent) and Europe (28 per cent) (Figure 6). Their combined share of the Indian IT software and services export accounted for 90 per cent in the FY 2014-15. The concern relates to the eventuality of an economic crisis – as it did happen in the USA during 2008-09 and subsequently in the European Union during 2010-13- in these parts of the world that would jeopardize the Indian IT industry's external demand. There have been several exogenous factors/developments which threaten the prospects of the Indian IT sector's engagement with the global market. These include, strict immigration policy of governments in the USA, the UK and OECD countries; the anti-outsourcing business policy of the USA in the recent past; sub-prime crisis in the USA; and sovereign debt crisis in some of the European economies as Greece, Italy, Portugal, Spain and Ireland. Whereas India's heavy reliance on the USA has undercut opportunities in other major markets such as Japan confining India's specialization in services and BPO sector has also stymied entry into diverse IT activities (D'Costa, 2011). As observed by Kathpalia and Raman (2014), such near-full dependence on a few countries is not a pragmatic business model particularly when the USA and EU markets have been displaying reluctance to go beyond their current limits of work to be sent offshore.

Section IV

Concluding Observations

The IT policy in India has undergone drastic changes during the past 60 years or so. Following the early decades of protectionism, by around the mid-1980s the state, partially and gradually though, moved ahead to liberalise the economy in general and brought up the first Computer Policy of India. However, even as the government had realised early on the potential of computer technology for the economic progress of the nation, the dependence on imports of IT hardware, in particular, remained deadweight for the decades to come. Another policy concern remained the uneven growth of the sector *spatially*. Although till the early 1990s the central government had created notable IT infrastructure, especially the STPIs and related transport and communication network, in the subsequent years, several state governments offered attractive fiscal sops and other incentives for IT firms; a few succeeded in creating IT clusters, which are mostly concentrated in the four states of Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu.

Globally, India has continued to perform well in the computer software and ITES sphere at least since the post-reforms period. However, this achievement has been dwarfed by the neglect of the *high-end* IT services, albeit it is possible to note that latest technological advancements like cloud computing, big data and mobile applications, increasingly, are becoming part of business of IT firms in India. Too much of dependence on a few external markets for IT exports could prove to be a risky business model and there is serious need to explore possibilities of broad-basing global market, mainly, the African, Asian and Latin American ones.

India's leading position as the global outsourcing hub has now come to be challenged by the anti-outsourcing policy of the US government, financial crisis slowing down growth of the developed world and fast-growing competition from Philippines, China and Costa Rica. Additionally, cyber security and scarcity of professionals and venture capital in new-age IT innovations as big data, cloud computing and e-commerce have been areas of concern. Recent initiatives like Make-in-India, 100 Smart Cities Mission and Digital India aim at improving e-governance, reducing on electronics imports and taking the IT and its benefits to unreached regions and untapped markets of India. But, the success of such state initiatives would hinge upon focusing constant innovation, improving IT infrastructure and removing legal and administrative bottlenecks to sustain its leadership position and to take anew.

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The major areas of research at the Institute are the following:

1. **Natural Resources Management, Agriculture and Climate Change**
   Research under this area concerns the broad realm of environment and development. Studies have focused on economic viability, equity, environmental impact assessment and institutional mechanisms. Issues in common property land resources, land use and water harvesting have been researched extensively. Implications of climate change risks for Asia and the adaptation and mitigation strategies at the local levels have begun to be studied.

2. **Industry, Infrastructure and Trade**
   The main themes include policy dimensions concerning the micro, small and medium enterprises, industrial clusters and intellectual property rights. Studies on basic infrastructure and linkages between infrastructure and regional growth have also been carried out. Trade and development and finance are new areas of interest.

3. **Employment, Migration and Urbanisation**
   Studies under this theme relate to employment, labour, diversification of economic activities and migration. International migration has emerged as an additional theme along with urban services and aspects of urban economy and governance.

4. **Poverty and Human Development**
   Issues examined include access, achievement and financing of education and health sectors. Studies on poverty relate to conceptual and measurement aspects, quality of life, livelihood options and social infrastructure. There is an increasing interest in understanding urban poverty, rural-urban linkages and issues in microfinance.

5. **Regional Development, Institutions and Governance**
   Recent studies enquire into regional underdevelopment and the dynamics of local level institutions. Tribal area development mainly relating to livelihood promotion and human resource development has been a focus area. Recent analyses have also looked into Panchayati Raj Institutions, Forest Rights Act, MGNREGA and Right to Education Act.

Much of the research informs national and regional policies. The Institute also undertakes collaborative research and has a network with governments, academic institutions, international organisations and NGOs. A foray into specialized training and doctoral programme has just been made.

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