Development of the Information Economy in India and the Role of Diaspora
The Missing Intercourse

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Abstract: India experienced a unique development phenomenon in the late 1980s to 1990s when the IT sector, in the form of production, software exports, and services related to computers and IT, became dominant in the Indian economy. As in developing countries in general, India is faced with the problem of inadequate human capital when it comes to achieving modern economic levels, and the industrial and manufacturing sectors hampered by regulative government policies. Looking at the situation as it stands; India has reached the stage of what is called the information economy, which is the typical economic style of developed countries. Using the diaspora role approach as a state development actor, the authors have a hypothesis that the success of India in addressing the problems of human capital needs relates to their success in utilizing the diaspora that acts as a technological and knowledge transfer initiator, an additional number of human capital, and as transnational bridges between multinational and state enterprises. In other words, the diaspora is the link that allows India to jump to the stage of information economy.

1 INTRODUCTION

India's growing development in IT is a unique phenomenon, because as a developing country, India has a dominant information economy and this can be seen from several facts about India. Firstly, there are various regions of India that have developed into IT incubation centers that are full of information-based economies. One of them is Bengaluru, known as the Silicon Valley of India, which accounts for 38% of India's IT exports, making it the IT Capital of India (Arora et al., 2013). India's position as one of the global IT centers and as a software export center is done through Bengaluru. Some of the leading IT companies such as Intel, Texas Instruments, Bosch, Yahoo, SAP Labs, and Continental, have now opened their research centers in Bengaluru. With astonishing Indian achievements, India has shown itself to the world as a country that will lead Asia as the spearhead of the global economy and in technological developments.

This can be seen from one sub-sector that has shown a significant improvement; the software sector, especially in relation to exports. As Table 1 shows, from 1987-1988 to 1989-1990, India's software exports rose from $52 million to $100 million, nearly doubling over four years. In terms of this growth percentage, it is noted that software exports in India reached 78 percent in the same period.

Table 1: Export of Indian software from 1987 to 1990

Year	Exports of software (US$ million)	Growth over previous year (percent)
1987–1988	52	NA—
1988–1989	67	29
1989–1990	100	49

Eichengreen and Gupta (2010) also said that with respect to the service sector, revenues derived from activities based on IT and telecommunications are dominant. This is evident from the composition of the services sector in India dominated by software, business services and communications in 1990. Software exports that occupy 64 percent of the total revenue from the service sector. This is followed by business services at 27 percent, and then finances (5

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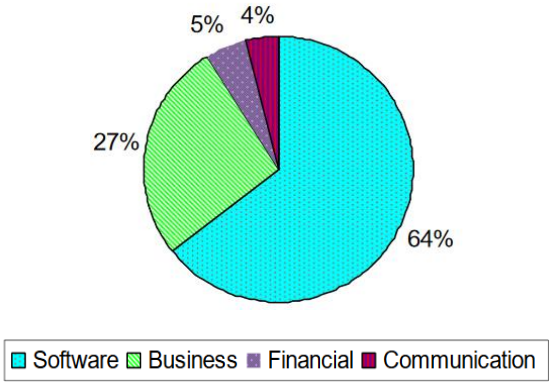
percent) and communications (4 percent) (see Graph 1).



Graph 1: The composition of the services sector in India in 1990

Uniquely, the development of India's information economy occurred in the midst of the availability of human capital, which can be said to be limited. Data from Papola and Sahu (2012) noted that in 1972 to 1973 alone, 74% of Indians still worked in agriculture. Data from the Selected Education Statistics (Bag and Gupta, 2016) suggested that up to 1983, only four per cent of Indians were in high education. Not only regarding quantity, but most of those in higher education were mostly the driving forces in the agricultural and manufacturing sectors. In the research of Banerjee and Muley (2008), which mapped out the majority of engineering graduates in India up to 1990, it was dominated by mechanical and civil engineering with a growth rate of 17,696 and 13,546 graduates. On the other hand, computers and IT techniques showed a growth rate of 12,143 graduates. This shows us the picture that the output of the human resources produced by India are commonly those with quality and capabilities outside of the IT sector. In other words, the capabilities, abilities, and levels of knowledge and skills possessed by the majority of the workforce in India are not strong enough to create a breakthrough into the information economy.

Based on this exposure, it can be seen how there is awkwardness and a certain uniqueness when looking at the development of the information economy in India. Theoretically, the information economy is a knowledge-based and capacity-based economy that requires the foundation of the modernization of infrastructure that supports the IT sector, through the collection of human capital with special skills and knowledge as a driver of the information economy (Castells, 1996). This phenomenon then underlies the researcher's interest in analyzing what important aspects enable India to jump to the stage of having an information economy and the manufacturing and industrial stages. The uniqueness of this phenomenon also lies in how the experience of India is different from that experienced by Western and East Asian countries in its economic development, which passed through the first manufacturing stage. From this brief explanation, it can be underscored that India seems to have found a way to address the issue of its human capital needs, making it interesting to further examine India's economic information relationship with the issue of human capital. In connection with these findings, the question arises that the information economy in particular requires human capital oriented to specialized aspects of IT. How is the development of the information economy possible in India? How does India address the critical human capital needs of this relationship? To answer the question, the author used a diaspora role approach to state the development, which can be mapped into three:

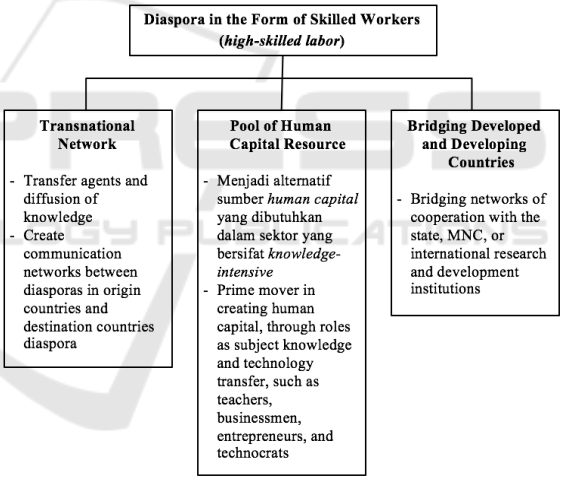


Figure 1. The role of diaspora in the development of the information economy (*Source: Author analysis*)

From this approach, in general, the hypothesis of this study can be formulated as follows:

- The key to the successful development of the information economy in India is generally related to its success in addressing the problem of human capital needs and
- The crucial role behind India's success in relation to addressing the human resource issues is India's creativity in exploiting and developing the role of diaspora.

2 RESULT AND DISCUSSION

2.1 India and the Development of the Information Economy

To explain how the Indian diaspora play an important role in the IT sector-oriented economic development process, it is important to first discuss economic developments in India and how the IT sector can emerge, and grow rapidly in countries that theoretically should still be in industrialization. It will be demonstrated by looking at the modern technological advancements in India from the beginning of independence and how, at first, the agricultural revolution became the main reference of technological development in India. Besides that, this study will also explain what momentum was able to encourage the IT sector through the industrial revolution to becoming a major sector in India. This chapter also explains the driving factors involved in India's economic movement toward the IT sector in a relatively short period of time.

One manifestation of the realization of the information economy in India is the development of the Indian Institute of Technology, through India's national policy of the IIT Act in 1961. This investment is a collaboration between the Indian government and the US government. The role of the US as a collaborator in the development of the first wave of human capital makes IIT an important institution in the creation of qualified computer engineers. However, the IIT also has no significant impact on human resources in India. The limited number of human capital can be seen in the number of graduates produced by the computer engineering institute in India, which have only produced B.Tech (650 graduates), M.Tech (S2 equivalent) as many as 800 graduates, and 60 Ph.D graduates. Banerjee (2008) said that in the 1970-1985 period, India was projected to have a deficit in the number of graduates in engineering and computer science. It can be seen that regardless of the policies and policy orientation, India has begun to promote the development of the IT-based education sector. In reality India has serious obstacles in the way of its realization. This is because the number of graduates generated in India is not enough to push the mobile IT sector into being the dominant economic power in India. In the midst of an Indian situation requiring human capital to develop an information economy, Prime Minister Rajiv Gandhi, in the 1980s, implemented a policy of tax reduction and intensive development in the information economy sector. This suggests that this need, in some cases, has been bridged by the Indian government.

2.2 Rajiv Gandhi's Role in the Development of India's Information Economy

Under Rajiv Gandhi, India, which previously focused solely on agricultural and industrial economics, then began to look toward the IT sector. To support the development of the IT sector, Rajiv Gandhi devised three key policies aimed at building the preconditions and infrastructure needed by India to reach the economic stage of Information. This policy was made by the Government of India under Rajiv Gandhi, with the help of Sam Pitroda and Narasimaiah Seshagiri. Starting from this description, Rajiv Gandhi sought to design a foreign policy that maximized the role of the IT sector in India, that opened the technology transfer network gateway, and that maximized the role of Indian diaspora as the prime mover. This made the Indian government under Rajiv Gandhi the first to emphasize policies for the IT sector, electronics, software, and telecommunications.

There are three major policies in the Rajiv Gandhi era that were considered to have revolutionized the IT world in India, as well as being a magnet that draws Indian diaspora back to their home countries, namely the Computer Policy 1984, the Software Policy 1986, and the Software Garden India India 1988. The Computer Policy 1984 downgraded PC software and tasks, and allowed the import of computers in exchange for the export of low tax software. The 1984 Computer Policy also reduced the software import tariff from 100 percent to 60 percent. In just one year after the policy came into force, it was noted that computer production in India increased by 100 percent, while computer prices dropped by 50 percent (Athreye, 2005). The 1986 Software Policy provided access to technologies and software in order to enhance their global competitiveness and to promote high value-added exports (Athreye, 2005). Therefore, the import of software in any form is permitted and the various procedures involved are simplified. The policy also invites foreign investment and provides venture capital to encourage the establishment of new companies and export growth.

All three of these policies are rapidly changing the information economy environment and thus, the Indian IT industry, enabling domestic players to demonstrate their capabilities in the IT sector and thus to become viable alternatives for multinational

corporations that seek to invest in India. The policy Software Technology Parks of India 1988 shows that India is aware of the key factors of infrastructure and the availability of IT sector incubation centers in relation to building the information economy. Multinational companies within the STP area are not required to nationalize such a manufacturing sector, and may be wholly foreign-owned and exempt from export duties. From the description, generally it can be concluded that in the effort involved in developing the information economy, there are obstacles that have arisen, namely the need for human capital.

2.3 Indian Diaspora and the Role of Human Capital

In this chapter, we will explain the mapping and dynamics of the second wave of Indian diaspora, which appears in many developed countries. According to the Indian Ministry of Foreign Affairs data in 2016, there are around 30.8 million Indian diasporas. India has the largest diaspora population in the world with more than 15.6 million according to the United Nations Department of Economic and Social Affairs (2015). Interestingly, the Indian diaspora apparently showed a distinct trend after independent India, favoring advanced post-industrial countries as their goal. The diaspora that emerged after Indian independence were referred to as the second wave of the diaspora, and many chose to go to the United States after the 1965 Immigration Act was passed in the US and the state quota for immigrants was abolished. This allows the Indian diaspora to get permanent residence and to bring their family members. It is interesting then to see what underlies the number of diaspora who choose developed countries as their goal.

2.4 Indian Diaspora in US

As one of the most recent and up-to-date IT innovation centers, the US is a key destination for Indian diasporas looking to pursue an education and career in IT and computer engineering. Since the beginning of the 20th century, the US has been known as a center of computer innovation and is believed to be the birthplace of computer technology. The occurrence of the computer boom throughout the late 1950s to 1960s led to many companies becoming engaged in the field of computers and software. The rise of the IT industry in the US was also followed by the inclusion of the Computer Science course at MIT as part of the Electrical Engineering program in 1963. Similar majors were also emerging in various other US universities and it became one of the majors that US aspiring students wanted. The existence of an educational container in computer science and engineering eventually became the main appeal for Indian diasporas who wanted to continue their studies in that field. In addition to the existence of the latest computer boom and innovations in the US, this diaspora saw the existence of career and business prospects in the field that they did not encounter in India at the time.

2.5 Contribution of Diaspora in the Development of the Information Economy in India

This proactive approach began to work when, throughout the late 1970s and the 1980s, diaspora began to emerge in India and provided the new IT sector needed for its resurrection. To then see how this brain-reinforcement process was slowly taking place, the author has mapped out and illustrated the contributions made by Indian diasporas returning to India toward development in the IT sector.

The mapping of this contribution will qualitatively be in the form of data that represents how the diaspora returned to India, transforming itself into the architect behind the IT sector's main foundation. From the data and through case examples of diaspora contributions to the development of the IT sector as described, it can be seen that there has been a significant contribution from the Indian diaspora regarding the development of India as a country with an information economy. This can be seen in how the diaspora played a role in the crucial moments involved in the rise of the IT sector in India throughout the 1980s. Starting from Sam Pitroda's role in the telecommunications revolution and internet communication network in India, through R.K. Baliga and Sharad Marathe with the concept of the Electronic City and Software Technology Park that became the forerunner of the Indian Silicon Valley, through T.K. Rao who made Texas Instruments the first multinational IT company in Bengaluru and ending with Azim Premji, who was the mastermind behind one of India's IT giants. They are all Indian diaspora who pursued their education and careers outside India, who then returned to their home country and became the initiator of IT sector development.

2.6 The Missing Intercourse: The Development of the Information Economy and the Role of Diaspora

This chapter will present an analysis and verify the diaspora's role hypothesis in terms of developing key points in the IT sector in India that occurred over a relatively short period of time. The analysis begins with a review of the IT sector's development issues in developing countries. This was followed by a problem review for India. After that, the discussion continued in order to discuss the extent to which diaspora can be the actor that becomes a solution to the problem of developing the IT sector in a given country. In the end, the subject focuses on how Indian diaspora came in response to the problems and become actors who began the process of developing India's information economy.

First, the diaspora have the potential to become a stronger transnational link between the diaspora and the diaspora's home country. According to Safran (1991), the diaspora tend to involve their homeland early and with greater dedication than non-ethnic investors. This is because the diaspora underlies their actions with sympathy and solidarity. Second, the interaction between diasporas and domestic actors tends to be more reliable and lasting, and this is called a trust network. A trust network is defined by Tilly (2007) as a good network of interconnecting relationships between diasporas and communities in their home countries that facilitates the transfer of ideas and resources from the outside to the domestic actors. This is because the proximity of a shared culture, history, and language that makes it easy for the diaspora to be trusted by their country of origin. Good relationships facilitate the transfer of ideas and resources from the outside to the domestic actors. Third, diaspora networks help to overcome institutional and infrastructure constraints and reduce transaction costs in investing in undeveloped homeland markets (Chen and Chen, 1998). With linguistic similarities and the knowledge of local norms, diaspora are more likely to involve local officials and economic actors. Support at the domestic level can enhance economic liberalization (Hsing, 1998).

Diaspora in the category of high-skilled workers can also be a major actor in the process of the transfer of technology and knowledge from developed countries into their home country. The process of technology transfer and knowledge occurs when diasporas have been educated in developed countries and return back to their home countries, often becoming educators, businessman, entrepreneurs and technocrats who are the main drivers of the process of creating human capital and forwarding the economic development of the country (Saxenian, 2005). In many situations, the diaspora also pave the way for the inclusion of multinational companies and international research and development institutions in their home countries. This is possible because diaspora play a role in bridging the link, allowing for collaborations between the state and multinational corporations, as well as international research and development institutions as the subject of knowledge and technology transfer (Saxenian, 2005). In other words, the diaspora also have an indirect role as an actor who opens the door of cooperation and who inhibits the inequality of science, technology and human capital between their home country and the destination country.

Diaspora also help local entrepreneurs enable economies in their home countries to participate in the information economy (Saxenian, 2005). Their professional network can quickly help to build promising opportunities, raise capital, build management teams, and build partnerships with manufacturers in other parts of the world. The ease of exchanging communication and information in the network is localized by freedom, technology, and the discussion of new skills, technology and capital, as well as potential investors (Saxenian, 2005). There are three roles underlying the rise of India's information economy. In general, the diaspora depiction becomes a bridge and an important link in the economic view of information.

The explanation of this study is that an important issue in India's information-economic development efforts related to inadequate human capital can be domestically produced by India to solve the urgent need for human capital. The possible path for India to build its IT sector and its information economy is through diasporas. This is motivated by the absence of significant efforts by India in relation to the accumulation of human capital through the means of applying for foreign workers or through the reform and implementation of effective educational policies. Therefore, diaspora have three major roles in the development of the state. By pulling diaspora back into the high-skilled worker category, a brain reinforcement situation will occur and the problem of human capital needs in India can be bridged.

Diaspora, when in the context of the development of the information economy, serve as an important link in the process of developing the information economy. Through its three roles, the diaspora can act as an important linking thread for

knowledge transfer, changing the mapping of multinational corporations as key actors in the transfer of knowledge at the global level. Many diasporas return to India to start their own businesses and to create forums for information exchange. They also advise the country's development authorities. Besides that, diaspora also play a major role in bridging various state benefits, such as remittances and FDI flows that are of international importance for the knowledge transfer process.

3 CONCLUSIONS

In general, India is experiencing a shortage of human capital suitable for a larger revolutionary information economy under Rajiv Gandhi's government. In the period 1984-1990, India succeeded in making the information sector one of its major sectors and revolutionized the information-related policies in India, especially in the aspects of software production and exports. This occurred in central India, which was visited by human resources to encourage the information economy sector. This led to a potential discussion of the diaspora as a source of human capital. In connection with the situation of Indian diaspora emigrating out of India, they are a group that has a high level of education and that are a part of the skilled workforce. The data found showed that diaspora have a high interest in the IT sector in the destination countries, which is dominated by the US. This is evident from the number of Indian students at MIT who occupy one of the largest numbers of diaspora students and in the high number of Indian diaspora involved in the Silicon Valley region.

This caught the attention of PM Rajiv Gandhi, who sought to attract the diaspora. Through his initiative, Rajiv Gandhi succeeded in attracting important figures such as Sam Pitroda, T.K.Rao, Azim Premji, and Sharad Marathe. Accompanied by three revolutionary policies - the 1984 Computer Policy, the Software Policy 1986, and the India Software Software Park of 1988 - India quickly succeeded in revolutionizing their economic conditions into an information economy. Not only that, the diaspora called by Rajiv Gandhi also initiated the construction of important points in India's information economy sector. Using the outlined framework, it can be confirmed that the main findings in this study are: (1) that India has proven successful in addressing human capital needs in an effort to build the information economy in a short time and (2) that diaspora are the answer to the needs and proven problems, and that they have a significant role and contribution to India's development of the information economy. Therefore, it can be concluded that India, in a short time, succeeded in building its information economy and addressed the problem of human capital needs. The diaspora are the chain and the answer to the cause of the development of India's information economy. In this case, the diaspora served as an alternative source of human resources required by the information economy in India, and they contributed to the information economy in India through the initiation of technology transfer, the source of knowledge and the human resources that foster the development of sectors related to the information economy. They serve as a bridge between their home country and the global economy.

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