CHAPTER II
GLOBAL POLITICAL CONTEXT FOR TECHNOLOGY ACQUISITION BY INDIA

SECTION - I : POLITICAL CONTEXT IN WHICH INDIA EMERGED AS A NATION

A) International Background

The international relations among the states of the world has changed considerably in the past five decades. During the colonial times rich and powerful countries invaded and colonized numerous countries of Asia and South America and Africa. Their prime motivation was to exploit the bountiful deposits of raw materials and have access to their rich natural resources. The colonies also served as the vital source of outlets for their manufactured goods. Unequal free trade and gun boat diplomacy were the elements of direct colonial rule.

Direct colonialism was too transparent and an obviously unjust system to be sustained indefinitely. Under the impact of the independence struggles, most of the colonies gained independence from after the Second World War. Yet it soon became evident that despite political independence, the former colonies, now known as the developing countries, remain trapped in a vastly unequal international economic order. The element of injustice in the global order among the states has not only remained intact but also intensified the kind of exploitation that had begun during the colonial period.
The unequal exchange became even more unequal as the historical trend of deterioration in the terms of trade of the developing countries continued, during the half a century that has passed since the Second World War. The division of labour was on the previous pattern where the poor countries providing raw materials for the rich and the latter supplied the finished manufactured goods to the former thus perpetuating a structural dependence.

During colonialism, the political security apparatus of direct colonial rule kept the colonies in their place, whilst the colonial masters competed with one another. Their conflicts culminated in the Great-Depression of the 1930s and finally the Second World War. In the post-war period as the direct colonialism crumbled, multilateral institutions were established by the big powers which were aimed at regulating conflicts among themselves as well as maintaining the world economic order. The big companies nurtured through colonialism continued to expand into multi-sector, multinational corporate giants in the post colonial period. The multilateral institutions took on the functions of maintaining broad international macro-framework for continuing the status quo. Thus, as Khor Kok Peng concludes, the former coloniser-colonized relation was transformed into the North-South relations.

At the economic level, three institutions were set up to manage the transition from the colonial era to a post-colonial eras: the World Bank, the International Monetary Fund (IMF) and the General Agreement on Tariffs and Trade (GATT). The World Bank became the major mechanism to mould the post independence development models of the South through loans tied to policies that

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2 Ibid, pp.10-11.
promoted increasing integration with the world market. Its policies promoted an expanding output of raw materials and import of new technologies in agriculture, forestry, energy etc., and finished manufactured goods supplied by the North. IMF controlled the countries external balances by providing loans and imposing financial discipline on countries with balance of payments problems.

In recent years the World Bank and IMF have worked in unison in negotiating with developing countries' governments facing external debt repayment problems, providing rescheduling agreements and new loans on conditions that they undertake "structural adjustment" policy packages involving macro economic reforms that orientates the economy towards production for export, import liberalization and drastic cuts in state expenditure like welfare, education and food subsidies to balance the budget, etc.

GATT's role has been to promote and regulate the world wide liberalization of trade, which has facilitated the expansion of trade sectors in national economies thus ensuring the South North flow of raw materials and North South flow of manufacture as well as North-North trade expansion. The Northern countries are now expanding the role of GATT through the Uruguay Round Negotiations\(^3\) to incorporate powers for liberalizing the services and agricultural sector, for freedom of foreign investments and to tighten intellectual property regimes to the benefit of the patent holders most of whom are in the North, mainly the transnational companies.

By and large, the transition from colonialism to post-colonialism was managed without the former colonisers loosing their advantage. Of course, there were selective power shifts among the countries of the North like the decline of

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\(^3\) The update on the Uruguay Round of Negotiations and the Role of GATT is dealt within detail in the last chapter.
the supremacy of Great Britain and the rise of United States of America. The North not only maintained but greatly strengthened its domination of the world economy.

To this overriding trend there are two counter forces. The first was the emergence of a powerful Soviet or Socialist bloc: these states categorically decided to remain outside the world market system. Several socialist oriented developing countries also made efforts to reduce the grip of world markets on their economies. The socialist model emphasising greater equity and commanding position of the public sector, provisions of basic goods and services to the masses presented an alternative path for the Third World Development. Some of the developing countries got together to start the Non-Aligned Movement as West and East alike were appealing to the new nation-states to join their respective blocs.

India, the pioneer of non-alignment, provided the second important counter force in the post-World War-II era. Nehru conceived non-alignment as not entering into military alliances with any country, and in particular with any country either of the Western or the Communist bloc. The United States had alliance with some forty countries and the Soviet Union with some eleven countries. The essential feature of these alliances is that an attack on one member of the alliance system is considered as an attack on all other members. This will grossly curtail the horizon of the foreign policy and relations of a newly independent country.

The second essential feature of non-alignment is "acting according to our best judgement", an independent approach to foreign policy, not being tied down

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A. Appadurai and M S. Rajan, "India's Foreign Policy and Relations", South Asian Publishers, New Delhi, 1988, p 38.
to a particular line of action because of membership of a bloc. A third essential is the attempt to maintain friendly relations with all the countries whether belonging to any military bloc or not. Non-alignment provided a very important instrument for conducting diplomacy for the newly independent states.

B) The Response of the Third World

The space gained by these new nation states enabled them to exercise some degree of control, however limited, on their national economies political dynamics and social policies. Many governments boldly took steps to promote domestic enterprises and economic activities. These policies highlighted the attempts of nations to fight against foreign control that was a legacy of the humiliating experience of the colonial times. These attempts ranged from nationalization of foreign owned assets, to restricting foreign investments, placing limits on equity share and presence of foreign personnel and operating positive discrimination in favour of locally owned enterprises. Local industries were shielded from TNC's through high import duties or restrictions in some countries. Their main aim was to safeguard and strengthen their hard won freedom from the new threat from their former colonial masters. Slowly, as colonial phase became history, the North started evolving new ideologies of dominance, which would appear to be politically neutral. As Dinesh Mohan says, they found technology as

6 C.P.Bhambri, Foreign Policy of India, Sterling Publishers, New Delhi, 1987
the most-effective new form of domination, technology as an ideology. In his opinion, this is an instrument by which their present-day colonialism is progressing. Almost helplessly most of us in the Third World have fallen into this trap of conceiving and portraying our goals in terms of technology.

Third World regimes at least in theory had the choice of borrowing industrial technology in its various forms from the developed world, or generating such technology indigenously. Indeed, this choice had become the focal question should they import or create; one more oriented to their specific problems. As science and technology have increasing application in all aspects of the production process, technology has increasingly been recognized as crucial determinant of a nation's economic foundation for progress, development and prosperity.

Since the first industrial revolution took off in England the demand for numerous types of technology and continuous evolution has been an unchanging phenomenon. Today, in the era of high grade technology, technology needs of the nations form a major element of international relations. For any state, however prosperous and developed, it is next to impossible to cater to all their requirements indigenously. From this fact arises the importance of the process of technology transfer to promote and modernize industries, as discussed in detail in chapter I. So, more or less, the world is successfully moving towards a systematic change leading to a mutually advantageous technology interdependence.

But since the global community of states is not the community of equals, the concept of interdependence breeds in it the concept of dependence. Acquiring technology from abroad, whether at the government to government basis, or through MNCs or through negotiations with individual companies, or any
other channel, is possible only at a price. The price here is the determining feature which binds nations into either relations of interdependence or dependence.

Unfortunately for developing countries which are emerging from the structurally disadvantageous colonialism, the acquisition of technology through transfer proves to be an unusually expensive proposition; yet for them there hardly exists any other choice. They are at the bottom line where technology levels of production are concerned. Thus, what is popularly called the technology gap, is engulfing the entire range of industrial growth and competitiveness for the developing countries. So, from the very start, they are in a dependent position. They have no infrastructure to develop their own R&D at that level of sophistication that is required and they lack capital to pick and buy just the required technology for fuelling their economic engine.

SECTION - II : TECHNOLOGY ACQUISITION BY INDIA

Technology in the Indian National Interest

In India, like in any other member country of the world community in international transfer of technology, it is the acquisition, development and utilization of technological knowledge from another country, that plays an important role in its economic development. At the time of her independence, in India technological development was very rudimentary. Under the objectives of a planned economic development the government was very particular on its emphasis on the "core" sectors for the development of industrial and technical infrastructure, along with efforts to reduce the inequalities in the incomes, wealth
and economic power to meet the basic minimum needs of the population. Though India was keen to bridge the technology gap, she made clear her intention to preserve some measure of independence in the type of the technologies, the terms regarding the price and keeping a carefully controlled hold on all incoming technologies. The government from the very beginning has taken upon itself to direct and regulate the technology policy, by controlling the technology import as well as protect and promote indigenously available technology. While during the 1950s and 1960s technology import was liberal, yet since mid 60s it has become more selective and discriminative. There has been the strictest application of Monopolies and Restrictive Trade Practice Act 1969 (subsequently amended in 1980) and the Foreign Exchange Regulation Act (1973) severely restricted foreign investment and collaboration in the countries.

Yet restricted technology transfer has never stopped. The prime motivations for these decisions were -

(1) equitable economic growth in which most of the population participate and equally important was the protection of the environment.

(2) to increase domestic technological capability, which was essential to achieve sustained and balanced economic growth.

Economic growth totally reliant on foreign sources of technology would not be efficient because indigenous technology capability was necessary to attain a sustained and increasing productivity.

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Suppliers too have a wide range of motives. These include export-potential, market protection, market penetration, and increased production to reduce unit costs, fundamental objective being a satisfactory economic return.\textsuperscript{11}

In all technology transfers, especially in the Indian context, two issues are extremely important. They are:

(1) the appropriateness of technology being supplied

(2) the availability and cost of the technology, the technological assimilation and the learning effects, their capability to produce technology so acquired and their revealed comparative advantage in exporting technology to international markets.\textsuperscript{12}

India is an emerging world power. It is recognized as the pioneer of Non-Aligned Movement, a pillar of commonwealth of nations, a protagonist of the Third World and a guide of G-77 Group of countries. Along with the second largest population, an abundance of natural resources, a large pool of scientific and technical manpower, the sixth largest economy (GDP $1 trillion calculated by IMF) and sophisticated nuclear and space programme, India can legitimately aspire for a super power status by the next century.

Indian foreign policy has a distinctive character of its own. Soon after Independence, it chose to follow a path of independent foreign policy in a world charged with cold war alignments. Apart from a refreshing originality, it has shown a rare constancy and a remarkable continuity.


\textsuperscript{12} H.W. Singer and others ed., Technology Transfer by MNC's, Ashish: New Delhi, 1988, Part - 1, p 4
A foreign policy is always determined by a certain order of facts which result from an interplay of a large number of factors that affect the formulation of policy in different ways and different circumstances. Determinants include geographical, historical, political tradition and ambitions, military strength, national character, domestic milieu, and personalities of decision-maker.\(^{11}\)

India is a big country. It is not surprising that its assets led to a perception of India as an independent centre of power. The excitement and the pride of having won the independence after two hundred years of colonial rule made India face the future with a great deal of confidence. In this atmosphere the conviction grew that India had a leading role to perform in the affairs of the world and get its deserving position in the same league of states as the US, USSR and Peoples Republic of China.

It is clearly this perception of India, however distant the prospect, combined with the recognition of its present weakness that led to the birth of Non-Aligned Movement (NAM). We can clearly see that NAM was simply an expression of India's more generalized assertion of national independence. Nehru was convinced that joining any of the blocs would mean giving up one's own view and policy objectives on particular issues and adopt the other party's views in order to please them and gain favour. In other words, NAM meant that even before its potentials are realised, India would maintain its foreign policy autonomy as a putative great power, even though when NAM was launched India lacked the economic and military capabilities to back up its claim to be an independent centre of power.

India, as the innovator and pioneer of the NAM had to withstand tremendous pressure from the two superpowers on the face of bitter rigid power bipolarity. In this context we can understand the basic point of departure for India vis-à-vis the other Third World countries. On the one hand, India is extremely poor and underdeveloped with a weak base of defence capabilities. On the other, it is extremely conscious of its great power potentialities. It is determined to sustain its national independence and foreign policy autonomy. In this light it becomes essential to provide for a substantially strong and self reliant industrial base and a vibrant economy. A strong industrial base, specially its capital goods component, are the sin qua non of national independence. Thus, necessarily the country needs a vigorous science and technology policy that could check this country's massive technological dependence.\footnote{Baldev Raj Nayar, \textit{India's Quest for Technological Independence}, Lance Publishers, New Delhi, 1983, pp 2-6}

Formation of Indian National Congress (INC), has been a landmark in the social and political history of the country. From an initial stage of being an almost inocuous debating society it gradually developed momentum under the stewardship of the subsequent generation of its leaders and, growing almost exponentially, it acquired the fame of a massive movement for overthrowing the British rule.

One consequence of the strengthening of the mass movement was the growing realization among the newer generation of political leader to develop at least a broad contour of a vision of the new India after it attained political independence. These are contained in a number of resolutions and policy documents INC had adopted from time to time. The setting up of National Planning Committee under the then Congress President S.C. Bose, with
Jawaharlal Nehru as its Chairman can be regarded as the culmination of these trends. In that sense it can be called a landmark document which laid the foundation of the policies, plans and programmes of India after it attained independence. It acquired some very distinctive international and national overtones, because of some major convulsions that have been taking place in different parts of the world. Apart from the Indian National Movement for freedom, the Russian Revolution, the Great Depression and the Spanish Civil War have had their influence in the shaping of the vision. The roots for the vision of India as articulated in this reports of the NPC have drawn inspiration from the events taking place within the country and abroad to modernize Indian development in science and technology, socialistic pattern of society, assigning public sector commanding heights in economy and commitment to social justice in the fields of education, health, land reforms, decentralization of administration.

Pre-Independence Background - Colonialism and Modernization

Bipin Chandra has examined the impact of colonial rule in modernizing India. British economists have always upheld that the backwardness of the Indian economy and its failure to modernize itself was largely due to the value system i.e., spiritualism, asceticism, the caste system, joint family etc. Similarly, the British economists have always argued that the Indian capital was proverbially shy, it always sought safe avenues of investments and thus lacked the basic quality of adventure, which is an essential condition for dynamic entrepreneurship. Bipin Chandra rejects both these arguments for the absence of modernization. It is a historical fallacy to assume that India under the British rule did not undergo a
fundamental transformation or that remained basically traditional. But modernization in India was brought within the political parameters of a colonial economy. Thus, the colonial links between India and Britain resulted in the progress of the Industrial Revolution in Britain while it meant the modernization of those sector of the Indian economy which strengthened the process of integration of the Indian economy with the British capitalism. It was therefore not an accident nor was it historically exceptional that India was integrated into the world capitalism without taking part in the Industrial Revolution. It was modernized and underdeveloped at the same time. 15

On the eve of Independence, in the Discovery of India, completed in December 1945, Nehru wrote, "Outwardly, the war has encouraged India's industrial growth and production. Yet it is doubtful how far this has led to the establishment of new industries or is merely an extension and diversion of old industries." 16

At the fag end of the British colonial rule, India found itself face to face with the Second World War. And India had no choice but to follow the British into the war as there were many political interests at stake. Some statesmen and economists are of the opinion that the war opened up new avenues of progress for the Indian industries. This is again a very debatable issue.

The leaders were conscious of the growing power of USA and the Soviet Union and were aware of the role of technology in the transformation of their power status. Indian efforts to acquire autonomous technological capability after she won her independence were concomitant to its quest for a global role. For

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15 Bipin Chandra, "Colonialism and Modernization", Presidential Address, Section II, Indian History Congress (1970), pp.3-6.
16 Jawaharlal Nehru, Discovery of India, 1945
India the interrelationship between the great power politics and technology was directly proportionate. It was a firm proof of the linkage between the development of industrial technology and the construction efforts of Indian national power.

The Sub-committee of NPC on "Engineering Industries and Scientific Instruments Industries" stressed the need for heavy industries as the first necessary step towards a strong national security. It was clear that the needs of modern industrialization that necessitated the immediate establishment of and rapid development of heavy engineering industries within the country on large scale was realised at an early stage. The demands of national security also required that such industries be set up at as early a date as possible. Modern war is won more and more with machines. From the very beginning, the perception of our leaders was that technological strength enabled a country to play an active role in international affairs.

Nehru showed remarkable realism in his views on the vast military potential of the modern technological strength. This was clearly articulated in his speech given barely four months after Independence, while addressing an Industries Conference in New Delhi. Referring to the Second World War, he remarked, "Many things contributed to the winning of the last-war, but I think the chief reasons were two, the amazing capacity of American industry and scientific research..." He was very certain that, "...ultimately the technology behind the Americans... more than anything else decided the victor". Sardar Patel, although the Home Minister in Nehru's Cabinet, was equally concerned about developing technological capability for defence purposes. He maintained that India must be

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17 National Planning Committee Series, INC, Bombay, 1948, p.17.
industrialized quickly and efficiently in certain direction "otherwise we are doomed in the modern world because a modern army requires many things which only machine can produce."\textsuperscript{19}

\textbf{India's Quest for Technological Independence}

Nehru was the moulder of India's destiny. Nehru established the basic framework for science and technology in India and fundamental lines laid down by him were being followed at least till recently. Hence the "Nehru Model of Science and Technology" compels attention. The basic point of departure for India in developing a model for industry and technology is that India is both an extremely poor and underdeveloped as well as a country weak in defence capabilities, while at the same time it is a major and potentially great power. These facts then determine the goals for the country. First, India must raise the living standard of its population, and equally. Second, it must provide for the national security as well as for the role in the world's structure of power commensurate with its size. And the route to these major goals lies in the accomplishment of rapid industrialization.

Consistent with the thrust of India's national goals India's industrial strategy ought to aim at the building of a self-reliant industrial system. The short term objectives would be somewhat different. It would be ideal of course to build the system with indigenous technology. But given the utter lack of capital and absence of R&D, it will be a long drawn process. Accordingly, India must rely on

\textsuperscript{19} P.N. Dhar, Indian Steel Industry and Nehru, \textit{Metals in India's Development}, GOI Publication, Ministry of Steel, New Delhi, 1989, p 1
a liberal import of technology and given the wide scope of industrialization, she should do so on a broad front.

As discussed in the earlier chapter, when the developing countries attained political independence, some of the more naked form of colonial exploitation and consequent capital transfers were ended. In the meantime, however, advanced capitalist countries had evolved new techniques of production, and huge conglomerate enterprises, which straddled more than one nation. Although the scientific developments were often financed by the state in advanced capitalist states, the TNCs played the dominant role in their development. Through the system of patent rights the developments of know-how were closely guarded by the firms. This assured that much of the new technological developments came to be controlled by the transnational and other firms based in advanced capitalist countries. The developing countries remained technically backward and failed to introduce an alternative spectrum of techniques, which would have required an alternative strategy of development.20 In this given scenario, the development in Third World grew to depend greatly on the foreign aid (mostly loans) from the advanced capitalist countries. This aid in turn created markets for the TNCs in the Third World. In other words, we can say that the foreign firms penetrated Third World countries often acting in collusion with the local collaborators. These collaborating enterprises were in many cases public sector corporations which found it easier to depend on TNCs than to alter the economic environment so as to prepare for technological independence.

Thus, we realize that soon after Independence the crucial question was whether the country should start industrial development from a scratch or seek

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foreign assistance. There was evidently a huge gap between the industrial level of the developed and the developing countries. So, the options for the nation were very few. Obviously, outside help was necessary to enable India to set up a few basic industries and train an army of technicians, engineers, management personnel and scientific manpower. This settled, the next problem was availability of foreign exchange to buy equipment and machinery and pay for training etc. India was on the look out for sources of credit on easy terms. The most important factor was to ensure that India was not forced to pay high price for the techno-economic help that she was seeking.\(^{21}\) Given the background of India's ambitious self perception as a global political leader, the satellite status of this country with regard to its industrialization and economic development was clearly unacceptable. During the 1950s and the 1960s, industrial technology was one of the most fiercely guarded national assets. However, India was definite on its stand to refuse the status of a peripheral supplier state of primary products. She aimed at reducing her dependence on the developed states for manufactured or finished goods to meet her developmental needs. The objective was to make India self-reliant at the earliest through import substitution of capital goods.

We observe that while both growth and social justice were stated to be among the goals of India's development strategy, the emphasis has generally been on the growth of the kind that is consistent with building national power and autonomy. Industrial growth strategy that promoted the political objectives of nation building that were also crucial in the early years of Independence.\(^ {22}\)


India has a long and distinguished tradition in science. However it is only after Independence and the vision of Jawaharlal Nehru that science and technology were developed in a conscious way as a major force for social and economic change. The enthusiastic efforts of S.S. Bhatnagar led to the development of the Council of Scientific and Industrial Research (CSIR) - a chain of national laboratories, covering a wide spectrum of science and technology and bio-medical sciences. Visions of Homi Bhabha led to advanced research in nuclear science and other fundamental areas of Atomic Physics. The Tata Institute of Fundamental Research and what has now come to be known as Bhabha Atomic Research Centre (BARC) and the entire gamut of activities today coming under the Atomic Energy Commission. The space programme envisioned by Vikram Sarabhai in the 1970s has grown into a self-confident and self propelled area of Indian science. Therefore, we see that there was very strong economic and political motivation which enabled the Government of India to adopt the science policy resolution on 4 March, 1958 as in the following -

The key to national prosperity in the modern age, apart from the spirit of the people, lies in the effective combination of these factors - technology, natural resources and capital. The most important of these is the technology because the creation and adoption of new scientific techniques can in fact make up for a deficiency in natural resources and reduce the demands on capital.

Specific steps were taken to acquire the scientific temper to move towards modern India at a fast pace. The prime task for this purpose was to build up scientific manpower of the highest quality corresponding to the famous institutions of technology of US, like the Indian Institute of Technologies, down to the Industrial Training Institutes (ITI). Setting up of Indian Institute of
Technology, Regional Engineering Colleges and Industrial Training Institutes were one of the first steps. It can be presumed that these steps emanated from the anti-imperialist and anti-colonial overtones of national movement.

In the colonial times, nations projected their supremacy in terms of military might and science machismo dominance. Slowly this colonial phase became history and most states made tremendous efforts to make themselves independent and self-reliant so that they could finally throw off the dominance of the West, which had encompassed all aspects of human thought.

The West had now to evolve new ideologies of dominance which would appear to be politically neutral. In technology they found the most effective new form of domination. It became an ideology, and almost helplessly, most of us in the Third World have fallen into the trap of conceiving and portraying our goals in terms of technology.

**Nehru-Mahalanobis Model**

The First Five Year Plan (1951-56) was a great success. That really strengthened the confidence of Nehru in "economic planning". During the course of the First Plan, Nehru sent the eminent statistician, P.C.Mahalanobis, to Soviet Russia to learn from the planning experience of that country. After returning to India, Mahalanobis, in close intellectual fellowship with Nehru, made a model for the Second Five Year Plan. It is known as the famous Nehru-Mahalanobis Model. This is universally acclaimed as a great work in the literature on planning.
The Model identified the main objectives of Indian economic planning as: (1) economic growth and (2) social justice. A strategy of industrialisation was suggested to realise these objectives. The Model distinguished two types of industries - the heavy industries and the light industries. Heavy industries were considered the engine of economic growth and light industries the means of social justice. It was anticipated that by walking on these two legs the Indian economy would reach the "take-off" stage within a limited time-span. To impart a socialist orientation to agriculture and the rural economy community development projects, land reforms and cooperative farming were recommended in the Model.

Steel Industry - Its Rationale

Indian economic planning made impressive head ways within the frame work of this Nehru- Mahalanobish model. "Planning is a continuous movement towards desired goals. While precise formulation of plan objectives have varied from plan to plan, essential goals of Indian planning have remained unchanged," so wrote Prime Minister Nehru in his Introduction to the Third Five Year Plan. What are these goals and what are these objectives? Essentially, they are: (a) elimination of poverty by (i) ensuring the highest possible rate of growth on a sustained basis, (ii) reducing the disparity of income and wealth distribution, and (b) self-reliance, though not autarchic development to ensure the maximum freedom possible to the contrary in decision-making in an inter-dependent world.

The First Five Year Plan made a modest beginning for the realisation of these objectives, but it was the Second Five Year Plan that set the pattern. The model on which the plan was based was designed by Prof. Mahalanobis. It

emphasised the production of the basic materials like coal, iron and steel, power and building up of heavy industries, specially the machine-building industries. This, on the one hand, ensured self-reliant development which would not have been possible if attention had been confined to consumer and/or intermediate products without making sure of the base on which such production has necessarily to stand. On the other hand, by its emphasis on the basic and mother industries, as the machine-making industries, it ensured the growth of a host of subsidiary and ancillary industries and then to spread of industrialization.

Iron and steel occupied an important position in the group of heavy industries as it provided a basic material for the growth of the latter. As the Second Plan stated in explaining the priority attached to iron and steel, "the expansion of the iron and steel industry has obviously the highest priority, since more than any other industrial product, the levels of production in these materials determine the tempo of progress of the economy. Diverse types of fabricating facilities have to be created to promote the production of a wide range of item ... the creation of basic facilities such as the establishment of heavy foundries, forgings and structural shops is imperative ..."

The importance of iron and steel was summed up by Prof. Mahalanobis in his draft Plan Frame. "... in the long run the rate of industrialization and the growth of national economy," he wrote, "would depend on the increasing production of coal, electricity, iron and steel, heavy machinery, heavy chemicals and the heavy industries generally, which would increase the capacity for capital formation." "One important aim", he emphasised, "is to make India independent as quickly as possible of foreign imports of producer goods so that the accumulation of capital would not be hampered by difficulties in securing supplies
of essential producer goods from other countries. The heavy industries must, therefore, be expanded with all possible speed."

Rejecting the thesis of the Western economists which would have condemned India to the role of primary producer, or at best to the secondary role of producers of consumer goods dependent for capital, inputs and even technology on foreign sources, the Second Plan boldly opted for and laid the foundation for self-reliant industrialization of the country.

The public sector was assigned the main role in the promotion of heavy industries. But for the continuation of these industries we required foreign capital and technology. As we had a foreign exchange reserve of $1200 million at the dawn of freedom, the Model anticipated the procurement of necessary capital and technology from Western countries by using this reserve. In the case of light industries no such bottlenecks were anticipated since India had a heritage in craftsmanship. Further, it was expected that this industrial sector would provide employment to a vast section of our population and also the necessary wage goods.²⁴

Indian developmental strategy for industrial and technical infrastructures has depended on technical cooperation from a number of countries. We will study this aspect in the context of the development of the steel industry with technology transfer negotiations initiated by the government. However, of all the newly industrializing countries of the Third World, India has, according to Sanjay Lall,²⁵ remained the most inward looking and protectionist. The activity and entry of the foreign MNCs have been severely curtailed vis-à-vis growth and diversification.


Access to foreign technology for indigenous firms through licensing has also been controlled by limiting the number, duration, content and royalty rates of the contracts. But in spite of all the controls India managed to make considerable progress. As Abid Hussain\textsuperscript{26} puts it, "technical changes for progress must be viewed as a process of creating and sustaining an environment for technological innovations, so that the whole system of technology can be useful for solving specific problems". Soon after Independence, India recognized that technology was no longer an applied science but an internationally traded commodity that can be worked upon to suit the specific factor endowments and orders. Therefore, what India needed was a process of intense technological fermentation, a process that would lead to the naturalization of technology in which the source is not the key issue but its adaptation to the factor endowments, its efficient use and its diffusion.\textsuperscript{27}

Evidence suggests that there was very little import of technology in pre-1965 period, thus implying that during this period, foreign capital was considered desirable predominantly because of its role in filling the savings gap, not so much to bridge the technology-gap. It is here that the role of diplomacy in ensuring technology transfer along with institutional collaborations and transfer of skills became important. In the next chapter we shall study the bold negotiating skills displayed by the government for steel technology transfer. Inspite of many controls and regulations, India could make definite progress in the areas like steel because national objectives defined in the Five Year Plans encouraged us to act according to priority of national development.

\textsuperscript{26} ibid Abid Hussain, pp 35-42
\textsuperscript{27} ibid. pp 38-39
A technology development strategy which had the potential to make India a leader in the frontier areas of technology should have ensured that imported technologies were absorbed and adapted to enhance technological capability of the nation and increase the international technological competitiveness of Indian goods.

The Nehru-Mahanobolis Model did not work as anticipated because of the major constraint of foreign exchange. By 1957-58 most of the reserve was drained. Gradually, foreign exchange remittances almost reached their saturation point, while export began to stagnate. The Indian goods lacked competitiveness in the global markets as the costs were high, while the quality was inferior. The main reasons for there were the technological obsolescence and the highly protected local market.

A large number of industrial projects remained half complete. In order to confront this issue we approached the multilateral institutions including the IMF and World Bank. They then insisted a policy reversal. The main requirement was adopting a pro-private sector policy and permitting multinational corporations (mainly consumer goods oriented) in the Indian economy. This external intervention to a large extent betrayed the goal of "socialist" pattern. The Nehru Government had to yield to the pressures of the IMF and World Bank.

However, this necessitated a change in our foreign policy. So we moved closer to the Russian side to empower ourselves in negotiations with the West.\textsuperscript{28} This political aspect did have its implications for the technology transfer negotiations that India participated in. As our international negotiations for technology transfer in steel sector brings out clearly that the socialist pattern of

\textsuperscript{28} ibid pp.37-38
our national objectives and the decisions to concentrate on the core sectors had already discouraged the US and the Europeans, who were earlier willing to collaborate.

A Comparison between the US and the Soviet economic aid coming in to India

The US aim was to promote its trade: The USA had been particularly anxious to shift the emphasis of the Indian planning towards agriculture. According to John P. Lewis, the former director of US Aid Mission to India, "aids come wrapped in a host of regulations defining where, when and how it can be used ... ". In short, it is not India that defines the purpose of aid, not even where, when and how it would be utilized. It is the American financial interests that decide both the quantity and structure of aid.

The USA tops the list of foreign lenders to India but all its aid is not worth while. Moreover, the terms and conditions are more favourable to the USA than to India. Had the major share of aid been in the shape of heavy industry equipment, such as machine tools, steel mills, hydro-electric projects, etc. it would have given a powerful impetus to India's economic development.

The aim of Soviets was to promote infrastructural co-operation: In contrast, the Soviet economic cooperation helped to a great extent in building up a sound economic base by strengthening our key industries. Soviet assistance in our key industries such as steel, oil, power engineering has been of immense help to India in its struggle for economic independence and self-reliance. More than 99% of the Soviet aid has come into public sector and of that 90% was in priority sectors, 80% in metallurgical equipment, 60% in power generation.
So far, we can say Soviet aid is designed to do away with dependence on aid. "The growth of India's self-reliance has been the story of the growth of her basic industries."

Table 2.1

<table>
<thead>
<tr>
<th>Sector</th>
<th>American Aid %</th>
<th>Soviet Aid %</th>
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</thead>
<tbody>
<tr>
<td>Railways</td>
<td>3.8</td>
<td>Iron and Steel 52.3</td>
</tr>
<tr>
<td>Power &amp; Irrigation</td>
<td>7.0</td>
<td>Oil 16.2</td>
</tr>
<tr>
<td>Steel &amp; Iron Ore</td>
<td>1.8</td>
<td>Power 14.6</td>
</tr>
<tr>
<td>Transport &amp; Commn.</td>
<td>1.1</td>
<td>Coal, Mining 2.3</td>
</tr>
<tr>
<td>Industrial development</td>
<td>25.0</td>
<td>Industry 12.0</td>
</tr>
<tr>
<td></td>
<td>38.7</td>
<td>Others 1.1</td>
</tr>
<tr>
<td>Wheat Loan</td>
<td>55.9</td>
<td>Drug Projects 1.5</td>
</tr>
<tr>
<td>Health, Agricultural, Social,</td>
<td>5.3</td>
<td>Others 1.1</td>
</tr>
<tr>
<td>Educational Etc.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>61.9</td>
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</tbody>
</table>

Source: T. Nagi Reddy, India Mortgaged, 1978

K.N. Raj observes that in the case of Western loans, they are tied to exports to India, but the repayment has to be made in foreign currencies. In case of the USSR, the aid is tied to imports, but the repayment is tied to exports. Thus, he feels that loans from the USSR are, therefore, a lesser burden than those from the Western countries.29

But the foreign exchange crisis and closed form of India's economic pattern was creating the pressures to bring about structural policy changes. These structural policy changes in the long run have managed to entirely change the

focus of technology transfer negotiations in the context of core industries as well. We can see this, currently in the post-1985 period when the foreign exchange crisis finally pushed India for a second IMF loan and we were forced to agree to the entire range of conditions under the Structural Adjustment Programme.

Though the Nehru-Mahalanobis Model in the Second Five Year plan was a magnificent one, in implementation it was a failure due to constraints, like the ones listed above. We also failed in moving forward in land reforms and other rural improvement programmes.

The border problems with China and Pakistan also weakened the Indian economy. In the early 1960s we had a serious food crisis, necessitating massive imports of food. This gave rise to another foreign exchange crisis in 1966, leading to further yielding to the World Bank pressure to devalue our rupee.

Even though during the Nehruvian era we had become dependent on the West for foreign capital and technology there were attempts to reduce it. Nationalisation of banks in 1969, enactment of the Patent Law in 1970, and the MRTP and FERA in 1973 were some crucial steps in this direction.

**Changes in the Post-Nehruvian Era**

The two oil shocks further weakened the Indian economy in the 1970s. So, towards the close of the 1970s, the Government of India approached the IMF for a 5 billion SDRs loan. Then the IMF stipulated certain conditionalities like liberalising imports, releasing price controls deregulating industrial production, promoting exports-oriented industrialisation, toning down the budget support to the public sector, sharp reduction in taxes, etc. All these conditions were against
the spirit of the Nehruvian economic policy. Nevertheless, we surrendered to the 
IMF dictate.\textsuperscript{30}

After the assassination of Indira Gandhi, Rajiv Gandhi came to power. This was the time when more overt efforts were made to negate the Nehruvian 
economic course. Some foreign trained Indian economists cited the "wrong" 
economic policy patterned by Nehru and his successors responsible for the relative 
derelative underdevelopment of India.\textsuperscript{31} So, for hiking up the Indian rate of growth the 
"mistaken" policies have to be corrected. That meant marketisation, privatisation, liberalisation and globalisation. To salvage the situation, government initiated a 
three pronged strategy:

i) Modernization of plant and equipment through liberalized imports of capital 
goods and technology

ii). inducing greater competition in the Indian industry

iii) assigning a greater role to MNCs in exports promotion measures.\textsuperscript{32}

Import duties on capital goods were drastically slashed 1985, procedures 
were simplified. While MRTP asset limit was hiked from Rs.20 crores to Rs.100 
crores. Government policy was also substantially liberalized towards foreign 
capital and technology.

Rajiv Gandhi's government responded positively to this call. However, 
subsequently his policies led to two serious problems: 1) fiscal instability and 2) 
the huge foreign debt. Though our imports shot up, exports did not keep pace 
with it. So there arose a serious foreign exchange crisis in 1990-91. All the

\textsuperscript{30} ibid pp 40-41
\textsuperscript{31} M.L. Gujral, \textit{Economic Failure of Nehru and Indira Gandhi}, Vikas 
Publishing House, New Delhi, 1979
\textsuperscript{32} GOI publication, Alexander Committee, 1978, GOI Publication Tandon 
Committee, 1980.
international credit rating institutions reported adversely on India. Thus, we even had to sell some of our gold reserves to meet the import bill. When we approached the World Bank and IMF they gave us the Anderson Memoranda containing the Structural Adjustment Programmes. The Narasimha Rao government loyally implemented the Anderson Memoranda. As a consequence, the public sector is being increasingly privatised, the foreign banks and TNCs are encouraged to come to India, the MRTP and FERA are diluted, a lot of restrictions on imports is removed, public distribution system is weakened, the public sector support system is taken away, price regulations are not seriously implemented, direct tax rates have been slashed. All these steps constitute the groundwork for the effective implementation of the New GATT ruling.\textsuperscript{33}

At this point let us refer to Table -2.2 given on the next page. This table gives an interesting information and a summary of India's social and economic developments spanning the forty five years since Independence (1947 to 1992), prepared by de Boer and Fell.\textsuperscript{34}

This covers policy eras, international contexts and the major events that have taken place in this long period of time. The above table not only enumerates, year-wise, very neatly the major events in the military, political and economic fields during 1947 to 1992, but it also gives a vivid and compact account of different eras, the contexts and the policy developments during these years ending right up to the radical reforms which led to the fundamental structure adjustment programme. Indeed, it most aptly puts together the political, economic, military and socio-cultural forces which have been at work in shaping some of the crucial policies formulated in India since 1947.

\textsuperscript{33} ibid, Abid Hussain, p42
\textsuperscript{34} Keto de Boer and G. Fell, A Fresh Look at India in The Mckinsky Qtly.
Table 2.2

India’s post-independence eras

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</tr>
</thead>
<tbody>
<tr>
<td>Jawaharlal Nehru</td>
<td>Lal Bahadur Shastri</td>
<td>Mrs. Indira Gandhi</td>
<td>Morarji Desai</td>
<td>Mrs. Gandhi</td>
<td>Rajiv Gandhi</td>
<td>V. P. Singh</td>
<td>Narasimha Rao</td>
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Eras

- 1947-53: State controlled Industrialisation
- 1960: Green Revolution
- 1965: Nationalism
- 1970: Charan Singh
- 1975: Chandrashekhari
- 1980: Gradual Liberalisation
- 1985: Liberalisation
- 1990: Radical Reforms

Context

- Intense suspicion of foreigners, trade, and capitalism - the colonial legacy
- India to become an independent centre of economic power, meeting others on the basis of equality
- Public sector will be mechanism to bring socialism, industrialisation, and modernization to Indian people

Policy

- Nehru launches and directs heavy industry program (1956 onwards)
- Centralised planning and control
- Massive public sector ownership
- Virtually closed to international trade
- Fertilizer production opened to private sector and foreign investors
- Nationalisation of sector
- Coal Industry
- Central Insurance Companies
- Copper Industry
- Major steel Complexes
- Price preferences for public companies removed
- Imports to allow competitive sector
- Abolition of fixed prices for pig iron
- MRTP bars expansion and diversification for large companies without government approval
- Role of public sector is to facilitate growth of the private sector
- Competition seen as a means of forcing nationalised industries to become more productive
- Acknowledgement of
  - Unprofitability of public sector
  - Stifling system of controls
- Pressure from World Bank & IMF

Major events since independence

Military

- 1947: Independence and 1st war with Pakistan
- 1952: War with China
- 1974: Nuclear Test
- 1987: Indian troops deployed in Sri Lanka
- 1989: Launch of Agni Intermediate range ballistic missile

Political

- 1950: 1st constitution
- 1964: Death of Nehru
- 1971: Treaty of Peace and Friendship with USSR
- 1978: Power & coal shortages led to widespread unrest, allowing Mrs. Gandhi to regain office
- 1984: Mrs. Gandhi assassinated by her Sikh bodyguard
- 1991: Rajiv Gandhi assassinated

Economic

- 1966: Currency devaluation (seen as a surrender to the US)
- 1973: Oil Crisis
- 1977: IBM and Coca Cola withdraw from Indian market
- 1990-91: Balance of payment difficulties
- 1991: Budget containing radical reforms passed

Source: de Boer and Fell
Coupled with the international forces that have been at work during this period, this tables provides an excellent framework for discussing the considerations which formed the basis of the crucial period during which India took the momentous decision of setting up massive steel plants under the auspices of the public sector as a foundation for building a dynamic, self-reliant and modern state with strong overtones of ensuring social and economic justice to the hitherto neglected sections of the populations. The table has been a valuable find during my research. It covers the long time span during which the public sector was placed at the commanding heights of the national economy and then came the phase through international compulsions, when the position of public sector kept on being reduced in degrees. Finally the table shows the radical changes in the economic policy of the nation since the 1991-92. These wide ranging changes have had their impact on the technology transfer negotiations for the development of steel industry. The crucial theme that I would like to ascertain through this presentation is that diplomacy does not only mean certain manoeuvres by some clever diplomats. While certain diplomatic negotiations with formidable counterparts abroad is important, much more decisive is the intrinsic strength of the state, as reflected in its various policies, which are summed up in the above table.

Here I would like to mention that throughout this research, I have perceived process of diplomacy as the communication between two nation states through negotiations. The actual contours of diplomacy of a country are characterised by the social, political and economic bases of the nation. In the context of India as well, the diplomatic parameters have been established over a historical span of time. These incorporate the forces of social formations, which
have had a deep impact on our national psyche, like the Indian Freedom Struggle, through non-violent and non-cooperation means. Then the international stand of the nation against imperialism and colonialism. Also the political motivation to ensure peace and justice for its people along with helping others to achieve similar goals. All these strengthened the base for our national aspirations. Thus, all these aspects like economic growth, social justice, self reliance, non-aligned foreign policy etc., constituted a base of values on which Indian diplomacy was conducted. As the Table-2.2 shows, through this long duration of time, various economic and political upheavals marked new elements to our national capability. This in turn affected our diplomatic strength. How the political motivations, national priorities and government attitudes affect diplomacy, this I will attempt to discuss more clearly when we study the diplomatic interplay of factors influencing the technology transfer negotiations for technology transfer for the development of India's steel industry.

SECTION III : TECHNOLOGY IMPORT POLICY

A nation's technology import policy is formed mainly by three principles :-

(i) the cost of technology import should be minimized;

(ii) technology importers should be discouraged from paying too much and their bargaining power with respect to their suppliers should be augmented;

(iii) importers should be encouraged to be technologically independent. The policy should enable India to move along with dependence to independence continuum of technological progress.

Therefore, it is rational for the government to regulate and condition the technology purchases in appropriate ways, so that the price paid is not what the technology suppliers dictate by virtue of superior bargaining power. The price should roughly correspond to what would otherwise prevail in a competitive market situation.36

The major stands of government of India's technology policy are the development of indigenous technology on the one hand and efficient adoption and absorption of imported technology on the other.

The basic principles governing the acquisition of technology have been the following :-

1. Imports of technology is to be permitted only on a selective basis where a need has been established, technology does not exist within the country and time taken to generate the technology home long enough to delay the achievement of development target.

2. There should be no tied purchases of components of raw material and no restrictive clauses with regard to sub-licensing and exports.

3. Outright purchase of technology is to be preferred over any other form such as equity participation export where it is deemed necessary under special circumstances. As a matter of fact, any kind of foreign collaboration unaccompanied by transfer of technology, is not allowed except with oil exporting developing countries.37

In this particular case, diplomacy is used to influence the conditions of technology purchase, to regulate its price by using political pressures or economic leverages or through many others aspects of bargaining. Through diplomatic negotiations the nation can attempt to ensure that it gets the best that can be acquired, while still defending and promoting the national interests.

In the period soon after Independence, the foreign capital was looked down upon due to the presence of strong nationalistic fervour prevailing at that time. Thus, during 1948-55, only 284 cases of foreign collaborations were approved. But the number of approval during next five years 1955-60, following a policy of liberalisation, almost trebled. The decade of 1960s observed a real spurt in the growth of foreign approvals. The first phase of Indian steel diplomacy very aptly brings out this aspect of India's international negotiations.

Later the number of approvals in the 1970s fell down significantly, compared the previous decade because of restrictive attitudes. The eighties, of course, were to witness a sharp and phenomenal rise in foreign collaborations. The classification in phases of the government policy towards technology import had its effect on the negotiations for steel. But we must keep in mind the larger framework of political issues and economic changes together with other developments, like in military and defence area requirements, which actually necessitates these constraints. These I have tried to bring out in the second phase of India's steel diplomacy in the 1970s and 1980s.

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Foreign technology induction in public sector undertakings - Foreign loans which form the major transfer mechanism of resources, cover significant elements of advanced foreign technology, for building the infrastructure for rapid industrialisation.

Some salient features of technology transfer in public sector are:

1. Government undertakings have resorted to the direct mechanism of technology transfer as they go in for outright purchase of know how from different sources. To some extent the nature of infrastructure projects such as power steel heavy electricals and railways development has forced the promoters to shop for various types of technologies from diverse sources which are not readily available as package from the donor countries.

2. In most undertakings technology transfer has been effected once and for all in the shape of a massive close of the technical know how. The state of technology in the Indian steel plants is a striking example in this respect.

3. The most important observation is while aid terms are apparently generous, the final price cashed for permitting capital goods and technology through aid channels tends to be exhorbitant. Conditionalities are a prominent feature of the aid received by India. Tied to aid is the inflexibility in the use of resources, and the reduced choice of technology. Mostly, it turns out to be Hobson's choice and the country is forced to accept the available technology from the donor country irrespective of its cost and appropriateness. Hence the lack of standardization in this

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[^39]: V. P. Chitale, in *Foreign Technology in India Economic and Scientific Research Foundation*, 1973, New Delhi, pp.21-22.
procurement of technology and machinery in our core sector generally renders operation of such mixed technology and plants more costly.

So, in spite of all the policy regulations our experiences at technology acquisition through the government has not been without the drawbacks. What comes out most strikingly from this analysis is that ultimately it is the bargaining status of the buyers and sellers of technology which influence the mode, the forms, the cost and the contents of technology transfer. Despite this armoury of controls through policy instruments, the Government of India did not have a strong bargaining position in negotiating with the foreign firms specially in the areas of new technology mainly aided by a clever and well thought out strategy.

Though a major control of the Indian industry has been one of the basic tenets of government policy, it has been used with considerable flexibility. Wherever it was difficult to bargain effectively, foreign equity participation was allowed and encouraged in joint ventures instead of payment for imported technology, machinery, plants and know-how. Special concessions were granted to foreign oil firm in early 1950s. In the mid-1960s majority foreign capital participation was allowed in fertiliser units. Given the advantages, the joint ventures have enjoyed wide acceptance among the MNCs, as the chosen instrument for technology transfer from the developed to the developing countries.40

Today after decades of controlling and mobilising of Foreign Direct Investment, the country is going all out to open the door of its economic reconstruction. This creates a totally new image of India in the international situation. The fierce claims of self reliance and independent foreign policy have

40 ibid, V.P.Chitale, pp.26-27.
taken a back seat in the Indian perspective of 1990s. Thus a new set of political and economic situations has been forwarded to the diplomatic efforts of the country, in which to carry out the international negotiations for technology transfer.

Channels of Developing technological capabilities

Since in the forth coming chapters we shall be discussing technology transfer negotiations in detail, it is relevant to see the context of the conduct of these negotiations for enhancing technology capabilities in a manufacturing industry, in general.

The technological capabilities for indigenous manufacturing of steel in the country includes the vital issues of technology transfer which are at the very root of conducting diplomacy for getting support from other countries. The other important areas for enhancing such capabilities are development of a wide range of manpower in considerable numbers, availability of the basic raw materials and other infrastructure facilities like transport, power, water, etc. The table 2.3 given on the next page, gives a general sequence of events for developing technological capabilities to set up the three major plants within a remarkably short span of time in the Second Five Year Plan.

Taking the instance of the enormous skilled manpower requirement for a steel plant - starting from the highly sophisticated steel technologies down to the worker on the floor, who directs the flow of the molten metal to the foundry, India has reasons to feel proud of placing on the ground the entire range of technologies within this short period. This owes a great deal to the foresight
<table>
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<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project preparation</td>
<td>Project evaluation</td>
<td>Process engineering</td>
<td>Product engineering</td>
<td>Industrial engineering</td>
<td>Technology transfer</td>
</tr>
<tr>
<td>1. Identification of suitable project design</td>
<td>Basic process design</td>
<td>Debugging new plant</td>
<td>Assimilation of product design</td>
<td>Improved work flow and scheduling</td>
<td>Development of local suppliers, subcontractors</td>
</tr>
<tr>
<td>2. Feasibility studies</td>
<td>Basic and detailed engineering</td>
<td>Initial adaptation to local raw material, working conditions, layout</td>
<td>Initial adaptation of product to local market needs</td>
<td>Better working practices, time and motion studies</td>
<td>Transfer of know how to buyers</td>
</tr>
<tr>
<td>3. Specifications of product range, input requirements</td>
<td>Equipment search, procurement, testing</td>
<td>Balancing facilities to remove bottlenecks, reach full capacity</td>
<td>Improvement in product design</td>
<td>Monitoring of capacity utilisation, coordination of different stages</td>
<td>Setting up turnkey projects for customers (Capital goods firms)</td>
</tr>
<tr>
<td>4. Specification of scale of production</td>
<td>Civil construction</td>
<td>Achieving adequate quality control</td>
<td>Adaptation to export market needs</td>
<td>Evaluation of inhouse and boughtout components</td>
<td>Setting up projects for similar plants (e.g. chemical or textile firms)</td>
</tr>
<tr>
<td>5. Identification of technology services</td>
<td>Ancillary equipment maintenance and repair, some inhouse spares &amp; manufacture</td>
<td>New product introduction by licensing</td>
<td></td>
<td>Setting up projects for similar plants (e.g. chemical or textile firms)</td>
<td></td>
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<tr>
<td>6. Negotiation for technology transfer</td>
<td>Equipment installation, renovation, adaptation, perhaps some inhouse eqmt manufacture</td>
<td>New product introduction by own development</td>
<td></td>
<td>Taking out patents, making blueprints</td>
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<tr>
<td>7. Negotiations contracts for construction</td>
<td>Commissioning, trial runs</td>
<td>Process improvements, energy savings, greater use of local raw material</td>
<td></td>
<td>Formal technology transfer unit</td>
<td></td>
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<tr>
<td>8. Project scheduling, finance arrangement</td>
<td>Training</td>
<td>Subsequent induction of new process technologies</td>
<td></td>
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<tr>
<td>9. Site preparation, infrastructure preparation (if needed)</td>
<td>Subsequent repetition of cycle for expansion of new plant</td>
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<tr>
<td>10. Basic research</td>
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</table>

Source: Sanjay Lal. Analytical framework to study the technological Change, ibid, Learning to industrialise
shown by India's political leadership in setting up extensive network of institutions with wide range of specialization and sophistication.

Apex institutions like IITs and going right down to the industrial technology institutes, the foundations of India's technological capabilities were laid by what Nehru had picturesquely called the Temples of modern India. Indian Institute of Metals, Dhanbad, was set up as one such research institute. While with hindsight one can clearly see the problems of obsolescence of the products and economic viability of the Heavy Engineering Corporation at Ranchi, it must be understood in the particular time context. The political leaders and the planners had the vision to lay the foundation to strive for self-reliance in the context of steel industry.

In every case the actual decisions about technology takes place at the microlevel. That is an investment decision embodying a particular technology is made by decision makers within a productive unit. The productive unit may be a large organization with world-wide activities such as multinational corporations or it may be a small unit of a family firm. The level of decision making is defined as micro since the decisions are taken by the units in question in the light of their objectives and resources.

While each decision takes place at the micro level, each is strongly influenced by the external environment. Apart from intervening directly by making particular investment/technology decision the governments can influence technology decisions by influencing the external environment. Direct interventions account for only small proportions of all technology decisions specially in a mixed economy. Hence, a government's greatest potential influence on technology
decision takes the form of influencing the decision making unit's external environment. 

In the following chapters on India steel diplomacy, I have attempted to look into the various facets of macro policies which have influenced international negotiation for technology transfer in the context of the Indian steel industry.

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Stewart F. Macro Policies for Appropriate Technology in Developing Countries