CHAPTER-1
INTRODUCTION - A THEORETICAL CONTEXT

Economic Development identifies a process in which a country’s real per-capita gross national product (GNP) enhances over a sustained period of time through continuous increase in per capita productivity. Apart from it, development can be perceived as a multi-dimensional process that involves the re-organization and re-orientation of the entire economic and social system apart from the structure of the economy because development undergoes a perceptible transformation. The concept of under-development is not purely quantitative but it is qualitative also concurring with welfare objectives.

The Economic Development is a wide concept that considers economic growth, and this economic growth is measured in the terms of Gross Domestic Product which plays an important role in reducing poverty and inequalities in income-distribution. Economic Development does not focus on the aggregates and per capita income, but it focuses also on concern about economic, social, and institutional mechanism that improves the standard of living and also promotes innovation that leads to structural transformation (Todaro, 2001).

During the process of economic development, the sectoral structure undergoes discernible transformation. The structural changes are indispensably relevant, as they elevate productivity and accentuates the process of economic development. Thus, both structural changes and economic development have a dialectical relationship. The pattern of development ensures that the focus of sectoral structural change remains on the sequential process through which the economic, industrial, and institutional structure of underdeveloped economies is transformed over time for allowing new industries to replace traditional agriculture set-up as the engine of economic growth moves. These changes entail transformation of ancillary-proficient technology, entrepreneurship, pattern of investment, variations in the composition of consumer’s demand, international trade, resource allocation, factor intensity, international specialism, efficient capital accumulation in physical as well as human capital, changes in such socio-economic factors as more urbanized, industrially assorted
manufacture and service economy, growth and distribution of country’s population, and also the changes in standard of living.

**The Structural Transformation and Industrial Development:**

Development means the suppression of the traditional sector by concentrating on modern sector and expanding that modern sector. These two sectors have little relation and interdependence, and each sector develops according to its own pattern. The interaction between agriculture and industries changes significantly over time during the process of economic development. However, as development takes place, the relative importance of agriculture declines sharply, while the importance of industry increases considerably.

Industries develop on account of the impact of growth in agriculture sector. Industrial sector absorbs the surplus labor and increases the demand for agricultural products. Whereas, in turn, the agriculture sector provides raw material, a market for industrial goods, and contribution to the industrial sector. The modern sector can be considered as an economic enclave of industrial countries, and this view is responsible for this sector’s multiplication and growth benefiting these industrial countries.

Taking data from twenty-eight developed countries, Kuznet (1957) has observed a consistent pattern of structural changes. This pattern has demonstrated that when the per capita income increases, the share of agriculture in GNP decreases. But increase in the industrial sector is there. The proportion of labor force in the agriculture sector, which is already almost eight-tenths of the initial level, declines in countries like Great Britain and United States. Evidence also shows that in the year 1940, less than 20 percent and over 30 percent of labor was engaged in the agricultural sector and in mining, manufacturing and construction respectively. In developing countries with the rise in national output, the average share of agricultural sector declined by 45.6 percent, and it increased by 17.9 percent in an industrial sector.

Based on linear logarithmic regression, Chenery (1960) made estimates from data taken from thirty-eight countries, including both developed and underdeveloped economies for the year 1950 and 1956. He used growth elasticity and size elasticity as variables, and concluded that the per capita value added depends upon per capita national income and population. During the process of industrialization, a number of
structural changes have been observed like rise in the importance of manufacturing sector and changes in composition of industrial output and production techniques. Apart from it the demand and supply pattern of consumers’ commodities has undergone change because the industrial output has risen from 17 percent to 38 percent. Apart from it primary production has declined from 45 percent to 15 percent at an income level of $100 to $1000.

Fisher (1939) and Clark (1940) observed a noticeable reduction in the proportion of labor force in agriculture sector in most of the countries. In the majority of these countries, except Australia and Canada, the productivity tends to be lower in agriculture than in industries. The shifts were considerable in the year 1820. In the United States, the labor force involved in agriculture was over 70 percent, but in 1940, it was less than 20 percent, and per capita income increased significantly. As the process of development proceeds, the pattern of industries undergoes changes. The demand shifts from basic necessities and less-value added goods to luxurious and high-value added consumer durable goods.

Engel’s Law (1967) expounded that over the time, the terms of trade have set out in favour of industry, as the market demand has increased. Structural resources are increasingly allocated to the industrial sector. Thus, the importance of agriculture sector goes on diminishing during such a period.

Lewis (1954) and Rannis and Fei (1961) contented that an underdeveloped economy consists of two sectors, and they are featured as traditional agricultural and modern sectors. The primary focus of the model is on the migration of disguised unemployed workers whose contribution to agricultural output is zero or negligible, and who have been reallocated for the growth of output and employment to the industrial sector. The process of growth is expanded by the rate of investment and capital accumulation. Thus, the labor-land ratio, that is, the marginal productivity of labor at subsistence level is no longer zero as it accelerates at a wage equal to the institutional wage of agriculture. Owing to this, labor supply curve slopes positively, which marks the development from the take-off to self-sustained growth.

Industrialization plays a vital role in providing employment opportunities, in generating incomes, in contributing to the maintenance and improvement of society’s capital assets, and in assisting the general improvement in economic and social welfare. Hence, industrial activity contributes to economic development, but at the
same time, it is a product of economic development (Jones and Cockrill, 1985). It gives rise to desirable, social, psychological, and institutional changes (Kirkpatrick, et.al, 1985).

Papola (2005) conducted a study by means of World Development Report (2004) for the time period of 1960 and 2002, about the economic transformation that occurred in some Asian developing countries like India, China, Indonesia, Thailand, Philippines, Malaysia, Republic of Korea, and Pakistan. The study concluded that the share of agriculture in GDP has slowed down in China, Indonesia, Thailand, Malaysia, Philippines, and India to 15, 18, 9, 9, 14, and 24 percent respectively. On the other hand, a noteworthy augmentation has been observed in their percentage shares in industry and services.

Taking into consideration the case of India, Papola (2012) explores the structural pattern of economic transformation in four phases. These phases start from Independence. Firstly Mid-1960s (phase1) amid a momentous structural change with a great boost in the share of non-agricultural sector, mainly of the industry in the national output. Secondly, Mid-1960’s to 1980 (phase 2) described as a slower pace of structural shift from agricultural to non-agricultural, i.e. a very less increase in the share of industry in national output. Thirdly 1980 to early 1990s (phase 3) experienced a large fall in the share of agriculture and vice versa in case of industry. And finally early 1990’s onwards (phase 4) has shown a considerable rise in the share of service sector and very little ascend in industry as compared to agriculture sector from the 1990s onwards. It was observed that the share of agriculture has taken a rain check from around 20 to 16 percent, that of services sector has increased from 54 to 59 percent, and that of industry has stagnated.

Nature and Pattern of Industrial Development as Economies Grow:

The most burning need for rapid industrialization of the developing countries is to accomplish the basic objectives of their economic and social progress. It has been recognized that industrialization is the surest solution to the problem of raising the standard of living of the people. Clark (1957) pointed out that the economic growth entails the movement of resources from the low-productivity sector, i.e. agriculture sector to high productivity sector, i.e. industrial sector.
Some studies provide the evidence on the relationship between the per-capita income and structural changes in manufacturing sector during the period of 1960-75. UNIDO (1979(a)) showed empirically that the structural changes were more profound at the intermediate income level of $265 and $1075 than at the high-income level of above $1000. At higher income levels, although the manufacturing sector matured, but it matured at a slower rate, that’s why the growth path featured as an S-shaped curve.

Hoffman (1983), in his study observed that with the economic development, the pattern of goods has been changing because the process of industrialization passes through different stages. In the initial stage of industrialization, the economy was dominated by the production of consumer goods as compared to capital goods with a net-output ratio of 5:1, but later with the lapse of time, the reverse situation occurred as the net-output ratio of consumer to capital good fell. The output of capital goods that started from the smaller base has been elevated higher than consumer goods with ratio 1:1. This downward pattern has been perceived by certain countries like Belgium, France, and Japan, before and by the end of 19th Century.

**Classification of Industries During Phases of Economic Development:**

Industrialization has positive impact on the economic growth of any country because it reduces unemployment rate and poverty; and increases trade, foreign direct investment, and also creates opportunities to re-balance the economy towards high value-added sector (UNIDO, 2012). Chenery and Taylor (1968), have classified industries according to their contribution in the economic development in their different groups as:

- Early Industries with low-income elasticity of demand, low potential for import substitution and export promotion, and also less share in Gross National Product of $ 200. Such type of industries include food, leather goods, and textiles.

- The Middle Industries with the share in Gross National Product growing to the per capita income levels of $400-$500; income elasticity of their product accelerates at 1.2 to 1.5 percent, but the potential for import substitution is low. These industries include non-metallic, minerals, rubber products, wood products, and chemical and petroleum refinery.
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- The Late Industries grow faster, and have shared in Gross National Product above $300 per capita with high-income elasticity. Some examples are clothing, printing, basic metals, paper and metal products as well as consumer durables.

Size Pattern of Industries during Development Process:

Further, Chenery and Taylor (1968) classified the countries according to their size and pattern of specialization in international trade. They are:

- Large countries featured as large-domestic market, large-transport cost, more diversified natural resources. The contribution of primary exports falls and imports of manufactured goods accelerate at the per capita income of $400 in the development of international trade.

- Small Countries characterized as a smaller domestic market, less diversified resources, more availability of foreign capital and large contribution in external trade.

- Small Primary-Oriented Countries suffering from the lags in transforming the export pattern as the primary exports and output were considered as 50 percent and 25 percent higher than the normal case, respectively.

- Small Industry-Oriented Countries involved in the export promotion and earning foreign capital have been utilized in the development of light industries as the per capita income of $400. These Countries have limited natural endowments, unlimited skilled labor, access to public, and private foreign capital.

Further with the growth of entrepreneurship, the enterprises were delineated in two parts as the informal and formal sector. UNIDO (1979(a)) has divided the manufacturing sector of informal sector into three main components explicit to less developed countries:

- Largest industrial enterprises that are mainly located in urban areas, and are using modern technology,

- Small and Medium-sized enterprises that are located mainly in primarily urban and rural areas, and are using intermediate level of technology,
Another component contains the small industrial enterprises that include artisan workshops, and are using traditional technology located largely in rural areas.

On the other hand, formal sector was subdivided according to the ownership of foreign-owned enterprises, citizen-owned private enterprises, publicly-owned enterprises, and joint-venture enterprises. These various distinctions were of economic as well as political significance because the behavior and performance of business enterprises may differ according to the type of ownership. The relative importance of these different types of enterprises has been analyzed in a sample of LDC’s that reviewed the different studies of Newfarmer and Mueller (1975), Kumar (1982), Swainson (1980), Lall (1979(b)), Teriba.et.al. (1972), White(1974(a)), Lindsey(1977), Unido (1981(a)). The relative share of foreign-owned enterprises in manufacturing sector in LDC’s of Brazil, India, Kenya, Malaysia, Mexico, Nigeria, Pakistan during period 1968-72 was estimated as 59 percent of 100 largest manufacturing companies, 30 percent of the annual turnover of private corporate sector, 50 percent with equity, 50 percent, 61 percent of 100 largest manufacturing companies, 63 percent of all shares by registered companies, and 7 percent of manufacturing assets respectively.

This notwithstanding, the share of investment in manufacturing sector in publicly-owned enterprises was accounted in the sample of LDC’s of Bangladesh, Brazil, India, Mexico, Nigeria, Pakistan, and Republic of Korea for period 1970-76, and was appraised in the course of the different studies of Unido (1979(a)), Ahmad (1978), Newfarmer and Mueller (1975), Swainson (1980), World Bank (1979(a)) as 85 percent of the assets of the industrial sector also accounted for 50 percent of industrial value added output. 30 percent of the registered capital in the group of 300 largest manufactured enterprises, averaged 60 percent of industrial investment, 15 percent to nearly 50 percent, 18 percent, 76 percent and 10 percent respectively. Thus, the existence of major foreign-owned and publicly-owned components along with the privately-owned components in manufacturing sector of most LDCs has affected the performance, choice of production techniques, the level of technical efficiency, export performance, profit rates, etc. (Kirkpatrick, et al., 1984).

Small scale enterprises further classified on the basis of size, nature, and characteristics of operations as:
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- Traditional household or cottage enterprises that are subdivided in a high-quality product or that have artistic value and low-quality product possessing local market and have minimal growth potential. (Byrce, 1965).
- Small factory enterprises that were developed from traditional or cottage industries,
- The Modern factory enterprises with the absence of significant economies of scale that make small-scale production feasible (Sutcliffe, 1971).

Staley and Morse (1965), have suggested the categories of industries in which small-scale operations are common:
- On the basis of location: That took account of factories which possessed local raw materials, products with local markets and relatively high transfer costs and service industries like small-scale printing, shoe, and watch repairs
- On the basis of the process: That consist of most specialized operations in machine metal working and repairing, crafts or handiwork with jewelry, some textiles and carpets, wood products, etc.
- On the basis of the market: That comprised low-scale economy product and other local-markets products such as pottery products, frozen packaged fish, leather goods, garments, woolen and canvas products, etc.

Chenery.et.al (1986) has observed that comparative to other sectors, manufacturing sector lifts up/grows fast. No doubt, in the initial period, the share of manufacturing sector in GDP is near to the ground/minimal, but in response to domestic demand the pattern of sectoral employment and output, this share perks up and this influences the economy’s labor productivity. Further Syrquin and Chenery (1989), on the basis of the study of 108 economies for the period of 1950-83, have engendered the pattern of industrialization by accumulating manufacturing sector into two sub-sectors of heavy and light industries.

Determinants or Causes of Industrial Development:

The developing countries have diverted their activities from agricultural to industrial economy for the past few years (Kuznet, 1973). It happens due to several advantages like economic diversification, generating employment opportunities, and transformation in technology. Many socio-economic factors like human capital,
financial institutions, and governments have contributed equally to promote industrialization in the developing countries (Beji and Aram, 2014)

The process of industrialization was escorted with the rise of saving rate. The rise of the saving rate was quite ubiquitous during the Industrial Revolution. The saving rate rose from 3 percent to 6 percent in the end of the nineteenth century to 10 percent to 12 percent around 1900 throughout the process of industrialization (Deane and Cole, 1969).

Chenery (1960), has made an attempt by using regression analysis to elaborate the causes of industrialization as the changes in demand-conditions. As the income level rose by $100 to $600, the substitution of domestic product for imports and the use of industrial product accounted for 22 percent and intermediate demand drove from the domestic product as well as the final use of product increased by 32 percent.

As the population increases from 2 to 50 million and also the income level accelerates from $300 to $600, under the effect of economies of scale, the market expands triple in size and output 40 percent to 57 percent of manufactured products (Chenery, 1960). To reimburse the primary production and also the exports of domestic products, furthermore, due to lack of natural endowments, some of the countries prefer to engage in the production of manufactured goods (Chenery and Taylor, 1968).

A sectoral link can also develop because manufacturing productivity exceeds that of agriculture and therefore, pulls labor out of the latter sector. This view holds that marginal productivity of labor in the modern sector is much higher than it is in agriculture. In fact, because of the unlimited supply of labor in agriculture, the marginal productivity is extremely low in it, if not negligible. Labor, therefore, has wage incentives to migrate from agriculture to manufacturing. This allows modern sector to grow further and develop economy (Lewis, 1954).

There are additional reasons that link these the two sectors. The agricultural sector’s exports provide foreign exchange, which can be used to import material and capital goods for industry. Furthermore, with successful functioning of banking sector, agricultural savings can be channeled to industry and invested by industry. Redistribution of the agricultural surplus can be taxed and provided as a support to manufacturing (Johnston.et.al, 1961).
International Integration is hypothesized to exert positive impact on industrial development. Small domestic market holds back industry in many developing countries, opening up to trade and creating exports opportunities that offer scale effects. This can come about by being able to lower unit costs of material by buying large amounts or producing at minimum efficient scale (Bernard et al, 2007). Furthermore, competing with foreign producers may force the domestic firm to become more efficient.

**Barriers to the Process of Industrial Development:**

Industrialization is the process that accelerates economic growth, affects structural changes in the economy, particularly in resource utilization, production functions, income generation, occupational pattern, population distribution, foreign trade, and also the social changes. The most pressing need for rapid industrialization of the developing countries is to achieve the basic objectives of their economic and social progress. It has been recognized that industrialization is the surest solution to the problem of raising the standard of living of the people. Clark (1957), has pointed out that growth entails the movement of resources from low-productivity sector agriculture to high-productivity sector industry.

The industrial sector in the developing countries has been facing a number of problems in industrialization and technological modernization. This has kept its production at devastating low levels.

The appropriate financial resources and institutions become the most necessary condition for industrial development (UNIDO 1979(a)), but the savings and capital do not get channeled properly for productive and profitable investment opportunities, and thus, slow down the process of industrialization.

Taking evidence from forty-three companies of Kenya in 1960, Snowden (1977), has concluded that smaller and medium-sized enterprises depend heavily on the savings and profit, but larger enterprises prefer more loans, and as a consequence, this causes a little net contribution to industrial financing in Kenya.

Key services called infrastructure such as transportation and communication network are necessary for efficient commerce. Roads, bridges, railways are needed to transport material and finished goods. Telephones, water supply, etc. are necessary for
industrial development. An absence of a dependable infrastructure can impose several barriers to industrial development.

The 1970s and early 1980s witnessed explosive growth in the external debt of many developing countries. Since the mid-1980s most of these countries have been experiencing difficulties in making the payments required for serving/repaying their debt. Such types of debts are considerable hurdles in the process of industrial development.

The developing economies face the problem in developing a strategy to become globally competitive. Industries in such economies face difficulties in attaching themselves with market forces and generating economies of scale, quality, and consumer satisfaction. In addition to these factors, these industries also pass through various obstacles like obsolescence of technology, non-availability of quality raw materials, high cost of basic and essential inputs, environmental issues, and lack of R &D facilities (Mathur et al. 2009).

Lethargic growth and productivity in manufacturing are fast eroding competitiveness of the industry, and these factors are bound to have serious implications on employment, investment, output, and thus income. A substantive improvement in the investment climate and a drastic enhancement in industrial productivity are the essential pre-requisites to compete in an increasingly globalized and competitive environment of production and trade (Hussain et al. 2012).

A well-developed entrepreneurial class motivated and trained to organize resources for efficient production, is often missing in developing countries. The lack of skilled labor damages the prospects of SMEs. The poor health of the work force is another reason of inadequate human resources. When labor force is healthy, less working time is lost and effort is expanded.

The underutilization of capacity of industries is also an obstacle in the path of setting up industries in developing countries. In such cases the performance of industries is not up to mark. The inadequate supplies of natural resources create difficulty in achieving industrial development as compared to the an industry that is richly endowed with such resources. Well, management of these resources matters a lot.

Economic inefficiency occurs when the factors of production are used to make an inefficient combination of goods. Thus, the society is at the wrong point of its
production-possibility boundary, and productive inefficiency occurs when factors of production are used in some inefficient combinations like too much capital relative to labor and vice-versa. Thus, the society is inside the production possibility boundary.

The vicious circle of poverty in developing countries causes the slow progress of industries, and this makes bad impact on the markets, and this limits the investment and capital formation in the developing countries.

Due to large number of hurdles, the manufacturing sector faces laggardness and needs a balanced and sustained growth. The industry needs incentives for industrial development. Industrial Policy is considered successful, only if the implementing powers have either directly yearned for industrialization to happen as expected, or they possess the force to perform in this way by the engendered incentives (Robinson, 2009). New innovations in the economy are imperative for achieving balanced growth. For attaining global competitiveness, investment by industry in R&D sector should be encouraged in the state (Kaur, 2013). Generally, the investment in R&D sector in the state/country is low. High Productivity leads to growth of manufacturing sector, and this will only happen if the government realizes the necessity to increase their investment in such sectors. It will result in improved quality of goods.

Technology Parks have emerged as the most composit incentives for promoting technology-intensive, knowledge-based SMEs with enormous potential to grow, and also construct growth path for other sectors. The developed nations have adopted the dynamic strategy of technology parks for maximizing their benefits as well as gain. Such Parks have been considered beneficial for endorsing entrepreneurship, knowledge–based industry, and economic growth within the regions (Link &Scott, 2003).

**Technology Parks as an Incentive for Industrial Development:**

Industries promote high degree of technology, new skills and also have tendency to encourage economic and social changes. In order to deliver healthy environment for the growth and development of industries, incentives are a must as they enhance and boost the economically backward areas to prosperity and make availability of infrastructural facilities, promotes technology up-gradation and R&D activities (Aregbesola and Akinkunmi, 2010).
As discussed in the preceding section, industrialization process in the developing economies is impaired, besides other factors, due to the inadequacy of infrastructure. Therefore, as an incentive for industrial growth, the government envisages the provision of integrated infrastructural facilities - both physical, financial, and industry-services.

One such means, which has aimed at the holistic dispensation of industry incentives and infrastructure for spontaneous and focused industrial growth is the inception of technology parks. Technology Parks have been acknowledged as a congregation of problems and solutions that are intimately linked with creating sustainable development in low and medium-income countries. They have been considered as essential components for edifying infrastructure and generating opportunities and also acting as a funnel for policy makers in achieving the errands for sustainable development. Investment in Science, technology, and innovations performs a significant base of economic growth and sustainable development.

“A Technology Park is an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To meet these objectives, a technology park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies, and markets. It facilitates the creation and growth of innovation-based companies through incubation and spin-off processes and provides other value-added services together with high-quality space and facilities (IASP, 2003).

These Technological Parks or Science Parks first originated in western nations including U.S and U.K., and they were often affiliated with academic or research institutions. These parks provide an environment for mutually beneficial collaboration of Research and Development (R&D) among tenants in the park, and with academia, when they are university-based. These Parks provide infrastructure and support for business, particularly high-quality communication, real estate, and office space. Such Parks promote innovations, entrepreneurship, and the growth of knowledge-based companies, and in turn economic growth within their region too is promoted (Link and Scott, 2003).

Technology Parks are the innovative thoughts that were initiated in American Silicon valley in 1951, with the purpose of technology up-gradation. The first technological park that decorated the vicinity of Silicon Valley, which formed one of
the poorest provinces, turned into the global centre of technology, finance, education and research. It was built on the campus of Stanford University. Western as well as East Asian Countries have attained notable success especially in attracting foreign investment, promoting entrepreneurship, and knowledge-based industries with the development of technology parks. Thus, it is necessary to have an effective mechanization for the absorption of these refined technologies, which have been successful especially in attracting foreign investment and promoting the growth of knowledge-based industries in these countries (UNESCO, 2002).

**Technology Parks Boost Economies:**

Technology, at the enterprise level, can be characterized as technical knowledge in the process of producing a product that is influenced by the information about the process, means of production, and experience (Dhalman and Westphal, 1983). Industrial growth acquires technological dynamism by swapping the traditional/backwards techniques with advanced techniques of production. Technical change can be defined as “a continuous process of cumulative synthesis emerging out of a perception of deficiencies in existing techniques and Knowledge” (Sutcliffe, 1971). The innovation of Technology/Industrial Park is a prominent example of technical change. The developed nations have adopted the dynamic strategy of technology parks for maximizing their benefits as well as gains in the meadow of industrialization. Such Parks have been considered beneficial for endorsing entrepreneurship, knowledge–based industry and economic growth within the regions (Link & Scott, 2003). Technology Parks have been acknowledged as a congregation of problems and solutions that are intimately linked with intending for sustainable development in low and medium income countries. These parks are considered essential components for edifying infrastructure and generating opportunities. They also act as a funnel for policy makers in achieving the errands for sustainable development. Investment in Science, Technology and Innovations performs as a significant base of economic growth (UNESCO, 2010).

The governments of countries view Science Parks as a way of improving regional and national economies. In response, to boost manufacturing industry, in the 1990s, Singapore pumped $7 billion to biotechnology, medical services, and advanced materials in technology parks. Science parks are succeeding in incubating
and growing companies. In North America, more than 3 lakhs workers work in university research parks and also every job in research parks generates an average of an additional 2.57 jobs in the economy (AURP-Battelle Technology Practice Report, October 2007).

Science parks create an environment that fosters collaboration and innovation. They enhance entrepreneurship, economic competitiveness, commercialization of technology, and infrastructure for supporting the growth of global knowledge economy. Brazil is one of the developing countries that have strongly encouraged the establishment of technology parks and business incubators, mostly for budding small high-tech companies. Several dozens of such parks are now in existence. These parks provide a range of small business start-ups based on innovative new ideas from private sector researchers. They provide training, business planning for helping the fledgling businesses to succeed. University research and science parks are found all over the world but mostly are concentrated in developed countries. Over 140 are found in North America alone. Prominent examples include the Purdue Research Parks in West Lafayette, Hsinchu Science Park in Taiwan, The Research Triangle Park in North Carolina, Daedeok Innopolis in South Korea, Cambridge Science Park and Net Park in Durham (AURP-Battelle Technology Practice Report, October 2007). Similarly, Barcelona plans to retrofit 115 blocks of the City’s old Cotton District into Science Park and Seoul a 135-acre park to focus on entertainment and Interactive technologies (Brown, 2009).

**Technology Parks in India:**

The government of India has introduced Science Policy Resolution of 1958, that has renowned the magnitude of S&T in the country. Technology Policy Statement 1983 acts as the initiative for the expansion of indigenous technology mutually with the absorption and adaptation of imported technology, for attaining the objective of self-reliance and self-sufficiency in the meadow of industry (Rao, 1986). Subsequent to Economic Policy of Liberalization of 1991, the government of India has established technology parks for serving as mechanism of decoding the knowledge developed in academics into actual industrial production, enhancing the new scientific ideas, attracting foreign investment, encouraging small and medium
entrepreneurs, providing a seed bed for technological innovations, and motivating the knowledge-based industrialization in the country (Vaidyanathan, 2007). In 1991, India introduced a new fiscal policy encouraging foreign investment by liberalizing trade, devaluing the rupee, and easing foreign exchange transactions. The 1991 reforms boosted economic growth. The economy grew at 7.5 percent a year in the mid-nineties, and poverty level from 35 percent to 34 percent (World Bank report, 2004). The economically liberalized India, with its abundant supply of highly skilled English-speaking labor, made it an attractive place for U.S. software companies to invest. After the success of software industry, Government of India considered the Biotech sector as the next major growth sector in the country. Also, the government is now promoting various types of technology parks like in Taiwan and Singapore. The central and state governments have played a major role in the development of both these types of parks, though the initial growth of Software Technology Parks happened only under the umbrella of central government. Now these parks have emerged either as joint venture between the private sector and state government or as fully private technology parks.

The 2006 park profile survey conducted by Association of University Research Parks (AURP, 2007), reported the Biotechnology/Pharmaceuticals (23.8 percent of companies) and Software Information Technology (20.2 percent of companies) are the two most dominant technologies in research parks. Of many parks in India, only four are members of International Association of Science Parks (IASP, 2007). The major technology parks of India are Software Technology Park of India, Technopark (Trivandrum), International Tech Park (Bangalore), Tidel Park (Chennai), Info Park (Kochi), ICICI Knowledge Park (Hyderabad), Shapoorji Pallonji Biotech Park (Andhra Pradesh), International Biotech Park (Puna), Golden Jubilee Biotech Park for women society (Chennai), Biotech Park (Lucknow) etc.

**Nature and Pattern of Technology Parks in Punjab:**

The state of Punjab inherited very weak industrial base on the eve of partition of the country. It got further truncated at the time of reorganization of the state in 1966. Punjab’s industrial performance up to the end of 1980’s was much better than that of the country as a whole. During 1990’s, following the economic reforms,
Punjab faced a slowdown in industrial growth as the Government of India, opened the economy to imports as well as domestic competition. These steps provided large scope to the privatization process to generate the growth of the economy (Ahluwalia et al., 2008).

The new industrial strategy is proposed, and it also includes the growth of technology-advanced sectors like IT and IT enabled services, Biotechnology Parks, Food Parks, Textile Parks, Software Technology Parks, Nano-Technology, Telecommunications etc. This includes Research and Development and other specialized institutions. Most of the companies in Punjab, which are registered with STPI, focus on the business of E-Commerce, Medical Transcription system, software development and providing a web-based application (Government of Punjab, 2003).

Punjab is also trying to setup Technology Parks in the state in the areas/fields of IT, Apparels, Food technology, Biotechnology and some other areas/disciplines. All these are in the pipeline. Punjab is an economy where the basis for competitiveness is the rational capital and capability to absorb process and apply knowledge. Punjab is edifying successful partnerships with foreign firms, strengthening domestic capabilities and building tactical linkages. The industrial workforce is quite cost-competitive and motivated. Thus, the state is on the path of its industrial progress (Government of Punjab, 2009).

For sustained development of the Punjab economy and for encouraging entrepreneurship, the government is conducting an experiment with infrastructure facilities for setting up industry/technology parks in the state. These technology parks introduce conducive investment climate to fuel the industrial investment and innovations. The state has taken initiatives in building up specialized technology parks for giving a new level to manufacturing sector. In order to give push to software export industry in the state of Punjab in a concrete manner, the government took an initiative by establishing Software Technology Park of India to provide encouraging environment to entrepreneurs for performing the international practices within the state. The STPI was set up in year 1998 at Mohali district of Punjab.

The state is already involved in the project of setting up technology parks in various fields of apparels, food, biotech, and IT sector with the objective of increasing long-term capital investment and diversifying as well as generating employment
opportunities for skilled and trained manpower. The major technology parks in the state are Software Technology Park of India, ELTOP IT Park, IT Park, Biotech Park, Lotus Integrated Apparel Park, Rhythm Textile and Apparel Park, Punjab Apparel Park, Punjab Agri Food Park. Thus, for promoting industrialization and entrepreneurship, the state government has been conducting experiments with infrastructural facilities for setting up technology parks in different sectors of industry and region of the state.

**Hurdles /Obstacles in the growth of Technology Parks:**

The industrial sector in Punjab, despite various incentives and institutional supports, has been facing a number of problems, and this has kept its production at devastating low levels. The Technology Parks or Science Parks provide environment for mutually beneficial collaboration of Research and Development (R&D), infrastructure support for business, promotion for innovations, entrepreneurship, etc. Despite these beneficial steps, the technology parks still suffer from various problems:

Governance is a very important tool for the development of industries and also for technology parks. For setting up technological units, the government support is a must. The government usually, has laid down several policies for the development of technological units, but the implementation of these policies is not actually realized.

Due to over-population, lack of taking off/selling the yarn, thread, and garments and increasing prices of cotton, low capacities, unsold stock in the past few months, the textile parks is in big trouble (Source: Business Standard, July 2011).

The Rajpura IT park plan, in the pipeline, has been dropped by the state government, due to agitation by the farmers against the park. Prem Singh Chandumajra said, “There was a deadlock between the farmers and officials of Punjab Infotech over land prices. The officials express their helplessness for offering the desired price for agricultural lands. Hence the idea to set up the IT Park has been dropped”.

From a prosperous town to one hit by recession, lack of technology, policies of liberalization and privatization, lack of opportunities, various sources of raw materials, stiff market competition, mismanagement, a high per units cost of production of steel and overhead charges, without techno-feasibility studies, the

Owing to the lack of finance, the food park faces hurdles in operating. The implementing agency Punjab Agri-Export Corporation (PAEC) proposed a Rs. 15-crore project including grant-in-aid of Rs. 4 crore from the Ministry of Food Processing, but the ministry has sanctioned a grant of Rs. 2 crore only for the project and also PAEC has not allotted the industrial plots in the Food Park so far. Thus the potential of the food processing was not properly utilized (Ahluwalia et al., 2008).

The fiscal concessions announced by the Government of India in 2003 for the states of Himachal Pradesh, Uttaranchal, and Jammu & Kashmir had adverse impact on new investment in Punjab. There is also a lack of means for maintaining the projects in technology parks and if a component breaks, it is costly to obtain skilled people and spare parts for repairing the broken-down component. Thus, on the whole, the lack of governance, the lack of skilled labor force, and maintenance becomes a hindrance in the path of technology parks. Special incentives for industrial and knowledge parks are necessary for the overall growth of the technology parks.

**Objectives of the Study:**

- To understand the nature, problem, and trends of industrialization of Punjab requiring care and incentives.
- To elaborate the evolution, growth, and contribution of Technology Parks as intrinsic incentive for industrialization of the State.
- To assess the performance and problems of the Technology Parks in Punjab
- To analyze and investigate the relevance of the Technology Parks for industrial development of Punjab.

Thus the study intends to investigate and explore the growth, prospects, and problems of Technology Parks as an essential incentive for industrialization of Punjab.

**Need and Importance of the Study:**

Punjab, which saw its re-organization as a state in 1966, continued to remain basically an agricultural state, with a much less developed manufacturing sector. After
partition, most of the skilled labor in leather; sports goods, and textile sectors, went to Pakistan while most entrepreneurs and managers shifted to India. But Punjab, being a land-locked state, could not exploit trade opportunities, and hence Punjab had to stimulate/encourage its manufacturing. That’s the reason why manufacturing in Punjab mainly remained small scale and that too in a few traditional low-value added industries like wood products, rubber and plastics, hosiery, woolen textiles, bicycles, sewing machine parts, etc. Some engineering goods like hand tools and machine tools and steel manufactures did emerge, but due to anachronistic techniques and due to the lack of state support and assured markets, these industries could not develop on their own. This resulted in their miniscule contribution to the state domestic product. Consequently the productive opportunities in manufacturing failed to accentuate (Chadha and Kaur, 2015).

For giving a push to manufacturing, Punjab needs the structural transformation to be led by the intervention of investment, technological progress, and incentives introduced by the government in industrial policies that can enhance the growth of industries. Incentives evoke entrepreneurship, a high growth rate, reduction of foreign dominance, encourage small scale industry, and also bring balanced regional development (Jadhav, 2005). In the process of manufacturing, technological innovation is considered indispensable for steady improvement in products and in creating new innovations. Technology and innovations perform a significant function of economic growth and sustainable development. In this context, the Government of Punjab, following some experiment in setting up National Technology Parks, has taken some initiative to promote manufacturing in Technology Parks. It will give a new level to manufacturing sector. Technology Parks are considered essential components for edifying infrastructure and generating employment opportunities and also act as funnels for policy makers in achieving the objective for sustainable development (Chadha & Kaur, 2012).

The state government has introduced various incentives in their respective industrial policies to promote technology parks in the state. On the practical grounds, the present study investigates the performance and impact of technology parks on Punjab’s industrialization.

A Technology Park is a holistic incentive for industrialization. It works together with the academies, research institutions, and entrepreneurial talent to
develop industries in a more innovative way so that a robust industry and economic development follows. Technology parks create environment that fosters collaboration and innovation. They enhance entrepreneurship, economic competitiveness, commercialization of technology, and infrastructure for supporting the growth of global-knowledge economy.

**Chapter Scheme**

1. Introduction: The Theoretical Context  
2. Review of Literature  
3. Data Base and Methodology  
5. Industrial Incentives in Punjab and Role of Technology Parks  
7. Profile and Classification of the Constituents of Selected Technology Parks in Punjab  
8. Performance and Dynamics of Technology Parks in the Punjab Economy as Catalyst of Industrialization  
9. Problems and Policy Implications  
10. Summary, Major Findings and Conclusions