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KNOWLEDGE-BASED ECONOMY FOR SUSTAINABLE ECONOMIC DEVELOPMENT: THE CASE OF INDIA

Master's Thesis

Technology Governance and Digital Transformation

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I hereby declare that I have compiled the thesis independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading. The document length is 14220 words from the introduction to the end of conclusion.

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Abbreviations	Definition
ADB	Asian Development Bank
AI	Artificial Intelligence
CIA	Central Intelligence Agency
DPIIT	Department for Promotion of Industry and Internal Trade
FDI	Foreign Direct Investment
FY	Fiscal Year
GDP	Gross Domestic Product
GII	Global Innovation Index
GOI	Government of India
ICT	Information and Communication Technology
IIP	Index of Industrial Production
IT	Information Technology
KBE	Knowledge-based Economy
KEI	Knowledge Economy Index
MIC	Ministry of Information and Communication
ML	Machine Learning
MSC	Multimedia Super Corridor
NITA	National Information Technology Agenda
NITC	The National Information Technology Council
NSO	National Statistical Office
OECD	Organization for Economic Co-operation and Development
R&D	Research and Development
SME	Small and Medium sized Enterprises
SOE	State-owned Enterprises
UDISE+	Unified District Information System for Education Plus
WB	World Bank
WHO	World Health Organization
WIPO	World Intellectual Property Organization

ABSTRACT

Knowledge and Innovation have been seen to make a positive impact on the economic growth of a country. The economic growth of the country revolves around introduction and dessimination of new technologies and ideas, which tend to break the monotonous repetitive cycle and bring about change and surge in growth. Schumpeter talks specifically about the relevance of innovation and education for development of catchin-up nations and how they can achieve rapid development by adapting these (Schumpeter, 1939). This paper analyzes the concept of Knowledge-based economy for sustainable economic development, for developing nations and projecting it for the case of India. Incorporating evidences from previous research papers, articles and reports, with the help of Schumpeter's Theory of Economic Development and study of the four pillars of Knowledge-based economy model, this study derives a suitable development model for developing nations. This will show how these developing nations can benefit from transitioning into a Knowlede-based economy, and create a firm foundation for further economic development. It puts forward the study of challenges, key enablers and suggested developments for Indian case in order to benefit from the transition.

Keywords- Knowledge-based; sustainable; innovation; adult education; lifelong learning; economic development; policies; ICT; transition

INTRODUCTION

In the village of Betsur, in Karnataka state of India, lives Ganga Ram with his wife and seven children. Both Ganga Ram and his wife do not have permanent jobs and work in farms during season. They end up either being unemployed or take up unreliable odd jobs during off season. None of his children are well educated and the probability of them ending up like their parents are high. And if, the season brings no rain, their chances of having profit or even mere wages, diminishes. This is the story of every other household in rural areas of India. It repeats in thousands of villages and millions of families. These families include the youth, who are the future of the nation. Due to lack of funds for education and skill development, many youths, full of potential, remain uneducated. When their skills and knowledge can advance economic development of the country, it is been dissuaded in poverty and heedless righteous cycle of profit and consumption (Singh, 2015). The comprehension of knowledge in human beings and technology, is a very critical part of economic development. Knowledge has been identified to play an impetus role in the transformation of country's economic development, during past couple of years. This apprehension of knowledge and technology in economic growth defines the term Knowledge based economy (Sharma, 2017).

In year 2014, Asian Development Bank (ABD) published a report which showed that India has potential of becoming a leading Knowledge-based economy, if it overcomes the barrier of regulations, education, and infrastructure. Because of its two main assets, youthful population and its exceptional Information and Communication Technology (ICT) industry (Lane & Karen, 2014). Clearly the skills of majority of youthful population of India are not being utilized. Also, undoubtedly, if given right attention and time, it will change the future of Indian economic development.

Transformation of developing countries into a Knowledge-based economy is mainly based on four pillars, these elements play very important role,

1. Economic Incentive and Institutional regime,
2. Education, training, and human resource development,
3. Information Infrastructure,
4. Innovation system.

For a sustained economic development and socio-economic welfare, it is required to invest in these elements, which all together act as the four pillars of Knowledge economy framework (Sharma, 2017).

While Knowledge-based economy is such a clear concept, supported by the four pillars as mentioned above, it is required to get a better and deeper perception of the fluctuations and challenges of developing economies like India. This will present current state and offer insights into possible developments in policies that can support the growth and development for such economies. Hence, for the same purpose, theoretical section is built on the framework of Schumpeterian theory of Economic Development. Schumpeterian Theory emphasizes the role of Innovation, Education and Human resource development in driving economic growth (Schumpeter, 1983) , based on the four pillars, this seems to be quite relevant for Knowledge-based economies, where technological change and information flow are critical factors (Daan, et al., 2007). The breakdown of challenges and opportunities that arise in Knowledge-based economies, is very well explored, and supported by Schumpeterian Theory of Economic Development. Emphasizing on need for policies that support innovation, education, and training programs etc. This makes the study complete from a variety of perspectives, giving the opportunity to explore multiple areas.

India being one of the largest and fastest growing economy, it is essential to study the prominence of the country's transformation into Knowledge-based economy (Sharma, 2017). This study is aimed to bring about the key drivers and challenges during the transitioning into KBE, and derive a Knowledge-based Development Model for a developing country like India. Focusing on importance of knowledge as a key factor of economic development, which has proved to be a crucial paradigm of economic development, might also change living condition for Ganga Ram, who might not have to be dependent on seasons for his livelihood. Perhaps his children may escape the vicious cycle of hardship.

Studying Knowledge-based economy in terms of Schumpeter's theory of economic development will enable this paper to explore and dissect every relevant and important aspect of the KBE in developing countries

Literature review section will provide a detailed study of Schumpeter's theory of Economic development, define its relevance to study Knowledge-based economy in developing countries. The study continues to the main topic of Knowledge-based economy. A study of the previous

research papers was carried out to analyze existing literature on this topic, and to benefit this study relevant points were picked and presented. Later sections present case study of Asian countries to give a deeper understanding of relevance of KBE as a necessary sustainable economic development paradigm.

The Synthesis concludes whole study providing suggestions for necessary pre-conditions and presents Knowledge-based development model for developing nations. Analysis section consists case study of India to understand history, current state, and challenges, and then based on the Knowledge-based development model gives suggested developments to enable transitioning into KBE. Conclusion sections presents concluding comments and further possibilities for the study, along with limitations of this paper.

LITERATURE REVIEW

For the purpose of study, author has highlighted the supporting features of Schumpeter's Theory of Economic Development. This paper is a quest for exploring sustainable economic growth in developing countries, Schumpeter's theory of economic development is a right fit. Schumpeter's economic growth theory revolves around innovation, entrepreneurship etc., and provides the right foundation as a framework to build our study of Knowledge-based economy in developing countries like India (Beaugrand, 2004).

2.1 Schumpeter's Theory of Economic Development

Theory of economic development defined by Schumpeter is a special blend of comprehensive ideas and innovations defining a state of stationary equilibrium in economy, with no profits, no interest rates, no savings, no investments and no involuntary unemployment, a perfect competitive equilibrium. This equilibrium is defined as "circular flow," which repeats itself year after year (Schumpeter, 1983). Schumpeter's theory of Economic Development is initiated and carried ahead with this "circular flow" as the very first and basic concept (Gupta, 2009).

What can be derived from Schumpeter's theory is that development takes places in carrying out of new combinations of existing factors and process, or combining them in a new way and these combinations come about in form of innovations (Schumpeter, 1939).

Innovation can be

- Introducing new product
- A new combination of current production cycle
- Introduction of new market
- Finding new source of raw materials or semi manufactured goods
- Formulation of new organization in a sector

According to Schumpeter, what leads to development is the introduction of new product and the continued improvements in the existing ones (Ayehsa, 2005).

In the book The Theory of Economic Development, Schumpeter while talking about the economic development, clearly expresses his cherished perception which concerns intellectual creativity. Schumpeterian theory focusses majorly on knowledge, innovation, and entrepreneurship. The essential driver for competitive economies is the innovation, and Joseph Schumpeter gave special importance to, and appreciated the impact of technological innovation on an economy (Schumpeter, 1983). Schumpeter says that the ability of economy to gain competitive advantages from technical changes and innovation is directly related to the diffusion, adaptation and application of information and knowledge by the corporate (Śledzik, March 2014). These are the main features of Schumpeter's theory of economic development (Langroodi, 2017).

2.1.1 Circular flow

Circular flow being first and basic concept for analysis of development process, pointing towards continuous production of economic activities by itself at a constant speed- meaning continuous activity and no destruction. Circular flow can be defined as continuous flow of labor, land, and income in every economic period, which will result into satisfactory outcome of economy. The main elements of circular flow are as defined below (Suman, 2011) (Langroodi, 2017).

- All economic activities follow a predictable pattern and are mostly repetitive.
- The cumulative demand for goods is already known by producers, and they accustom the supply of output consequently. Hence, at each point, demand and supply are in symmetry with each other.
- Economy is a system in which maximum output is achieved and resources are fully utilized with no waste.
- There exists a competitive stability between firms working in a system.
- Prices being equal to average cost, creates a stationary equilibrium.

Now, what does circular flow mean in theory of economic development? This clearly implies that circular flow majorly works with static type of setting, but to have a dynamic and consistent development, there must be changes made in the flow, through innovation. And innovation can only be powered and driven by knowledge. According to Porter and Stern, innovation is identified as an essential driver of competitiveness (Porter & Stern, 1999), and economic dynamics, as said by Hanusch and Pyka, Innovation is the main motive of Knowledge-based economy (Hanusch & Pyka, 2007).

2.1.2 Role of Entrepreneur as an Innovator

Schumpeter describes entrepreneur as an innovator and the key figure in the process of development. Initiation of development and carrying it forward is made possible because of the entrepreneur, hence occupying central place. First step of Schumpeter's model is breaking of circular flow with innovation. The role of entrepreneur as described by Langroodi (Langroodi, 2017), from the book Theory of Economic development (Schumpeter, 1983), is to

- Be open and recognize the potential of innovation.
- To push through the social and psychological barriers that hinder the introduction of new things.
- Put the production means to work in new channels.
- Get necessary financing to implement innovations by convincing the banker.
- Inspiring other producers in field of activity by taking risks.
- As a standard motive, create a conducive environment to satisfy wants.
- Be the leader and provide guidance.

For an entrepreneur to function successfully, there are certain important things to consider. First one being the availability of technical know-how to the entrepreneur, which will help introduce new products and combinations of production factors. And second one is the command over factors of productions via capital resources. The entrepreneur needs purchasing power in order to fulfill this, in the form of credit and capital, which can be borrowed from banks and other financial institutions (Suman, 2011). When entrepreneurs as an innovator introduces innovations in certain field, it stimulates innovations in different allied fields. Nevertheless, expansion of innovation trend in other firms is never seen to be 100% (Langroodi, 2017).

This entire circle or loop of innovation by the entrepreneur is possible only when there are adequate resources available. Technical know-hows and credit capitals and finances are possible only when it is generated with help of production and consumption of knowledge.

2.1.3 Business Cycle or Cyclical Process

According to Schumpeter, business cycle is next component of development. Schumpeter's approach is historical, statistical, and analytical to business cycle or crisis believing that economic factors and non-economic factors act as inputs for the business cycle. To conclude, crisis is the

adaptation of economic life to new economic conditions (Schumpeter, 1961). To accelerate money, incomes, and prices, creation of bank credit is necessary in the economy acting as an essential element of Schumpeter's model. Bank credit creates an aggregating buildup throughout economy, with consumers increased purchasing power, which results into increase in demand for products and supply. Producers will raise investments, due to this rise in prices and increase rate of profit, by borrowing from banks (Langroodi, 2017). This creates a wave of credit inflation. The second wave starts when new entrepreneurs enter field of production superimposing primary wave of innovation calling it "boom" or "prosperity" (Langroodi, 2017) (Suman, 2011). Introduction of new products in market and new entrepreneurs takes place during prosperity phase. Old products get displaced, which decreases their demand and the prices fall. Due to this, old firms sell their goods at low prices, incurring losses. This leads to declined investments and increase in unemployment, leading to a drop in the aggregate demand. Quantity of money in circulation decreases and prices fall as entrepreneurs start repaying bank loans. Profits decline with increase in risk and uncertainty. Gloom and despair sweep the entire economy, boom comes to an end and phase of depression starts (Langroodi, 2017). In Schumpeterian analysis of development, innovators or entrepreneurs initiate the economic development, keeping it spontaneous and discontinuous. For next upswing to begin, there must be introduction of new innovations and revival of economies (Śledzik, March 2014).

In the book "Capitalism, Socialism and Democracy" by Schumpeter, he mentions innovation as the center of economic changes, which results in "gale of Creative destruction" (Schumpeter, 1942). In the same book, where Schumpeter creates "creative destruction" he defines it as mutation of industry that constantly revolutionizes the economic structure from inside, frequently dismantling old one, regularly create a new one (Schumpeter, 1942). Further Śledzik and Karol describes that innovation is nothing but "creative destruction" that helps the economy to develop while entrepreneur acts as the change creator (Śledzik, March 2014).

By studying Schumpeter's theory of development, author realizes that innovation is crucial driver of economic competition. There were many economists who were interested in knowledge and innovation, but Joseph Schumpeter put forward the dependency and impact of technological innovation on an economy, which can be called as a Knowledge-based (Śledzik, March 2014).

2.2 Knowledge-based Economy

There is a famous proverb, “give a man a fish, and you feed him for a day. But teach a man how to fish, and you feed him for a lifetime.” The whole concept of Knowledge-based economy runs on the same basis. Providing an economy with technology and market interdependence will help entire region grow. The usage of new language of KBE by enhancing human, structural and stakeholders’ capital becomes the new metaphor of development. New keys of prosperity and wealth are nations new ideas or intellectual capital. Which play major role, more than savings or investments (Daan, et al., 2007).

Organization for Economic Co-operation and Development (OECD) defines KBE as a trend in advanced economies´ dependence on knowledge, information, and improved skill levels. Business and public sectors increased need to access to all of these (OECD, 2005). In simple words it is a system of generation and utilization that is established on intellectual capital. For example, research, consulting, development etc, are intellectual capital for a company, which shows that company’s value shall be found in intangible assets i.e., value of employee’s knowledge (Ali, 2019).

KBE stands on four pillars, namely (Daan, et al., 2007)

- Economic incentive and institutional regime
- Education, training, and human resource development
- Information infrastructure
- Innovation system

The Knowledge economy index (KEI), which is based on the four pillars of KBE, was developed by World Bank, describing the indicators for each element of KBE.

Pillar 1 **Economic and institutional regime**	Pillar 2 **Education and skills**	Pillar 3 **Information and communication infrastructure**	Pillar 4 **Innovation system**
The country's economic and institutional regime must provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship	The country's people need education and skills that enable them to create and share, and to use it well.	A dynamic information infrastructure is needed to facilitate the effective communication, dissemination, and processing of information..	The country's innovation system—firms, research centers, universities, think tanks, consultants, and other organizations—must be capable of tapping the growing stock of global knowledge, assimilating and adapting it to local needs, and creating new technology

Figure 1- Four Pillars of KBE framework; Source- (Tocan, 2012), Author has used this data as it is, to support the definition of KBE pillars.

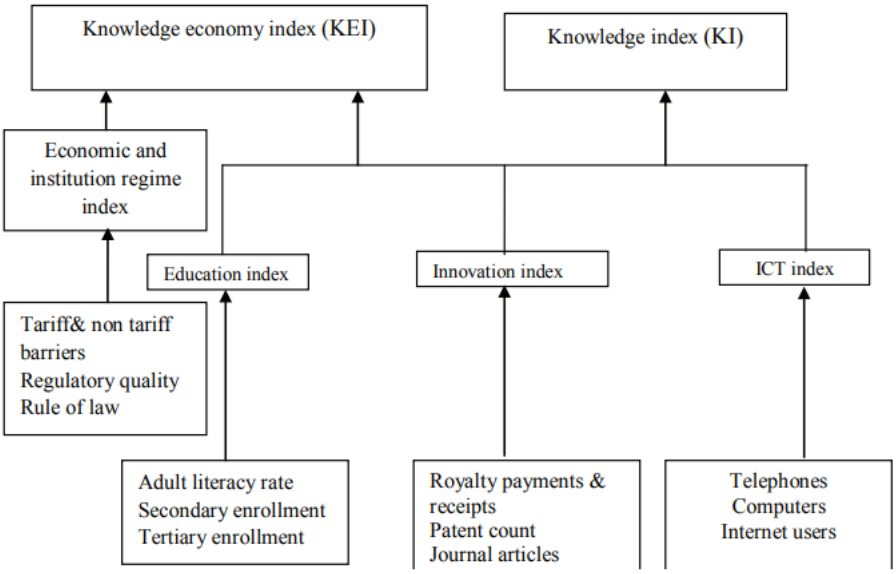

Figure 2- Knowledge-based economy Indicators; Source- (Tocan, 2012) ,Author has used this data as it is, to support the definition of KBE pillars.

Economic development is majorly dependent on local economies´ unique assets to tackle challenges and provide significant solutions and assistance (Ali, 2019). Investing in skills, education and knowledge building of society will make way to possibilities of arriving at much more rational and practical solutions to hurdles posed to economic development. This will bring about practices that can transform traditional economic development strategies. This will provide with practical, implementable resources, abilities and skills that adapt strategies to work for local systems (Byrd, 2012).

2.3 Knowledge-based economy with perspective of Schumpeter's theory of Economic development

As learnt from previous sections, Schumpeter's theory of economic development, also known as "theory of creative destruction," is particularly suitable for studying Knowledge-based economy in developing nations (Schumpeter, 1934). It provides a framework to understand how innovation and entrepreneurship drive economic growth. Innovation and knowledge creation are key drivers of economic growth in a Knowledge-based economy. In Schumpeter's theory, economic growth is caused by entrepreneurs introducing new products, production processes, and organizational forms (Schumpeter, 1934) (Baumol, 2003).

In context of developing nations, this theory is particularly relevant as the country is undergoing rapid economic development and is experiencing a significant increase in Knowledge-based industries, such as information technology and biotechnology (Baumol, 2002). These industries are driving economic growth and transforming Indian economy, much in the same way that Schumpeter predicted that innovation and entrepreneurship would drive economic development (Baumol, 2010).

Additionally, Schumpeter's theory also highlights the role of the government in fostering an environment that is conducive to entrepreneurship and innovation (Schumpeter, 1934). In India, the government has been actively promoting the growth of the Knowledge-based industries through various initiatives and policies, such as the creation of technology parks, providing tax incentives for businesses, and investing in education and research and development (Acs, 1990).

The unprecedent changes, given COVID-19, have hit the world one-by-one, making recovery from the crisis extremely slow for the developing nations. These conditions require a comprehensive approach rather than quick fixes for catching-up economies (Li, et al., 2023). They refer to Knowledge-based dynamic capabilities as crucial to sustainable development emphasizing the cycle of continuous absorption, integration, and creation of knowledge in the innovation system. This knowledge can be internal or external, encouraging knowledge diffusion and influence, helping cope with complex and changing environment of developing nations' economies (Li, et al., 2023).

2.4 Benefits of Knowledge based economy for developing countries

The Knowledge-based economy is becoming increasingly relevant for developing countries like India for several reasons-

Firstly, it offers a way for these countries to participate in the global economy and leverage their strengths in technology, education, and innovation to drive growth and create new opportunities for their citizens. Secondly, a shift towards a Knowledge-based economy can help address some of the key challenges facing developing countries, such as poverty, inequality, and unemployment (WorldBank, 2021). by creating new opportunities for economic growth, innovation, and job creation, particularly in the technology and service sectors (CIA, 2021).

Additionally, a Knowledge-based economy can also help to foster more educated and skilled workforce, which is crucial for sustained economic growth and competitiveness in global marketplace. Creating a large pool of highly educated and skilled workers in areas such as engineering, information technology, and healthcare, can be leveraged to drive innovation and growth in these sectors (GOI, 2021).

2.4.1 KBE to help overcome Middle-income trap in developing nations

Middle-Income Trap - According to Middle-Income Trap economic development theory, a country being stuck at certain income level, due to advantages at hand and is not able to shift to a higher income level (Ghani, 2013). As defined by the World bank, the gross national product per capita of these countries is between $1,000 and $12,000 at constant (2011) prices (Khureja, 2022).

Certain inefficient aspects of economic development led to the countries being susceptible to middle-income trap. For example, **Structural transformation** of economy- economic growth is driven by factors like cheap labor, improvement in technology and productivity policies, focus on human capital, innovation policies etc., If there is no structural transformation of the economy, the country is susceptible to middle-income trap (Khureja, 2022). **Lack of strong governance framework** - the countries' governance framework should be able to provide stable economic policies to support developments in foreign investments, technology and innovation sectors, education system etc, if not in place, this will result in economic stagnation. Among other factors include **Income inequality, Economic Cycles, and population explosion** (Khureja, 2022)**.**

Many of the developing nations in Asia are majorly dependent on the manufacturing and agriculture for the development of economy of the country. Labor-intensive goods have a comparative advantage in much of the exemplary growth among Asia. But they are finding it difficult and almost impossible to continue their economic success with the same growth model, as it was over the last few decades (ADB, 2013-14). Due to technological advancements all over the world, these labor-intensive growth models are losing to catch-up. With increasing cost, the mere wages are not enough to survive, let alone develop and grow (Phale, et al., 2021). Hence, the developing and catching-up economies get stuck in middle-income trap.

Other developing nations like Brazil, the Russian Federation, or Turkey also faced similar challenges. They had to make a shift from labor-intensive manufacturing to productivity-led growth through innovation. This helped them offset slowing labor force. Many advanced economies also made structural transformation from agriculture to industry to services (ADB, 2013-14). Knowledge-based economy approach will provide these developing nations with a framework. As seen from the sections above, KBE highlights and focusses on the various factors of technological innovation, human development, educational and research capacities etc., of the country. These factors are important to enhance the quality of population. Innovation and Economic policy development will enable the advancement of educational institutions and technological firms, opening the opportunities and possibilities of high-income jobs. KBE will support to implement corrective reforms in areas like education and research institutions, government policies etc., which are essential to overcome middle-income trap (Woo, 2009).

In conclusion, the Knowledge-based economy is relevant for developing countries as it offers a path for sustained economic growth, job creation, and improved standards of living for its citizens.

2.5 Preconditions for transitioning into a KBE

Based on previous sections, it is understood that there are various pre-conditions for transition into Knowledge based economy, that needs to be in place. According to some researchers, the key pre-conditions for a successful transition include-

1. Strong and Continuous education System: A well-educated and highly skilled workforce is essential for a Knowledge-based economy (Nada & Berchane, 2017-2018). This

requires a robust education system that provides high-quality education and training opportunities for individuals of all ages and backgrounds (WB, 2021).

2. Access to Information and Technology: Access to information and technology is crucial for a Knowledge-based economy (Dyker & Radosevic, 2000). This includes access to the internet, high-speed broadband, and the latest technological tools and platforms (ADB, 2007).
3. Investment in Research and Development: Investment in research and development is necessary to drive innovation and create new Knowledge-based industries and technologies. This requires investment from both the public and private sectors (Altbach, 2013).
4. Supportive Legal and Regulatory Framework: A supportive legal and regulatory framework is needed to ensure that the Knowledge-based economy can flourish (Dyker & Radosevic, 2000). This includes protection of intellectual property rights, access to capital, and a favorable tax and investment climate (Komolafe, 2021).
5. Entrepreneurial Culture: A culture that encourages entrepreneurship and innovation is key to a successful transition to a Knowledge-based economy (Julien, 2007). This requires support for new businesses and startups, as well as a strong ecosystem for entrepreneurship and innovation (Bedianashvili, 2018).
6. Strong Institutions: Strong institutions, including a well-functioning government and a transparent and predictable legal system, are necessary for a Knowledge-based economy to thrive (ADB, 2007).
7. Collaboration and Partnership: Collaboration and partnership among different actors, including government, businesses, academia, and civil society, are essential for the successful transition to a Knowledge-based economy (Afzal & Lawrey, 2012).

It is important to note the interdependent nature of these preconditions, and must be implemented together in order to achieve a successful transition to a Knowledge-based economy.

From the study so far, two factors keep coming up as the main factors for successful and sustainable transitioning to KBE, and they are Innovation and Continuous education system. To present a furtherance and build strong foundation for the research, it is important to dig deeper into the two factors and understand why they are important.

To excel the competitiveness and economic growth in the modern globalized world, Innovation becomes the main motive, especially for Knowledge-based economies. By the definition, KBE

are economies where creation, distribution and consumption of knowledge are the main drivers of economic growth. And it is only made possible through knowledge and innovation as the main sources of productivity and competitiveness (Commission, 2010).

Innovation is the center of many entrepreneurial activities, where it brings stabilization to the entrepreneurs' ideas. Organizations that design initiatives and develop policies for sustainability and growth, requires support from the policies, of Government and Public Administration with respect to/ regarding entrepreneurship and innovation (Ribeiro-Soriano & Kraus, 2020). For the new initiatives to impact positively the economic development, they need skilled resources, talent, good ideas and knowledge led society. The economies access this knowledge from research organizations, emerging entrepreneurial firms, developing social networks, knowledge spaces etc., And evolution of these is made possible only by innovation and having in place policies supporting innovation (Ribeiro-Soriano & Kraus, 2020).

Peter Nielsen and B Å Lundvall talks about innovation being the result of knowledge creation and how this characteristic is the fact that knowledge, with respect to skills and competencies, is the most important input (Nielsen & Lundvall, 2007). The paper further says how skills and important competencies used in production of knowledge, which is true by the definition, only improve with use. The elements of Knowledge-based economic development are not scarce in traditional sense. The more the usage of skills and competencies, the more they enhance (Nielsen & Lundvall, 2007).

The special issue by Entrepreneurship and Regional Development journal says, "*a source of growth and competitiveness can be found in the innovative interplay among local actors and institutions as the region serves as an 'incubator' for small and medium-sized organizations"* (Ribeiro-Soriano & Kraus, 2020).

Hence, from the statements above it is clear that the process of knowledge production results in innovation as one of the outputs along with enrichment of learning and development of skills. This proves the point of this study of innovation being the main motive of KBE.

In the study for Russia, A.I Orlanova defines Continuous Education as nothing but "Life-long Learning" which means the possibility for an economic system to build policies and facilities, allowing people to indulge in learning life-long. This will enhance the professional, educational, and personal skills in the society (Orlanova, 2012).

As quoted by G.T Kefela, in an article on Knowledge-based economy and society, “A flexible education system underpins the Knowledge-based economy” which means that though the system begins with basic education, providing a foundation, but to develop core skills that are technical, learning needs to continue with secondary and tertiary education. The continuous education system or lifelong learning system, which extends from early childhood to retirement, encourages creative and critical thinking in problem solving and innovation (Kefela, 2010).

The vocabulary of “Knowledge-based economy” includes established terms like “Knowledge management” “Intellectual capital”, “Knowledge worker” etc., which is obviously suggesting towards a society based on knowledge. Meaning system of education holding to being an important aspect. Because of the requirement or need of educated people for an array of intellectual professions, they hold greater value than in a traditional society (Orlanova, 2012).

Investment in and around the system, which will support the society excel and master the professional and technical skills is key to innovation and growth (Kefela, 2010), and this leads to human capital development.

R Mustapha and Abu A, who refers to Knowledge-based economy as “K-economy,” in the study of developing nation Malaysia, talks about how investment in human capital is critical in a k-economy. “With knowledge replacing physical and natural resources as the key ingredients in economic development, education and human resource development policies needs to be supportive of continuous education system” (Mustapha & Abdullah, 2004).

They further talk about the how the formation of backbone of the K-economy is directly related to the creation of quality human resources. The human resources are nothing but our knowledge workers force, who are versatile, autonomous, and highly skilled. Who then, with these strong and analytical skills, build knowledge to produce useful actions. They can tackle a wide range of problems and are highly tolerant to uncertainties as they are flexible, due to highly acquired skills (Mustapha & Abdullah, 2004).

The traditional education system mainly targets the general age group from early childhood to youth of 25-30, or in some cases 35+ years of age. Which is the basic education system. And occasionally the older population group is targeted, encourages to take up or are seen taking up further education. A recent report released by W.H.O says that the share of global population aging 60 years and above will rise from 1 billion in 2020 to 1.4 billion by 2030. And it is estimated by 2050, this will double to 2.1 billion of the world’s population. And 80% of this older population

is expected to exist in low and middle-income countries (W.H.O, 2022), the traditional education system might limit their contribution to country's economic development. As important it is to implement essential policies and make investments which are designed to improve health care and well-being, it is equally important and essential to make changes in the policies of employment and education system to ensure full opportunity for older population to fully take part in development of society and economy (Orlanova, 2012).

It is apparent from the above scenarios that our educational output is directly related to the needs of the economy, including Knowledge-based economies, for growth and development. The findings suggest that the education system needs to be dynamically structured in order to make lifelong learning possible no matter the age of the population. Hence, continuous education system stands as an essential aspect of the catching-up societies to transitioning into Knowledge-based.

2.6 Case Studies to support the research of KBE benefitting developing nations

2.6.1 Case Study of The Republic of Korea

The Republic of Korea started with its GDP of 3.958 billion USD and thirty years later the GDP had grown more than six times (Daan, et al., 2007). According to the world bank report, the attributed factor of production was found to be "knowledge" (Carl, et al., 1998/99). Knowledge has always been important for development, however, it was only after 1996, when Organization for Economic Co-operation and Development (OECD) published its report on knowledge-based economy, that the concept of Knowledge-based economy gained awareness. Now, Knowledge-based economy is meaningful economic concept, which is worthwhile following (Daan, et al., 2007).

The Republic of Korea is an outstanding example, as a fellow Asian nation transitioning from an underdeveloped nation to a highly developed economy is just a few generations, to compare to when it comes to transitioning into Knowledge-based economy.

Earlier to The Republic of Korea being developed into the Knowledge-based economy, like other Asian developing countries, they began their journey out of declining economic conditions. India and The Republic of Korea are alike in many ways, hence makes for a good comparisons and benchmark for development. In 1990, the countries were roughly the same size with GDP about

300 billion USD (Nanavati, 2015). The Republic of Korea, alike a lot of Asian developing nations, suffered from capacious poverty, threats from inimical neighboring country, economic potency was low until the late 80's, private sector is dominated by giants, corruption and rent seeking behavior, most importantly the investment in education has always been high, without efficient usage of the outcome (Nanavati, 2015).

In order to contribute to South Korea's strategy for becoming an advanced Knowledge-based economy, a study was requested by the Ministry of Finance and Economy of Korea. This study was captured in the book "Korea and Knowledge-Based Economy." The book describes whole idea of Knowledge-based Economy (KBE) with respect to the developing nations. It defines KBE as an economy where knowledge is created, acquired, transmitted, and used efficiently by enterprises, organizations, individuals, and communities (Dahlman & Andersson, 2000).

The focus was not just on high-technology industries or on information and communication technologies (ICT), but reasonably also presented frameworks which helped to analyze a range of policy options in education, information infrastructure and innovation systems, which steered the Knowledge-based economy (Vinod Thomas, 2000).

Republic of Korea underwent tremendous number of changes to transform itself into a Knowledge-based economy. It is important to understand the steps taken and the challenges identified and addressed during this. Korea focused not only on the high-technology industries or ICTs, but also on the wider context of using knowledge and advances in ICT. It used the Knowledge-based economy framework which highlights four focus areas. These areas acted as the key enablers for transition into Knowledge-based economy (Dahlman & Anderson, 2000).

- A system of economics and institution that incentivizes the efficient use of knowledge, the creation of new knowledge, the dismantling and replacement of obsolete activities, as well as their establishment.
- The creation and use of new knowledge by an educated and entrepreneurial population.
- The ability to communicate, disseminate and process information in a dynamic and efficient manner.
- Innovation system in which firms, science and research centers, universities, think tanks, consultants and other organizations interact and tap into global knowledge, assimilated to local needs, and applied to create new knowledge and products.

This was used to study the state of where Korea stood and to advocate further steps to assist the progress of transition to an advanced Knowledge-based economy. They identified issues in these four crucial areas. These challenges had to be addressed for Korea to benefit from the Knowledge-based economy (Dahlman & Anderson, 2000).

1. Economic incentive and institutional regime

Challenge- Promoting a Knowledge-based economy, society, and economy free from direct intervention. Should foster flexible, adaptive, and creative markets and society.

Measures taken - Strengthening markets by modern regulatory oversight in certain new areas. Few markets to name, such as Product markets, financial market, labor market, knowledge market, industrial restructuring and entrepreneurship and social issues (Dahlman & Anderson, 2000).

2. Education, training, and human resource management

Challenge- The challenge was the efficient usage of already existing high investment in education system.

Measures taken- Switching to new model of education and promote quality, creativity, and lifelong learning. Also, emphasize on human resource development and not just formal schooling.

3. Information infrastructure

Challenge- The Ministry of Information and Communication (MIC) should facilitate private supplies of services and consign area of market failure. Unlike then existing regulatory regime that constrained the continuous fast development, where MIC tried to manage much of the sectors development. The market was progressing rapidly than the regulator could predict.

Measures taken- Setting up an independent regulatory agency, liberate the telecommunications service industry and allow greater foreign investment. Telecommunications needs to be developed in a modern regulatory that can include interconnection standards, service quality and auctioning of spectrum. Harmonizing e-commerce with evolving international standards.

4. Innovation system

Challenge- The challenge was productivity of Korea's expenditure on Research and Development. Government identified the weakness with Korean innovation system.

Measures taken - The first plan proposed by the Government was to increase the R&D expenditure from 2.8% to 5% of total GDP. The other suggestions included interactions among firms, universities, government etc., providing support to R&D in large companies, improving support provided to innovations in SMEs and so on.

By studying these challenges and implementing the suggested reforms, Korea could overcome the necessary issues to be transitioned into a Knowledge-based economy (Dahlman & Anderson, 2000).

2.6.2 Case Study of Malaysia

When studied the case of Malaysia and its approach towards transitioning into Knowledge-based economy, there are few important factors to consider. Unlike the previous example, Malaysia had a strong economic performance during the 1990's (pre-transitioning period), with an average economic growth rate of 8.5% per year. The unemployment rates were low, with stable prices and exchange rates, and robust international reserves. Malaysia's growth strategy was "investment-led," becoming a success factor for raising output and income (Meesook, et al., 2001). Let us learn further the reason Malaysia chose to shift focus from the well-working growth strategy to a Knowledge-based development of economy.

Though the investment-led growth strategy was working fine for the development, there were also signs of stress, due to deceleration of exports, deterioration of the investment quality, weakness in the banking and corporate sectors, etc... Hence, when the infamous Asian Financial Crisis during 1997-98 hit the continent, Malaysia was abruptly caught (Meesook, et al., 2001). Though some of the controls made on short-term capital were effective in curbing the crisis (Ba, 2023), and low level of external debts spared Malaysia from external debt crisis (Meesook, et al., 2001).

This fight against the Asian Financial Crisis highlighted the limitations of the current traditional economic model, depending majorly on agriculture and manufacturing. The Malaysian government recognized the need to move towards a more sustainable resource for development, away from low-cost manufacturing (Mohamed & Hussen, 2021). The need to develop and utilize the Knowledge, Technology, and innovation to create high-paying jobs, services, and industries, led the country on Knowledge-based economy path (Mohamed & Hussen, 2021). Mapping the move towards Knowledge-based economy, to achieve sustainable economic growth rates, where knowledge will play a dominant role in driving productivity. The level of economic growth was

projected to increase four-fold with information and Knowledge-based economy in place (Mustapha & Abdullah, 2004).

Now, to make this transition, Malaysia had to overcome certain challenges with respect to education system, Innovation system, developments in ICT, also the overall infrastructure. Let us take a closer look at the challenges faced and the Measures taken to overcome (ADB, 2007) (Mustapha & Abdullah, 2004).

1. Education, Training and Human resource development

Government of Malaysia realized that, though the enrolment to higher levels of education was good and improving, there was lack of knowledge workers, scientists, and skilled workers. Also, the learning abilities was found to be low in the Malaysian graduates (ADB, 2007), making the Research and Development (R&D) capability and technology-based infrastructure weak (Mustapha & Abdullah, 2004).

Challenge- For the organizations to adopt and apply new technologies, or innovate, they need to hire highly skilled knowledge workers. This demanded that the education system to produce relevant skilled and proper graduates (Mustapha & Abdullah, 2004).

Measures taken - To tackle this challenge, the Malaysian government had to focus on three critical strategies.

- Life-long learning / Continuous Education system- This was put in place to deal with retaining and re-skilling of workers. Along with providing opportunities to older population to pursue adult education. This program also included distance learning and virtual learning facilities. Providing incentives for skills upgrading, by coordinating with private sector was also introduced (ADB, 2007).
- Restructuring of Education and Training system- Priority was on science related education, and encourage the tie-ups between universities and industries.
- Attract Global talent- In 2001, Malaysian Government conducted a Brain-drain program to attract returning scientists. Incentives were provided to retuning scientists in all relevant fields, like ICT, Science and technology, arts, industry, accounting and finance, medicine, and health, etc.… These incentives included income tax exemptions, car import duty and sales tax exemptions (ADB, 2007).

2. Innovation System-

Challenge- The weak Research and Development expenditure in relation to the total GDP, is leading to weak innovation performance. The number of scientists and engineers per million population is extremely low. The linkage between Industries and Academic institution was also weak. This is also the case with connections between Malaysia and other innovation system actors, making the local market dominated by small and medium sized enterprises, limiting the technological capacity (ADB, 2007).

Measures taken - As a counter measure for low number of scientists and engineers, and to strengthen the R&D sector, Malaysia has launched initiatives attracting the skilled workers. To serve as a sandbox for invention, research and other ground breaking multimedia developments, Multimedia Super Corridor (MSC) was launched by Malaysian Government (ADB, 2007).

3. Economic incentive and institutional regime

Challenge- Though Malaysia identified the need to transition into a Knowledge-based economy, there were about to come a series of transformational changes within the economic structure. The challenge here was to adapt to these changes and successfully transition into a KBE. This required some major developments within the policies and balance the development of major elements i.e., education, infrastructure, and innovation (Mustapha & Abdullah, 2004).

Measures taken - Malaysia started the journey of transitioning into KBE with the launch of Vision 2020, in the 1990's. "Knowledge-economy Master Plan" was formulated to support this initiative (ADB, 2007). Knowledge-economy Master Plan was a blueprint of significant knowledge-economy policy initiatives (Mustapha & Abdullah, 2004). It identified seven strategic areas, such as development of human resources, establishment of institutions necessary to drive the transition into KBE, incentivization of application of knowledge in all sectors of economy, etc. (ADB, 2007). Overall, all these strategic reforms were aimed to address the changing economic condition and to adopt them in order to transition into a KBE (Mustapha & Abdullah, 2004).

4. Information Infrastructure

Challenge- Though the Internet era had begun in the early 1990's for Malaysia (Salman, et al., 2013) the infrastructure around Information and Communication Technology (ICT) was limited. Which made it difficult and expensive to adopt and leverage ICT (Meesook, et al., 2001). Some Major challenges include high cost of ICT equipment, inadequate telecommunication

infrastructure, focus of government policies was low, awareness of ICT among the population was also a concern, and many more (Mustapha & Abdullah, 2004).

Measures taken- Government of Malaysia, in 1996, formulated the National Information Technology Agenda (NITA) with the purpose of providing direction and way forward to the IT developments. The aim of NITA was to develop a knowledge society by building and developing the IT infrastructure, create and develop IT-based applications and efforts towards human development. Previously, in 1994, The National Information Technology Council (NITC) was established under the knowledge empowerment Vision 2020. The aim was to develop and utilize IT for national development. NITC mainly acted as a think-tank for government, pertaining to the IT related developments. These initiatives led to numerous e-governance initiatives in Malaysia. Such as, Human Resource Management Information System, Project Monitoring System, Electronic Labor Exchange e-Services, Electronic Government-Accountant General Integration, etc. (Mustapha & Abdullah, 2004).

2.7 Synthesis

When compared or combined the Schumpeter's theory of Economic Development and the context of Knowledge-based economy in the previous section of example of similar Asian countries, few key elements that when studied together could help us derive essential enablers and barriers for the transition of India into a Knowledge-based economy.

The concept of "circular flow," which is continuous production of economic activities at a constant rate, and Schumpeter talks about how for any economic development it is necessary to break this circular flow from within through innovations driven by entrepreneurs. Knowledge and skills are the central force of modern economy, which drives innovation. Study of KBE enables us to understand how innovation can accelerate economic development. When compared with the first pillar of Knowledge-based economy model, which focuses on economic incentive and institutional regime, which talks about a system which promotes competent usage of knowledge and innovation, creation of new knowledge, breaking down and replacing old ways and flows.

1. Creation and use of knowledge in the form of education, training, and human resource management. This pillar point towards the continuous adult education part of the Schumpeter's theory.

2. The information infrastructure which can communicate, disseminate, and process information of new knowledge and innovation supports the role of entrepreneur as an innovator in recognizing and inspiring the efficient usage of innovation.
3. Innovation system which leads to the interactions between firms, science and research centers, universities etc.

These points harmonize with Schumpeter's analysis of development, where he talks about next upswing after recent decay of existing flow. This can only take place with new innovations.

When Schumpeter talks about "creative destruction" it points towards creation and usage of innovation and knowledge. Schumpeter's theory highlights the importance of fostering an environment that is conducive to entrepreneurship and innovation, which can be created either via innovation centers, promoting entrepreneurial growth, and research firms. For which the government needs to put in place supportive policies and refine the existing infrastructure. And, the case studies highlighted the role of Government as the driving force for innovation and knowledge-based economy. It is very important that the role of government to be redefined for a successful transition. Government needs to take up the role of entrepreneur/innovator, which is the central role in the economic development. The Schumpeter's theory also talks about progress in technology leading to growth in output. This brings us to improvisation of the information infrastructure through ICT. This is also one of the KBE pillars. This ICT revolution will improve the socio-economic activities efficiency and functioning of the developing nations.

Let us now derive the key enablers and put together a **Knowledge-Based Development Model**, for developing countries like India, which will present how developing countries can benefit from transitioning into Knowledge-based economy-

- **Innovation System**

As understood that competent usage of innovation and knowledge is crucial for the growth of economy and to breakdown the existing flow, the key enabler is to invest in the improvement or strengthening the markets which will adapt, utilize, and create knowledge and innovation. Also, seen from previous section that innovation system caters to various entrepreneurial activities stabilizing the creation and consumption of technologies. Developments in and around Innovation systems will make way for enhancing knowledge society by attracting local and global talents, to invest and utilize the opportunities.

- **Continuous Education/ Adult Education System (life-long learning)**

Many Asian developing nations may already be investing majority in the education system. What it needs now is the effective and efficient utilization of this investment. Hence, there is a need to switch to new education model. It needs to Implement outcome-driven governance systems in education and enhance local decision making at schools and universities by defining autonomy and accountability clearly at the institutional level. (Example taken from Republic of Korea's case) (Dahlman & Anderson, 2000). What can be a game-changer is the opportunity for older population and those who have crossed the formal age for education, to develop vocational skills and pursue further education. This will not only build an educated knowledge-society, but also support the changes in infrastructure. In addition, Schumpeter emphasized the need for catching-up economies to invest in education and training in order to develop the skills and knowledge required to effectively adopt and implement new technologies.

- **Economic Policies and Infrastructure refining**

The next enabler would be redefining the role of government as entrepreneur or innovator. As already discussed, the entrepreneur as an innovator plays the central role in Schumpeter's theory and leads the economic development. It is important that the government takes central role and guide this transition, of course with the support of science and research centers, universities, research, and development firms etc. This also means that the government takes lead in making certain changes in the economic infrastructure. Making way to adopt and disseminate the latest technology and innovation into the society.

- **Reach and Access to Information and Communication Technology**

It is quite given that ICT plays an important role in this journey of Knowledge-based economy, hence the next enabler will be improvisation of information structure via ICT. It can be a key tool for developing countries to create new opportunities and drive growth, based on Schumpeter's ideas about the role of entrepreneurship and innovation in economic growth. Economies advancing their ICT-related skills and knowledge will be better positioned to capitalize on the opportunities presented by this technology if they invest in education and training.

RESEARCH METHODOLOGY

The Objective of this paper is to analyze Knowledge-based economy for sustainable economic development, for case of India. The literature research has been built on Schumpeter's Theory of Economic Development, to view the already clear concept of Knowledge-based economy. This was important as the Schumpeter's theory presented this study with the importance of Knowledge and innovation for economic development. Also, evaluate the gaps in KBE for it to emerge as a sustainable economic development paradigm for catching-up economies. Using Schumpeter's theory and the study of KBE, author supported the research objective to put forward benefits from transitioning into KBE.

The approach taken here is a blend of qualitative and quantitative methods, best suited based on previous studies with similar objectives. This gave the study benefit of taking opinions, experiences, and interactions from previous research papers for qualitative analysis, and support them with the help of reports, data generated for quantitative analysis. This gave author an opportunity to explore various aspects of the theoretical framework used and the core concept of KBE. Further, case studies of two countries were used to understand the depth and context of KBE for developing Asian nations with similar background. The case studies were important to understand the similarities of challenges existing and possibilities of corrective reforms. This also helped the author to arrive at the Knowledge-based Development model, that describes the key enablers for transitioning into KBE.

For the Indian case, the history, current state, and challenges were studied to understand what has been done so far in terms of economic development since independence. The purpose of this was to understand what has worked, what were the challenges and gaps that needs further focus. This was important as to interpret the reasons for success and failures of previous economic development plans and models. The study of current state shows where India stands in terms of knowledge-centric developments and what are the barriers to fully utilize the knowledge force.

Then the analysis of Indian case was carried out based on the model developed for which secondary data has been used. As there exists coherent studies and reports, it was important to analyze the existing data. The information gathered also required authenticating the data source, to eliminate usage of any undesirable information and make the study more authentic. The data used to analyze in the study is taken from reports released by,

- Government of India- Ministry of Finance, Union Budget 2023
- World Bank- Studies and reports on Middle and Low-income countries
- Asian Development bank- Studies on Asian developing nations
- United Nations- Technology and Innovation Report
- WIPO- Global Innovation Index

Analysis of the reports generated by the above-mentioned organization was carried out to understand the current approach towards Knowledge oriented policies and economic factors. This was important as it helped the author understand current state and put in place suggestions for changes, combined with the theoretical framework and case studies.

ANALYSIS

4.1 Case of India

After a detailed study of the existing literature on KBE, the impact of KBE, the relevance, pre-conditions etc., this section will present the current economic condition and the challenges faced by India, in terms of the aspects discussed above. This section will also suggest, based on the findings from the theory, the necessary pre-conditions, modifications in policies for development.

4.1.1 History of Economic Development journey until now

When author talks about Economic Development journey of India post-independence, the approach has always been structured to leverage potential resources, which are either available in abundance or needs focus due to national issues. Hence, the history is divided mainly in three chapters. First one being interaction between the state and industrial capital, second one the centrality of food and water, and lastly the interconnections with global developments. One can say that the development history is majorly clustered around these three chapters, but can also see that they seem to merge with each other (Menon, 2021).

The Indian Independence, in 1947, itself was a turning point, marking the beginning of Indian Economy. The British rule of 200 years had left the country hopelessly poor and undergone de-industrialization. The population was heavily illiterate, sharp social differences etc., leaving the big nation broken into pieces. India was the poorest country in the world, in terms of per capita income in the beginning of 20^{th} century (Mint, 2019). During the early years of independent India, in 1950s, the performance of the economy was below potential, when compared to China and South Korea, which started off at the same state as India (Adhia, 2015).

The first chapter of the history of economic development of India, is all about adopting the strategy of Industrialization (Adhia, 2015). The Industrial Policy Resolution in 1948 was proposed, under the leadership of then Prime Minister Jawaharlal Nehru, with the aim of empowering the local influential industries. With the combination of substantial public sector with interventions and regulations from state, which would protect the indigenous industries. The idea was to have the state and public sector, both play a leading role in economic progress (Mint, 2019).

Government prepared and implemented a "Five-year Plan" which involved creation of large industrial state-owned enterprises (SOEs) by raising a massive number of resources and investments. The chosen industries were mainly producing heavy industrial goods like, steel, chemicals, machines and tools, locomotives, and power (Adhia, 2015). Based on the beliefs of some economists, the Indian leaders pursued Industrialization, as they were convinced that industrial sector offers the greatest scope of growth. Taking from the experience with the British, the belief of "Importing from abroad is like being slaves to a foreign country," goodness of national self-reliance was much the idea behind it. This was the main reason for the Indian Government to invest in Industries producing basic and heavy goods over consumer goods, to reduce country's reliance on goods of basic and heavy industrial goods. Industrialization can be said to be moderate success with some positive outcomes, but also bringing out many problems resulting from the strategy chosen by the planners. Creating new public enterprises, focusing on producing heavy industrial goods like steel, chemicals and other products were seen as aiding the economic development, as they are associated with developed economy. Whereas these industries were facing cost overruns. Many SOEs were running on political considerations rather than economic considerations resulting in loss and draining the resources of government. Lack of capital and skills leading to enterprises being overstaffed, leading to lower incomes, or idling the capacity. These problems just intensified during 1960s (Adhia, 2015).

Initially Agriculture sector was rejected as the mainstay of economic development strategy, not because it offered no scope for growth, but because it was believed that the superiority of agriculture was characteristics of backward economy. It was also rejected under the thought of eventually running up against the problem of insufficient demand, there is only so much that people are willing to eat (Adhia, 2015). During the mid-1960s, India saw the consequences of prioritizing industry over agriculture for public investments, as the country went into food crisis. Leading to importing subsidized grains from the United States on a broad scale (Adhia, 2015). This is when the second chapter of economic development history begins.

In this chapter, where the centrality was food and water, was driven by two salient factors- food and hunger. These two factors became the drivers of national politics and economic policies. Some scholars of Indian Political economy had now turned their gaze from factories, industries, and urban capitals to farms, fields, and villages. They understood the importance that needs to be given to agrarian oriented policies. Hence, during mid-twentieth century, focus was shifted from iron and steel to rice and wheat (Menon, 2021).

Responding to the food crisis of 1960s, the agricultural strategy was changed. Government of India started to guarantee the farmers higher crop process, promoted usage of modern means of irrigation, like chemical fertilizers and high yielding varieties of grains were subsidized. This surged the output production, leading to the "Green-Revolution" in late 1960s. this made the country self-sufficient in terms of food (Adhia, 2015). But along with this came the conflicts within Indian societal systems. The idea of enhancing the countryside (rural areas) and focus on farming and agriculture was on one hand increasing the yields and supply of food, on the other hand it was rising class conflicts, due to deepened hierarchies, increasing vulnerability to plant-diseases, and leading to expansion of slums resulting from migration of landless population from countryside to cities for jobs. But due to lack of education and skills, they were just ending up being unemployed, leading to increased unemployment rate in cities. The agrarian oriented strategies did not help the economic growth of the country much. The high degree of investments in agrarian developments required heavily rich and privileged farmers and land owners, and the government of India took this path being aware of it. This means the system accepted that hierarchies will remain, and probably get worse (Menon, 2021). Disparities created by uptake of subsidized inputs that was largely with massive-land owners and risks due to adopting to new methods only deepened towards the late 1960s. As the Industrialization strategy turned more interventionist after "green revolution" there were increased restrictions on activities of large firms, stopping the growth of new industries (Adhia, 2015). With changing strategies and policies came the problems such as lack of reach of information, lack of education, increased gap between the societal classes, unemployment, etc., What also ungoverned during the "green revolution" was the significant growth of population (John & Babu, 2021). Unchecked population growth has always shown to be disadvantageous if not supported by the economic facilities and policies well. And India was not even close to having such policies in place. Which resulted in increase of health risks, lack of availability of geographical and demographical advantages, etc. (Spengler, 1964). Ungoverned increase of population is one of the leading causes for poverty in developing nations, especially in India, which was recovering and emerging out of the post-colonization impacts. Studies show that direct disadvantages of the population lead to various issues among which lack of human capital development is a major concern (Tsai, 2006).

This is where the third chapter of Indian economic development history starts. During the first two chapters, the government of India had rejected the idea of import, and was focused on state owned industries and indigenous resources. But now the country was opening to global interventions (Menon, 2021). India had started importing certain goods, following the craze of

"imported goods". Towards 1980s, where some focus was still on Industrialization and some on Agricultural reforms, India was facing backlash due to poorly administered interventions and increased debts on poor farmers, stagnating the economic development. The restrictions on industrial licenses were suspended almost overnight, tax rates were slashed, import duties were slashed, restrictions on new firms were removed, and several state-owned enterprises were sold. Now, liberation, privatization and globalization guided the policies rather than socialism (Adhia, 2015). Government and their policies dominated the conversation on development of India, but think tanks and private foundations were seen to be important for shaping the economic policies. The Global connection line from India to World, were majorly through private parties and not always featuring government as an important subcontinental coordinate (Menon, 2021).

The "Privatization" during 1980s increased the efficiency of private sectors' performance, made the political system more independent and not impacting the revenues generated by private companies, increased competitions in the market etc., all these benefiting the economy (Kousadikar & Singh, 2013). The economic growth surged in 1990s and early 2000s. private companies were thriving, during 1993 to 2009 the people who were below poverty line decreased from 50% to 35% of total population (Adhia, 2015). Though this was a fix for high unemployment rate, it failed to acknowledge the skill level of laborers, keeping the average per capita income lower. This only supported increased corruption, illegitimate ways to earn more money etc. Also the private companies were so focused on profit maximization, the objectives of social well-being were not considered (Kousadikar & Singh, 2013).

While India continues to focus on all three factors, Industrialization, Agriculture, and connections to global developments through privatization, one very crucial factor seems to be missing and taking a back seat i.e., Human resource development. It is seen that in all the history of Indian economic development, the policies towards human resource development, skills and education and innovation were never given special preference.

4.1.2 Current State and Challenges

During the period of 2004-2014, the GDP of India grew at 8% per annum, and then slowed down thereafter to 3.6% in each of the last 9 quarters prior to March 2020 (Mehrotra, 2021). But the lockdown due to Covid-19, has had a disastrous impact on deaccelerating the economy. An article released by Time of India, July 2021, mentioned that according to official data released by the statistics and program implementation ministry, Indian economy has subsided(dropped) by 7.3%

due to the global pandemic. Year 2021 saw the GDP growth rate of 8.68%, summing the annual change to 15.28% (Macrotrends, 2021), the lowest since the independence in 1947. India is one of the fastest and largest economies, but all the major sectors have been badly hit by Covid-19. This also means a pike in unemployment rate. Many eateries, major shops, business establishments, manufacturing units, travel services etc. were discontinued, which resulted to this increase in the unemployment (Mangla & Shreyansh, 2021). In a press note released by National Statistical Office (NSO), the growth rate is forecasted to drop down to 7% for the year 2023 (PIB, 2023). Now the real quest is to overcome this volatile nature of economic growth and bring in a more stable and sustainable economic growth factor.

To accelerate the improvement in the economic development and provide opportunities to the growing population, India now must unite all the resources. The government, private sectors and the civil society must work in collaboration. Policies and strategies developed with the focus on making more competent use of knowledge to increase the welfare of the citizens and productivity of the economy. Creating, disseminating, and using knowledge will enhance this growth and development (WorldBank, 2005).

The World Bank Document released in 2005 predicted the GDP of India to be 50% greater in 2020 that year 2000. And suggested that the time was appropriate to make its transition to Knowledge-based economy (WorldBank, 2005).

A report published by Asian Development Bank, on 4th April 2023, stated the current economic state to be *hopeful yet challenging*. With the predicted growth rate of 6.4% in fiscal year (FY) 2023, to rise up-to 6.7% in FY2024 (ADB, 2023). This growth is mainly driver by private investment and consumption to improve transport infrastructure, logistics and the business ecosystem with the support of certain policies by the government (ADB, 2023).

Year 2022 was a period of recovery for Indian economy from impacts of pandemic, but was set back because of inflation towards the end of 2022-23. The greatest land conflict in Europe since World War II, the Russian invasion of Ukraine, had lingering effect casting shadow over 2022-23, resulting in rising food and fuel cost all over the world. Though India was one of the well performing, comparatively, during this period, it might not be completely unaffected from all of this. Especially for catching-up economies like India, the impact might seem grave in certain aspects (Satish, 2023). These challenges are discussed later in this section. Currently the focus is on industrial sector, logistics, relaxing FDI (Foreign Direct Investment) regulations,

manufacturing sector etc. (Satish, 2023). These developments will benefit the economic growth, but how sustainable will be the impact? Will these hold the capacity to withstand another pandemic, or another inflation? These questions still ponder around the development.

Index of Industrial Production (IIP), which is a gauge of factory output, suggests that the manufacturing in India is still unsteady. India has the potential to acquire manufacturing sectors from China, such as textiles, shoes, leather, and ceramic. Meaning more un-skilled and low labor-intensive employments. These labor-intensive sectors have the least focus on developing human skills, hence, limiting the growth (Satish, 2023). These are many such aspects which are unseen and leading to an unstable growth for Indian economy, easily and gravely impacted by external factors.

India suffers from one or more of the factors, also making it being stuck in the middle-income trap. Let us look at few of them to support the study being conducted in this paper,

- Lower per capita income- India faces a huge challenge when it comes to equal distribution of income. Due to least focus on human skill development in many sectors, as seen above, the distribution of income is unequal. Leading to the problem of poverty and becoming a big obstacle in the economic progress of the country (InsightIAS, 2019).
- Dependencies on "Hand-to-mouth" wages- Majority of Indian population is still dependent on daily wages, seasonal jobs and hugely on agriculture. And for most of the Indian farmers, due to lack of resources, un-predictable weather conditions, it is mere wages to fulfill daily needs (InsightIAS, 2019). Falling behind in the structural transformation of economy. Agriculture, which has been the primary sector for economic development so far, 45-50% of the Indian population is still dependent on it (Khureja, 2022). Another biggest concern, 'Pre-mature Deindustrialization' where manufacturing is to the peak with least levels of activities and early development process (Goyal, 2019). *"In manufacturing sector, the national Manufacturing Policy and Make in India initiatives have not succeeded to generate enough employment opportunities."* In the absence of addressing this concern, the population will remain trapped in low-wage jobs (Khureja, 2022).
- Lack of Infrastructure- India being a populous country, with high percentage of youth, is also lacking in terms of quality of human capital formation. When capital formation is considered, on a broader sense it means anything or any resource that enhances the quality and capacity of production (InsightIAS, 2019).Though a major focus is given on education, the quality of education in schools and universities is not being monitored and developed to meet changing

standards (Khureja, 2022). Education is getting costlier, due to increasing gap between advancing technologies and lack of availability to implement in the education system. This can mean educational policies, teaching faculty, advanced facilities to learn etc. (Goyal, 2019). And due to this, statistics says, around 55% of graduates do not meet the employable industry standards (Khureja, 2022). "*The new advances in technology requires skilled human capital and demands continuous education system"* (Goyal, 2019). Out of the total GDP, only 3.77% is spent on education and Human resource Development, where as it is suggested at least to be 6% (Diwani, 2019). Making India rank at 132/191 countries in Human Resource Development Index (Arora, 2023) which has only dropped from 130 in 2014 (InsightIAS, 2019).

- Low level dissemination of technology and innovation- India has recently adopted to various advanced and new technologies like Artificial intelligence (AI), launched 5G, Machine learning (ML) etc. (Benoy, 2023). Though as true this is, it is also true that further reach of these technologies to every individual is limited due to lack of education and skills. The impact of new technologies go hand in hand with development of human capital, in terms of skills and knowledge. Due to lack of development in these areas and absence of skilled labor hurdles in spreading technology and innovation in the economy (InsightIAS, 2019). This again limits the advancement of technology and innovation for the economy, creating an unstable foundation.

4.2 Analysis of India using the Knowledge-Based Development Model

This chapter will present the analysis of Indian case based on the model developed in the previous section, with the help of theoretical framework, literature review, understanding to core concept and the case studies.

Individual features of the Knowledge-based development model have been analyzed with context to India, to understand the brief background. The intention of the study presented in this section is to put together the barriers/challenges and suggestions for developments for India in order to benefit from transitioning into KBE.

4.2.1 Innovation System

To measure the indicators described in the KEI, pulling the data for these indicators, the report generated by World Intellectual Property Organization (WIPO) is been used. Every year WIPO releases Global Innovation Index, which captures the most recent global innovation trends and measures the performance of 132 economies in the innovation ecosystem. For the purpose of this research, author has considered the data of India for the year 2022.

This chart of data (Table-1) shows us what are the strengths and weaknesses of Innovation system in India, which needs to be focused on. The percentage expenditure on R&D is just 0.7 % of GDP, which is also a focus area (Gupta, 2023).

Strengths and weaknesses for India

Strengths			Weaknesses		
Code	Indicator name	Rank	Code	Indicator name	Rank
1.3.2	Entrepreneurship policies and culture	12	2.1.3	School life expectancy, years	92
2.2.2	Graduates in science and engineering, %	11	2.1.5	Pupil-teacher ratio, secondary	95
2.3.3	Global corporate R&D investors, top 3, mn USD	16	2.2.3	Tertiary inbound mobility, %	109
4.1.1	Finance for startups and scaleups	8	2.3.1	Researchers, FTE/mn pop.	82
4.2.4	Venture capital received, value, % GDP	6	3.1.1	ICT access	99
4.3.2	Domestic industry diversification	14	3.3.2	Environmental performance	130
4.3.3	Domestic market scale, bn PPP$	1	5.1.5	Females employed w/advanced degrees, %	103
6.2.1	Labor productivity growth, %	12	6.2.2	New businesses/th pop. 15–64	114
6.3.4	ICT services exports, % total trade	1	7.2.3	Entertainment and media market/th pop. 15–69	56
7.2.1	Cultural and creative services exports, % total trade	12	7.2.4	Printing and other media, % manufacturing	86

Table 1-Global Innovation Index 2022; Innovation Strengths and Weaknesses; Source: (GII, 2022), Author has used this data to arrive at conclusions regarding current state.

Also, Technology and Innovation Report 2023 states that India ranks at 46 out of 166 countries for “readiness index” that includes measure of readiness to benefit from innovation and Technology. This graph below (Figure 3) shows that India has high potential and opportunities, but has low skills (UN, 2023).

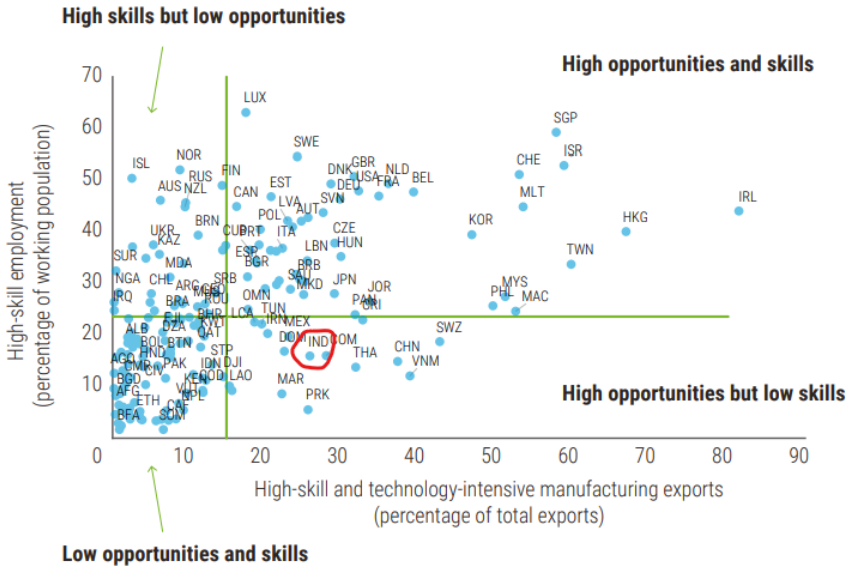

Figure 3- Technology and Innovation Report 2023; Source- (UN, 2023), Author has used this data to arrive at conclusions regarding current state.

Adoption of the latest technologies was accelerated when the world was faced with COVID-19. India was no different. Several ground-breaking ideas were seen due to the pandemic. India saw an urgent need to adapt and adopt to new technologies and innovations (Manorama, 2022). However, India needs to improve the investments around strengthening Research and Development (R&D) sector, as it plays a significant role in strengthening the Innovation System of a country, which was clearly also a lesson learnt from the case-studies of Republic of Korea and Malaysia. The case studies highlighted the importance of focus on R&D sector, which supported the strengthening of country's' Innovation System. In 2021, Government of India in collaboration with Department for Promotion of Industry and Internal Trade (DPIIT) and Ministry of Commerce and industry launched the first ever Start-up India Innovation Week. The main aim of this initiative was to act as a sandbox for start-up ecosystem to encourage entrepreneurship and innovation in India (Piyush, 2023). Incentives for workers and students taking up the role of researcher, will create a strong base for R&D advancements. A strong R&D will help India gauge the market with what is the demand, he trends in technologies, the capabilities of Indian system, and what policies are needed to be a sustainable player (Manorama, 2022).

4.2.2 Continuous Education/ Adult Education System

From the study in the previous sections, strong innovation system is majorly dependent on how robust and advanced the Education system of the country is. Any further developments need a strong foundation of educated population.

Areas like school life expectancy rate, number of students/ teachers and tertiary enrollment of students, vocational/technical skills training has been challenging. (Data below) Though various education programs are being launched by Government of India the challenge is also effective implementation. Plus, the enrollment of female population to these programs is found to be very low (Kumar, 2023).

Figure 4 shows that the enrollment rate drops by almost 20% for secondary education.

School Gross Enrolment Ratios *(in per cent)*									
Year	**Primary**			**Upper Primary**			**Secondary**		
	Girls	**Boys**	**Total**	**Girls**	**Boys**	**Total**	**Girls**	**Boys**	**Total**
2013-14	107.9	106.5	107.2	88.6	85	86.7	73.5	74.2	73.8
2019-20	103.7	101.9	102.7	90.5	88.9	89.7	77.8	78	77.9
2020-21	104.5	102.2	103.3	92.7	91.6	92.2	79.5	80.1	79.8
2021-22	104.8	102.1	103.4	94.9	94.5	94.7	79.4	79.7	79.6
Notes:									
1. UDISE+ data comes with more than one-year lag; hence data is available up to 2021-22									
2. GER greater than 100 per cent might represent the presence of over or under-age children in a particular level of education.									

Figure 4-School Enrollment Rate; Source- (GOI, 2023) (report generated by UDISE+), Author has used this data to arrive at conclusions regarding current state.

Figure 5 shows us the school dropout rates, which is clearly way higher for Secondary education. Though it has improved from previous years, but it is still a matter of concern. This shows us that the school life expectancy rate is very low.

Figure 6 shows us the rate of vocational and technical skills training in Urban and Rural areas, it is lower for rural areas and especially lower for female population.

School dropout rates *(in per cent)*									
Year	**Primary**			**Upper Primary**			**Secondary**		
	Girls	**Boys**	**Total**	**Girls**	**Boys**	**Total**	**Girls**	**Boys**	**Total**
2013-14	4.7	4.7	4.7	4	2.3	3.1	14.5	14.5	14.5
2019-20	1.2	1.7	1.5	3	2.2	2.6	15.1	17	16.1
2020-21	0.7	0.8	0.8	2.6	2	2.3	13.7	14.3	14
2021-22	1.4	1.6	1.5	3.3	2.7	3	12.3	13	12.6
Source: UDISE+									

Figure 5-School Life Expectancy Rate; Source- (GOI, 2023), Author has used this data to arrive at conclusions regarding current state.

Distribution of persons who received formal vocational/technical training *(per cent)*									
Age group	**Rural**			**Urban**			**All India**		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
2018-19									
	2.4	1.5	2	4.8	4.6	4.7	3.2	2.5	2.8
	1.8	1.1	1.5	4.9	3.9	4.4	2.8	2	2.4
2019-20									
	3.1	2.7	2.9	7	6.5	6.8	4.3	3.8	4.1
	2.2	1.7	2	6.3	5.4	5.8	3.5	2.9	3.2
2020-21									
	3.4	2.6	3	7.3	6.5	6.9	4.5	3.7	4.1
	2.5	1.9	2.2	6.2	5.3	5.8	3.6	2.9	3.3

Figure 6- Vocational/Technical Skills training rate in Urban and Rural India; Source- (GOI, 2023), Author has used this data to arrive at conclusions regarding current state.

Most of the illiterate older population was found to be in rural areas since India has higher number of populations residing in rural areas, where the reach of these programs can be matter of concern. Extending these educational initiatives to rural areas and develop the rural areas can transform the knowledge society of the country (Kumar, 2023).

Investing in the education system is the basic blueprint of KBE, which is already existing in high rate in Indian economy. Now what will drive this investment into a successful KEI factor is the effective usage of this investment. The drivers can be increasing the student-teacher ratio, improving school life expectancy and basic education qualification for job roles.

Enabling life-long learning and promoting adult education, something that clearly improved the education system and benefited the transition into KBE for Republic of Korea and Malaysia. By incentivization through government scholarships or organizational benefits, can boost the enrollment to higher education. Possibility to take-up tertiary educational courses and being able to focus and excel in it can encourage the population to be able to study further, to enhance their skills. The output of graduates in science and engineering is already an income group strength. What will drive this strength to KBE is effective usage of this talent in knowledge technology outputs, creative fields, as knowledge workers etc. What is also important is focus on human resource development along with formal education. A considerable number of Indian students were seen opting for higher education abroad. Like Malaysia's Brain-drain program to attract these students to return to home country and pursue their professional career can develop the knowledge workers in India. Further, as seen in the case of Republic of Korea, collaborations between Knowledge-based institutions and private sector can also benefit the transition into KBE.

4.2.3 Economic Policies and Infrastructure Refining

The readiness of a country's economic system to be able to adapt and recover from any crisis plays an important role in the economic development. In the case of India, when it went under sudden demonetization in the year 2016, economy was hit gravely. Increasing the unemployment rate, also discouraging the existing workers to just give up and quit, declining the rate of employed population. India was not ready for such a huge set-back. Though the demonetization was planned, it failed to address the adversities that it caused. The Indian economic and political system was not ready to be able to cope with the damage it was going to create. What was missing was an outline of the implementation (Lahiri, 2020). It was scarcely emerging out of this blow, when the pandemic COVID-19 impacted globally. The approach taken towards the pandemic was ad hoc. Unplanned lockdown literally slowed the country down. The government of India completely neglected the labor-intensive market and livelihood of these workers. This put Indian economy in another crisis. With the labor market, one of the strengths of Indian economy, being still due to the pandemic, the financial flow has come to an almost inactive state. India dominantly labor-intensive led nation, was now facing the challenge of reduced labor force. This impact was huge to recover from (Jaina & Dupasb, 2022).

With all the changes and developments to take place to benefit the progression of economy into a Knowledge-based, the challenge would be to maintain the ecological sustainability. Another challenge here is the intensity of adaption and adoption of the changes that are and will be initiated due to transformational economic changes. Indian economy and society need the capability and capacity to be able to accept all the changes.

Taken from the example of Malaysia, there needs to be a Master Plan in place, which will act as a guide to significant Knowledge-based economy policy initiatives. It needs to define the strategic areas that needs to be focused on and developed to support Knowledge-based development. The "Amrit Kaal" Budget of 2023, Minister of Finance Nirmala Sitharaman, introduced that the vision is to have an empowered and inclusive economy which is technology driven and Knowledge-based (GOI, 2023).

Redefining the role of Government as an entrepreneur or innovator will help tackle improvement in many areas. Government can identify, encourage, and incentivize new businesses, hiring of male and female workers, with advance degree, equally. Government of India needs to make

changes in its economic policies and infrastructure, also launch several initiatives to be able to adapt to the volatile economic factors.

Connecting the dot from Innovation to ecological sustainability, India should come up with "Green Innovation Initiatives" (Pachiyappan, et al., 2022). When sustainable development is discussed, switching to sustainable technologies and practices are valuable for economic development and knowledge-management processes, which is key in Knowledge-based economies. India should be considering switching to cleaner and green technologies (Shahzad, et al., 2021).

GII 2022 rank

India

40

Output rank	Input rank	Income	Region	Population (mn)	GDP, PPP$ (bn)	GDP per capita, PPP$
39	42	Lower middle	CSA	1,393.4	10,181.2	7,314

		Score/ Value	Rank
Institutions		**60.1**	**54** ◆
1.1	**Political environment**	59.9	64 ◆
1.1.1	Political and operational stability*	61.8	87
1.1.2	Government effectiveness*	58.0	49 ◆
1.2	**Regulatory environment**	64.1	67 ◆
1.2.1	Regulatory quality*	41.5	81 ◆
1.2.2	Rule of law*	45.6	60 ◆
1.2.3	Cost of redundancy dismissal	15.8	63
1.3	**Business environment**	56.3	40
1.3.1	Policies for doing business†	40.6	94
1.3.2	Entrepreneurship policies and culture*	72.1	12 ● ◆
Human capital and research		**38.3**	**43** ◆
2.1	**Education**	41.1	93
2.1.1	Expenditure on education, % GDP	4.5	60
2.1.2	Government funding/pupil, secondary, % GDP/cap	17.2	70
2.1.3	School life expectancy, years	11.9	92 ○
2.1.4	PISA scales in reading, maths and science	n/a	n/a
2.1.5	Pupil-teacher ratio, secondary	20.4	95 ○
2.2	**Tertiary education**	33.3	60 ◆
2.2.1	Tertiary enrolment, % gross	29.4	86
2.2.2	Graduates in science and engineering, %	33.7	11 ● ◆
2.2.3	Tertiary inbound mobility, %	0.1	109 ○
2.3	**Research and development (R&D)**	40.6	26 ◆
2.3.1	Researchers, FTE/mn pop. ◴	252.7	82 ○
2.3.2	Gross expenditure on R&D, % GDP ◴	0.7	53 ◆
2.3.3	Global corporate R&D investors, top 3, mn USD	68.5	16 ● ◆
2.3.4	QS university ranking, top 3*	46.0	24 ◆
Infrastructure		**40.7**	**78** ◆
3.1	**Information and communication technologies (ICTs)**	71.6	72 ◆
3.1.1	ICT access*	70.4	99 ○
3.1.2	ICT use*	45.0	97
3.1.3	Government's online service*	85.3	24 ◆
3.1.4	E-participation*	85.7	29 ◆
3.2	**General infrastructure**	33.9	50 ◆
3.2.1	Electricity output, GWh/mn pop.	1,167.4	93
3.2.2	Logistics performance*	52.6	43 ◆
3.2.3	Gross capital formation, % GDP	29.7	25
3.3	**Ecological sustainability**	16.7	115 ○
3.3.1	GDP/unit of energy use	9.9	73
3.3.2	Environmental performance*	18.9	130 ○ ◇
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.0	70
Market sophistication		**50.3**	**19** ● ◆
4.1	**Credit**	26.4	68
4.1.1	Finance for startups and scaleups*	54.2	8 ● ◆
4.1.2	Domestic credit to private sector, % GDP	54.8	64
4.1.3	Loans from microfinance institutions, % GDP	0.4	42
4.2	**Investment**	38.8	17 ● ◆
4.2.1	Market capitalization, % GDP	87.2	19
4.2.2	Venture capital investors, deals/bn PPP$ GDP	0.1	35 ◆
4.2.3	Venture capital recipients, deals/bn PPP$ GDP	0.1	23 ◆
4.2.4	Venture capital received, value, % GDP	0.0	6 ● ◆
4.3	**Trade, diversification, and market scale**	85.9	9 ● ◆
4.3.1	Applied tariff rate, weighted avg., %	6.2	97
4.3.2	Domestic industry diversification ◴	97.7	14 ● ◆
4.3.3	Domestic market scale, bn PPP$	10,181.2	1 ● ◆

		Score/ Value	Rank
Business sophistication		**30.9**	**54** ◆
5.1	**Knowledge workers**	24.7	80
5.1.1	Knowledge-intensive employment, % ◴	17.0	86
5.1.2	Firms offering formal training, % ◴	35.9	42
5.1.3	GERD performed by business, % GDP ◴	0.2	51 ◆
5.1.4	GERD financed by business, % ◴	36.8	51
5.1.5	Females employed w/advanced degrees, % ◴	2.6	103 ○
5.2	**Innovation linkages**	28.7	43 ◆
5.2.1	University-industry R&D collaboration†	50.7	42 ◆
5.2.2	State of cluster development and depth†	42.4	94
5.2.3	GERD financed by abroad, % GDP	n/a	n/a
5.2.4	Joint venture/strategic alliance deals/bn PPP$ GDP	0.1	33 ◆
5.2.5	Patent families/bn PPP$ GDP	0.2	44 ◆
5.3	**Knowledge absorption**	39.2	38 ◆
5.3.1	Intellectual property payments, % total trade	1.4	27 ◆
5.3.2	High-tech imports, % total trade	10.7	31
5.3.3	ICT services imports, % total trade	2.3	32 ◆
5.3.4	FDI net inflows, % GDP	1.9	77
5.3.5	Research talent, % in businesses ◴	34.0	40 ◆
Knowledge and technology outputs		**33.8**	**34** ◆
6.1	**Knowledge creation**	20.3	46 ◆
6.1.1	Patents by origin/bn PPP$ GDP	2.6	28
6.1.2	PCT patents by origin/bn PPP$ GDP	0.2	52 ◆
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a
6.1.4	Scientific and technical articles/bn PPP$ GDP	11.1	78
6.1.5	Citable documents H-index	41.9	21 ◆
6.2	**Knowledge impact**	30.4	56 ◆
6.2.1	Labor productivity growth, %	3.5	12 ●
6.2.2	New businesses/th pop. 15–64	0.2	114 ○
6.2.3	Software spending, % GDP	0.2	58
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.8	67 ◆
6.2.5	High-tech manufacturing, % ◴	34.8	37 ◆
6.3	**Knowledge diffusion**	50.7	15 ● ◆
6.3.1	Intellectual property receipts, % total trade	0.2	46 ◆
6.3.2	Production and export complexity	52.4	43 ◆
6.3.3	High-tech exports, % total trade	4.4	39 ◆
6.3.4	ICT services exports, % total trade	14.0	1 ● ◆
Creative outputs		**24.3**	**52** ◆
7.1	**Intangible assets**	38.0	40 ◆
7.1.1	Intangible asset intensity, top 15, %	75.1	14 ◆
7.1.2	Trademarks by origin/bn PPP$ GDP	42.6	56
7.1.3	Global brand value, top 5,000, % GDP	75.0	29 ◆
7.1.4	Industrial designs by origin/bn PPP$ GDP	1.0	66
7.2	**Creative goods and services**	17.2	61
7.2.1	Cultural and creative services exports, % total trade	1.9	12 ● ◆
7.2.2	National feature films/mn pop. 15–69	2.5	42 ◆
7.2.3	Entertainment and media market/th pop. 15–69	1.0	56 ○
7.2.4	Printing and other media, % manufacturing ◴	0.5	86 ○
7.2.5	Creative goods exports, % total trade	1.9	30
7.3	**Online creativity**	4.1	66
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.9	95
7.3.2	Country-code TLDs/th pop. 15–69	0.7	96
7.3.3	GitHub commit pushes received/mn pop. 15–69	3.8	66
7.3.4	Mobile app creation/bn PPP$ GDP	10.8	38 ◆

NOTES: ● indicates a strength; ○ a weakness; ◆ an income group strength; ◇ an income group weakness; * an index; † a survey question. ◴ indicates that the economy's data are older than the base year; see appendices for details, including the year of the data, at https://www.wipo.int/global_innovation_index/en/2022. Square brackets [ ] indicate that the data minimum coverage (DMC) requirements were not met at the sub-pillar or pillar level.

The Global Innovation Index 2022

Table 2- Global Innovation Index 2022; Innovation Strengths and Weaknesses; Source: (GII, 2022), Author has used this data to arrive at conclusions regarding current state.

4.2.4 Reach and Access of Information and Communication Technology

Though it is indicated as a strength, but the ICT access and usage are given weaknesses in the GII table above (Table 6 - Global Innovation Index 2022) Government of India is already working on another key driver of KBE, that is digitalization of Government services and participation of citizens in these services. Transition of Indian economy in to a Knowledge-based is already on its way, and certain areas are already been focused on. But the progress is comparatively slow and it has been nearly stagnant for couple of years. The most common barrier or challenge is the Digital Divide. There exists a tremendous gap between the regions and population that have access to ICT. As suggested in GII 2022 by WIPO, there exists a weakness in ICT access, reach and usage. This can be a major hurdle for India transitioning into Knowledge-based economy.

Indian Union Budget 2023-24 had special focus on technological development to promote better access and reach of latest technologies. Three Artificial Intelligence excellence centers to be launched in educational institutions with the vision of "Make AI in India and Make AI work for India"(PIB, 2023). This will provide students and researchers access to latest technologies.
Union Budget 2023-24 also announced reduction in the cost of telecommunication equipment, making it easier to be accessible to wide population.

On October 1, 2022 Government of India launched 5G services with support of Bharti Airtel and Reliance Jio. As of January 2023, 5G is made available already in 72 major cities in India (Saini, 2023). This will boost the ICT infrastructure in India.
India must consider implementing digital inclusion policies, programs, and tools. Taking reference from the other Asian nations, India needs to put in place ICT councils to support and focus on ICT developments. Some of them may include- (Steele, 2018) (NCDIT, n.d.)

- Increase affordability by providing reasonably priced internet services and internet enabled devices, empowering users by improving digital literacy of nation.
- Relevant and useful content creation to engage the population.
- Provide support with respect to technical issues and improve internet infrastructure development.
- Trying to close the gender gap in internet access and increase number of female users.

4.3 Key Findings from Case Of India

The analysis of Indian case based on the Knowledge-based development model was an attempt to identify gaps residing in the current knowledge-centric policies and development initiatives. This was important to arrive at improvement areas and suggest further developments. The key findings have been discussed in this section.

Since Independence in 1947, India's approach towards economic development has been focused majorly on reacting to the crisis. Though India started the economic development journey with "5-year plan", the policies have rather been reactive than proactive. Initially this approach did help develop certain sectors to flourish, but never enough to fill up the void created during colonization. Industrialization in the first phase, leveraging cheap and unskilled labor. Agriculture oriented policies in the second phase, benefiting from the rich, hefty land owners and farmers. And then for the third stage improving global connections in terms of imports and exports, and privatization. All these were good strategies, but failed to recognize and highlight the importance of human resource development.

In India, the importance on education and acquiring skills is very important. But it remains limited to the population who can afford it. Also, the economic development has never been utilizing this knowledge bank. Facing the adversities due to the demonetization, pandemic, inflation, etc.… the need and importance to switch to sustainable and robust economic development strategies has now surfaced. The recent developments are certainly pointing towards right direction, but needs further emphasis on knowledge-centric activities. What is understood from the study of India is,

- There needs development with respect to R&D sector in India, to improve its innovation capabilities and create a strong foundation. Based on the case studies and analysis of India, focus on R&D related policies was seen to be impactful for transitioning into KBE.
- Enabling the opportunity to enroll for adult education, tertiary education programs will enhance the knowledge-society and strengthen the human resource.
- Putting in place a "masterplan" with knowledge and innovation-oriented policies will act as a blue-print and support the transition into KBE. This will make way for the economic system to adapt to changes required and initiated due to this transition.
- Reach and access of ICT is the biggest challenge for India. The digital divide has caused the transformation to slow down. Making the ICT equipment's affordable, and subsidizing necessary internet enabled devices and services will empower the digital literacy of the

nation. India needs to consider digital inclusion policies, programs, and tools. Encouraging the users in rural areas by providing necessary support will engage more population.

The Union Budget 2023 is a proof of India's awakening in terms of understanding the importance of Knowledge and Innovation for economic development. It shed some light on the focus being given to life-long learning, innovation system, ICT infrastructure etc. India is slowly, but certainly laying foundation for Knowledge-based advancements.

CONCLUSION

Knowledge-based economy and the discussion around it has been taking shape over the recent times for India. Based on the previous section of key findings, India has some positive focus on knowledge and innovation centric policies to strengthen its foundation for sustainable development. The research aimed to present KBE as a sustainable economic development paradigm for catching-up economies, projecting on Indian case.

The literature review approach was to first understand the importance of knowledge and innovation for economic development of a nation. And this was done with the help of Schumpeter's theory of economic development. Then studying the four pillars of KBE model provided us with the different aspects of KBE, also understand. Schumpeter's theory and four pillars of KBE gave a holistic view of the KBE for sustainable economic development of country, Defining the relevance and depth of KBE concept, together they epitomized the necessary pre-conditions, benefits and need for developing countries to transition into KBS.

Theoretical research gathered reflects the expressions, opinions and discussions done so far by previous researchers and economists. It surfaces the importance of knowledge and innovation for economic development. Literature presented is also an attempt to identify the benefits, hence arriving at the pre-conditions for KBE. In order to understand the context of KBE and its impact on developing countries, two case studies of the Republic of Korea and Malaysia were carried out. The two case studies were chosen due to similarities of economic condition post-colonization. Starting with disparity of economy and deep poverty, both the countries enhanced its economy with KBE.

This gave us an overview of what policies needs to be in place, what approach can be taken by the developing nations, lessons learnt in order to transition into KBE. In accordance with theory and case studies, a Knowledge-based Development Model was designed. This model highlights the important features that act as pre-conditions for developing countries. It talks about innovation system, life-long learning/continuous education system, economic refinement, and ICT infrastructure.

For the case of India, first the history of economic development and current state was studied, identifying the gaps in Indian economic development plans so far. This was then analyzed with the help of model developed, to identify key challenges/barriers. This analysis section also

suggests further development recommendations to overcome these barriers and benefit from transitioning into KBE.

Results reflect that India is certainly moving towards knowledge oriented economic growth, but the pace may be slow. The reasons identified were lack of focus on innovation related policies that include R&D sector, lack of importance given to adult education and enrollment to tertiary education, missing master plan for the transition, and low access & reach of ICT.

These challenges can be overcome by putting in place policies like,

- Improve the investments around strengthening R&D sector, benefits, and incentives withing and outside organization will improve the output of innovation initiatives.
- Incentivize enrollment to secondary, tertiary, and adult education, through government scholarships, and private organizational benefits. The collaboration of public-private sector can enhance the opportunities.
- Putting together a master plan, that will administer all the changes and initiatives surrounding transition into KBE. This will act as a blue-print.
- Improving the relevance of digital content, empowering the users by increasing affordability of equipment and internet enabled services and devices, and providing support with necessary technical issues at rural areas.

The limitations of the study are discussed in this section. It is important to highlight the limitations as it helps the author understand the gaps in the existing study, and gives possibilities for further research and study to be carried out.

The research has not explored certain aspects of key drivers, like practical implementation procedure of the knowledge and innovation policies, and examples from India which could suggest practical issues while implementation. As the study was mainly analytical and the base for analysis was published reports, the aspect of public interaction and data based on actual on-goings is limited in this research. Also, one of the limitations is identifying willingness of the older population for the possibility of adult education system, to actively enroll. One can also say that feasibility of ICT equipment at affordable price could be a barrier for implementation.
The study must be continued, to explore the on-site implementations, challenges, and level of difficulty of implementation. This study should be used as the base for deriving key enablers and understanding the challenges, to build further study.

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