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Review Paper

Understanding national innovation system: Electronics sector in India

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Abstract

System of innovation as a framework in the field of Science & technology plays an important role in linking national, regional, sectoral and technological innovation to understand development and competition in firm or in particular technology, here National Innovation system (NIS) is discussed. And based on NIS, this paper basically focuses on finding various actors, institutions, system which leads to electronic sector development in India as an emerging technology with best assurance. For that various literature, surveys, articles and reports are considered and then graphical analysis is done. Based on the graphical analysis it would be easy to do future research and development in this sector.

Keywords: Actors, Collaboration, Industry-Institute Partnership, National Innovation system.

Introduction

The most significant mania now days which is being seen in the field of innovation is that innovation is basically a cooperative activity and takes place within the wider context of system. And, this immense system is now coined as 'the innovation system' and the accomplishment of innovation is resolute by way the innovation system builds up and functions. As per the conception of IS the way to innovation process is the way of flow of information alone and also among enterprise, peoples and institutions is taking place. The Electronics sector what is seen today is a dominant player in the economy and become globalised industries in the world. Today, it become a strategic enabler and can founds its application in all the services, which can be Internet as Internet of Things (IoT), telecom, engineering industries, aviation, energy, banking services.

Here in this paper the main focus is on National Innovation System (NIS) and based on that there is study on how development of electronics sector taking place in India is analysed and going to see different actors, institutions, their networks, how interaction going on and various functions of that.

Literature Review

This section considered an extensive literature review about: NIS, Electronics Sector development in India as theoretical framework.

Innovation system: In today's scenario, the use of Innovation Systems in form of theoretical framework is tremendously increasing in the developed countries by various research scholars' articles at different levels of maturity[1].

Innovation systems (IS) theory is a concept which starts from the basic point that the firm or the entrepreneurs cannot innovate alone, but the innovation take place in the perception of full system. But in particular, different actors, institutions, and technologies al have to analyse each other jointly with co-operation[2].

The innovation systems approach has been applied at National level[3], Regional level[4], Sectoral level[5] and Technological level[6]. Now a day there is International Innovation System, but here NIS will be centre of attention[7].

National Innovation Systems: definitions: A NIS has been defined in various ways by different scholars, some of them as follows: i. " .. *the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies*."[8]. ii. " .. *the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state*."[9]. iii. "... *a set of institutions whose interactions determine the innovative performance of national firms*."[10].

The NIS as methodological approach has been given importance because of three important factors in term of technology: i. increasing use of approaches of systems; ii. recognition of importance of the knowledge in terms of economics; and iii. growing number of institutions involved in knowledge creation and circulation[11,12].

Major elements of NIS can be seen and identified in Figure 1, followed by Figure-2 illustrates particularly the institutions, technologies, and incentives and linkages in the NIS.

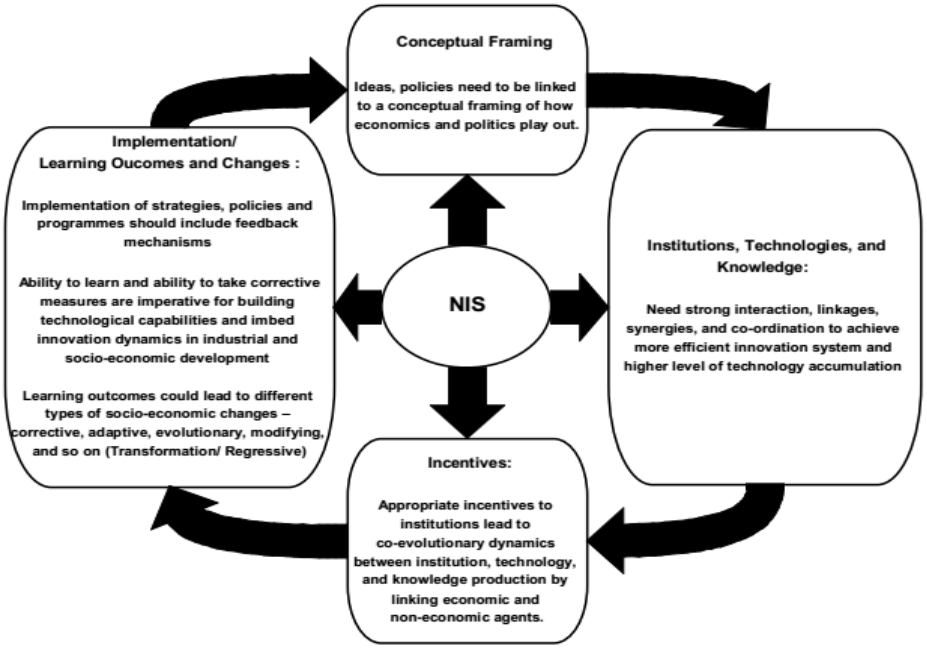

Figure-1: Key Essentials of NIS[11].

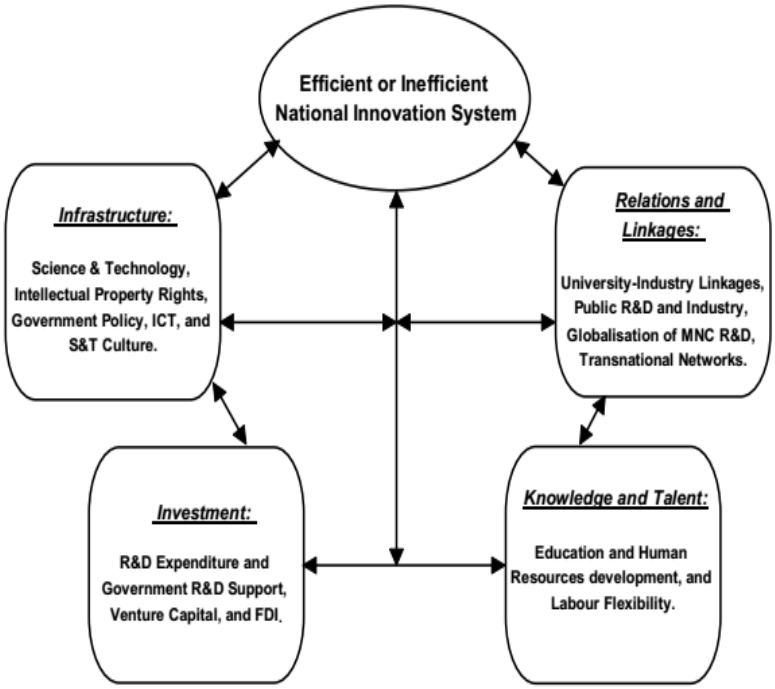

Figure-2: Link between Infrastructure, Investment, Knowledge Transfer and Technologies in NIS[11].

Electronic Sector development in India: The Electronics Industry in India began its journey around mid-1960s with direction on the way to defence and space technologies by the central government, and then during the period 1960s to late 1970s, the defence sector was the primary focus area for India's electronics sector. After that 1980s saw the birth of India's consumer electronics market with the development of televisions and telephones. Since mid-1991 onwards extensive economic and structural reforms have been carried out in India with major emphasis on facilitating external trade and boosting efficiency and domestic firm productivity[13]. The evolution of Indian Electronic sector can be seen in Figure-3.

Development Electronic sector in India is very high because of its Growing demand, Attractive opportunities, Policy support as FDI which is up to 100% allowed in the electronics hardware

manufacturing sector, and others such as M-SIPS (Modified Special Incentive Package Scheme)[14,15].

In today's scenario India's electronics sector in market expected to rose from USD 70 in 2015 to USD 400 in 2020 (IBEF Report, 2016) and 3.5% of the global electronics market by India. Present situation of India shown in Figure-4, its whole market expansion in Figure-5, and followed by categories of Indian Electronic Sector in Figure-6.

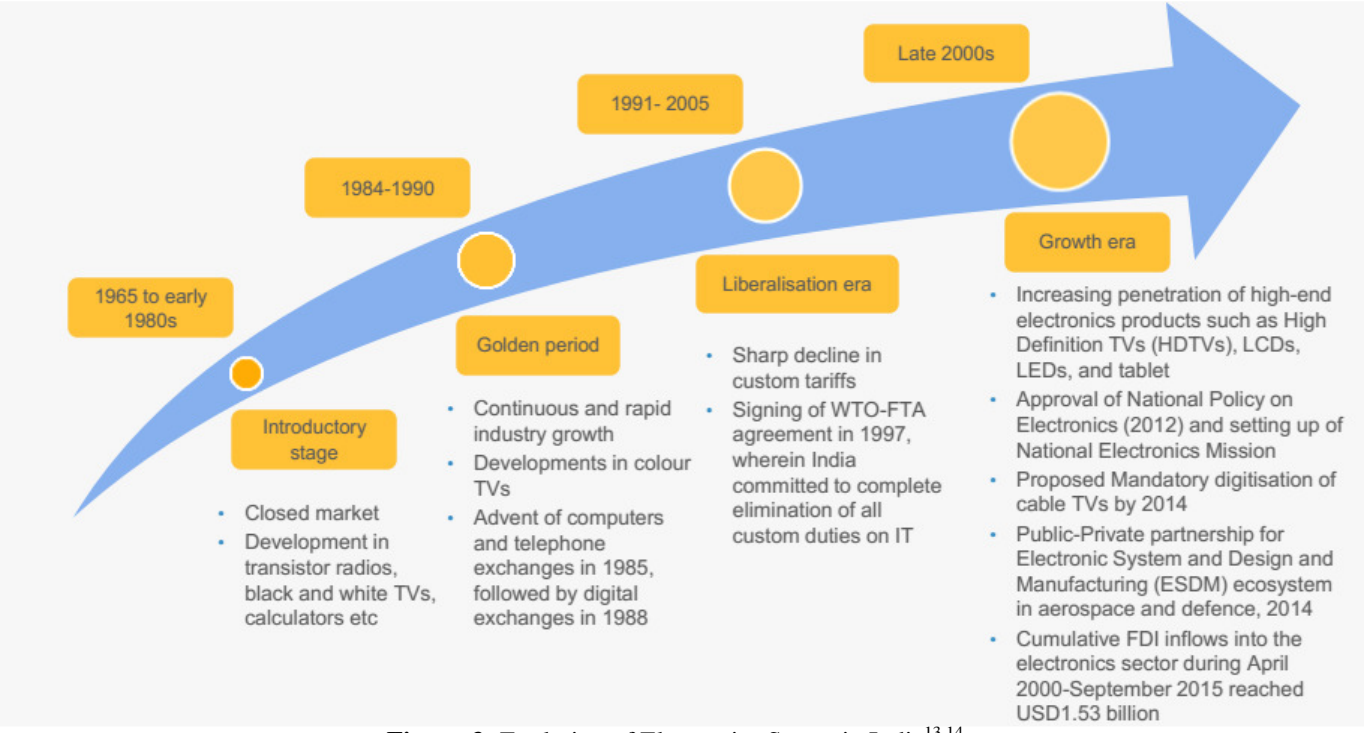

Figure-3: Evolution of Electronics Sector in India[13,14].

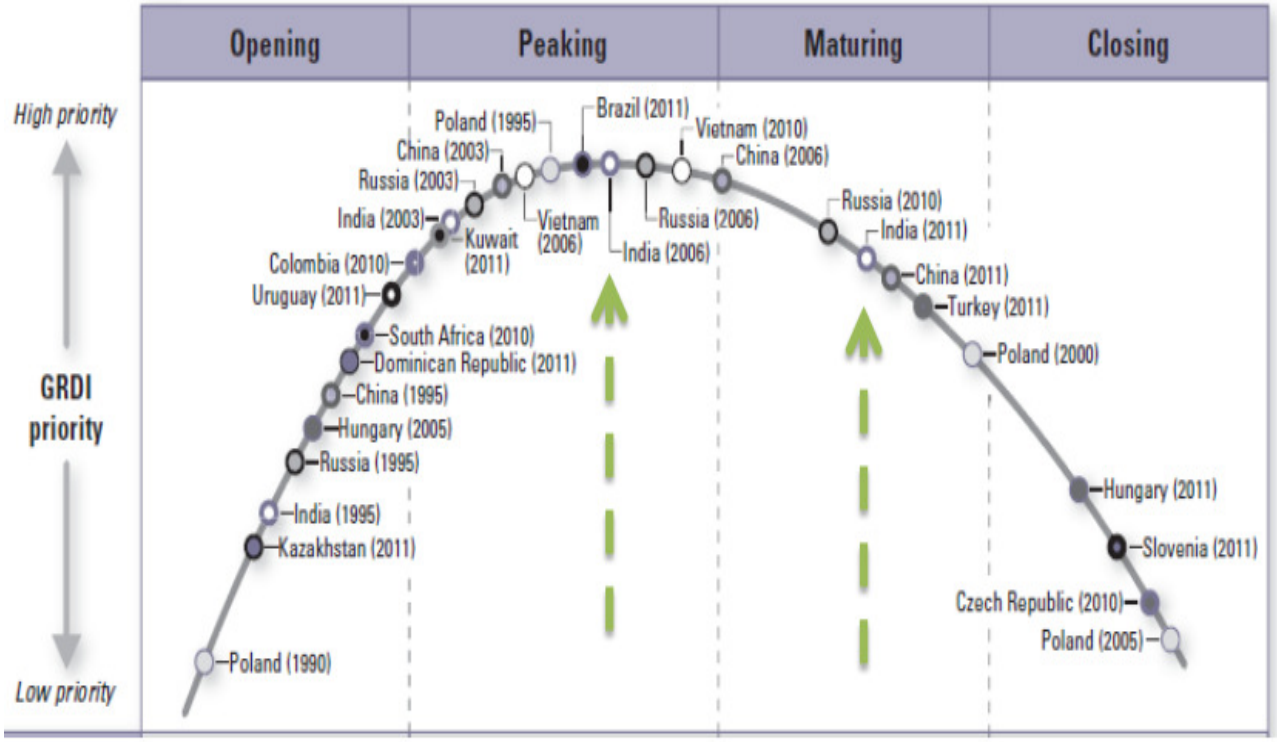

Figure-4: Electronics Sector Scenario in India[18].

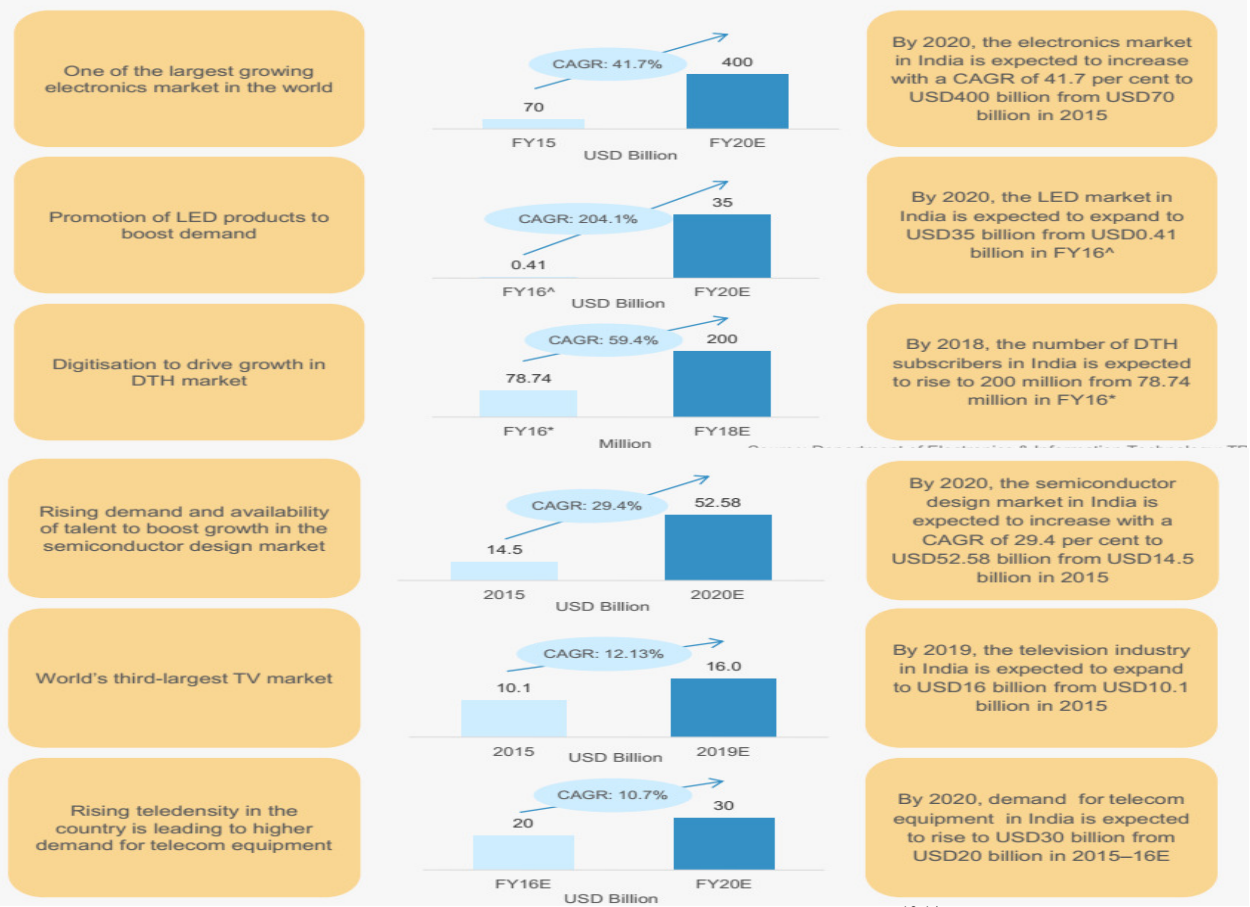

Figure-5: Market expansion of electronic sector in India[13,14].

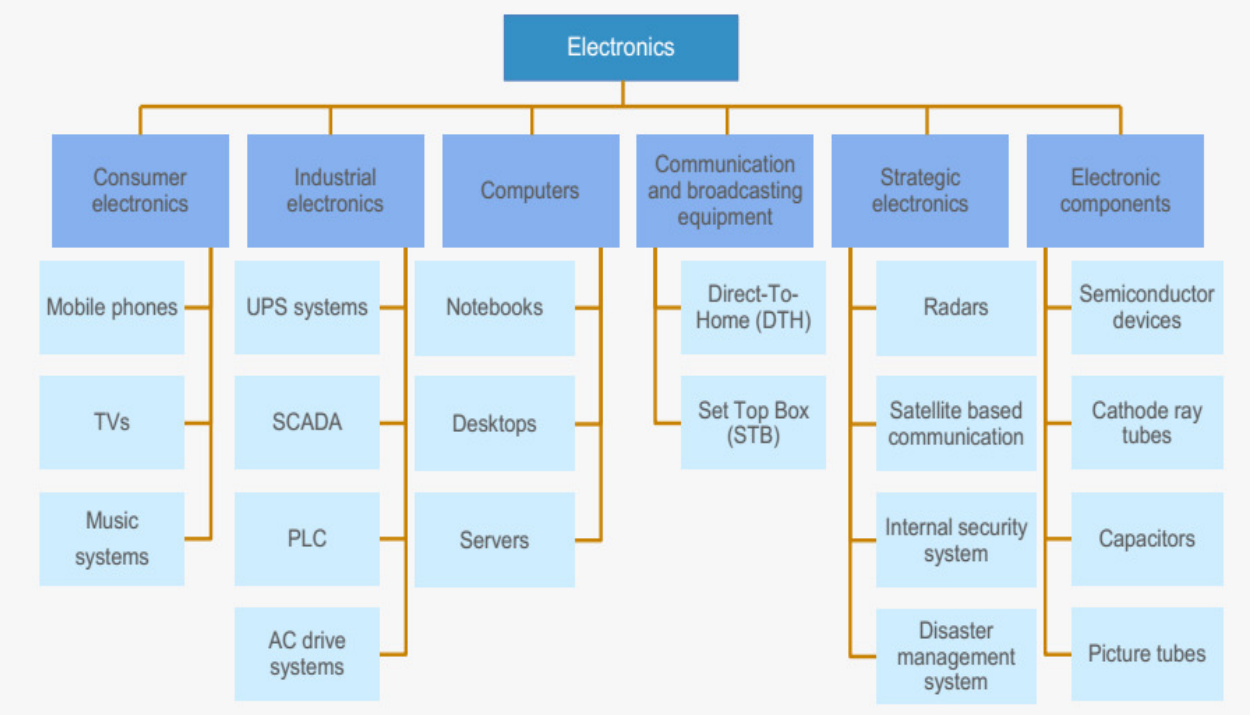

Figure-6: Rip of Electronics Sector in India[13,14].

Analysis of Development of Electronic Sector in India Using NIS

Analysis: As here National Innovation System (NIS) is used for analysing, firstly starting with actors or key players since many scholars have emphasized that they play very important role in promoting creation and dissemination of knowledge, product and so. A key focus is here on the Research &Development (R&D) of Electronics sector, which basically guides to innovative products. R&D as an integral part of Electronics ecosystem has been recognized by NIELIT and also ropes the entire R&D activities chain all over the country[16]. Then there is focus on different policies, strategies and stack holders and even different sectors of electronics in India as Figure-7.

There are various key players in Electronics Sector, but some of the key players are: BEL (BHARAT ELECTRONIC LIMITED) which meets the needs of Indian defence services; VIDEOCON as 3rd largest consumer durables manufacturer in India, followed by LG as 2nd largest and after that SAMSUNG; then HCL as one of leading IT company having offices in 31 countries; MOSERBAER as world's largest company in the optical storage media segment; FLEXTRONICS; CENTUM; JABIL which offers PCB (Printed Circuit Boards), inclusion amalgamation, and repair and distribution services with in-region.

There are various remarkable trends in Electronics sector which are Industrial electronics, Consumer electronics, Computers, Electronic components, Strategic electronics, e-waste management, major source to provide employment and others. In Figure-8 there is analysis on strong demand and policy support.

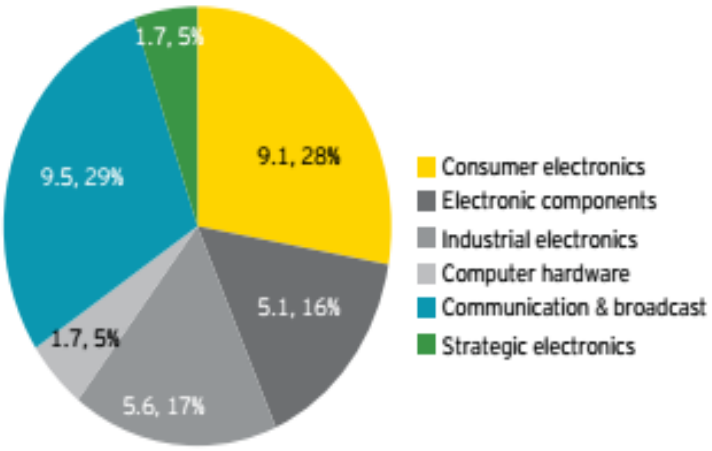

Figure-7: Different sectors of Electronics Sector in India[17].

Here policy mechanism focuses on FDI, Electronic Development Fund Policy (Dec 2014), Intellectual Property Rights, EPCG scheme; EHTP scheme, relaxation on custom duty and central excise M-SIPS and various others. There is focus on NATIONAL ELECTRONICS POLICY 2012 [17] which is shown in Figure-9.

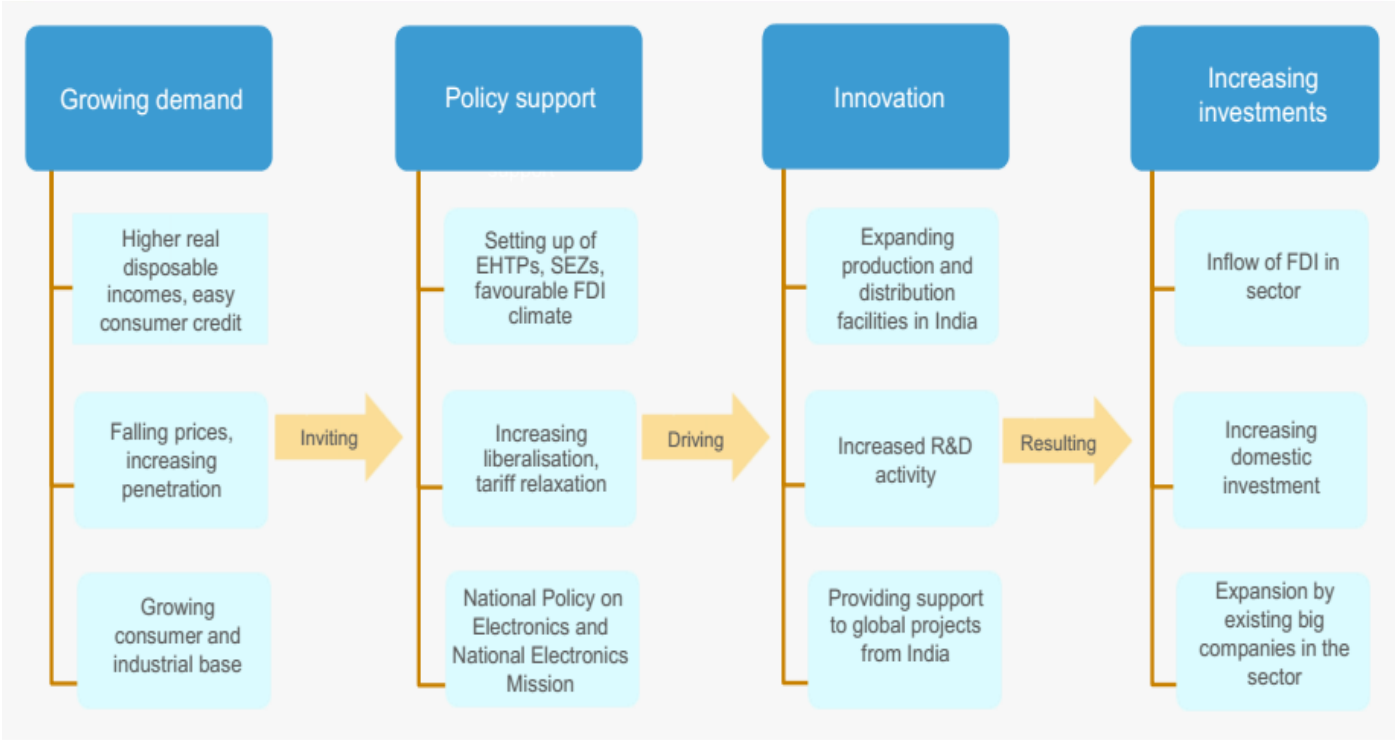

Figure-8: Analysis on strong demand and policy support[13,14].

Figure-9: National Electronics Policy 2012 [17].

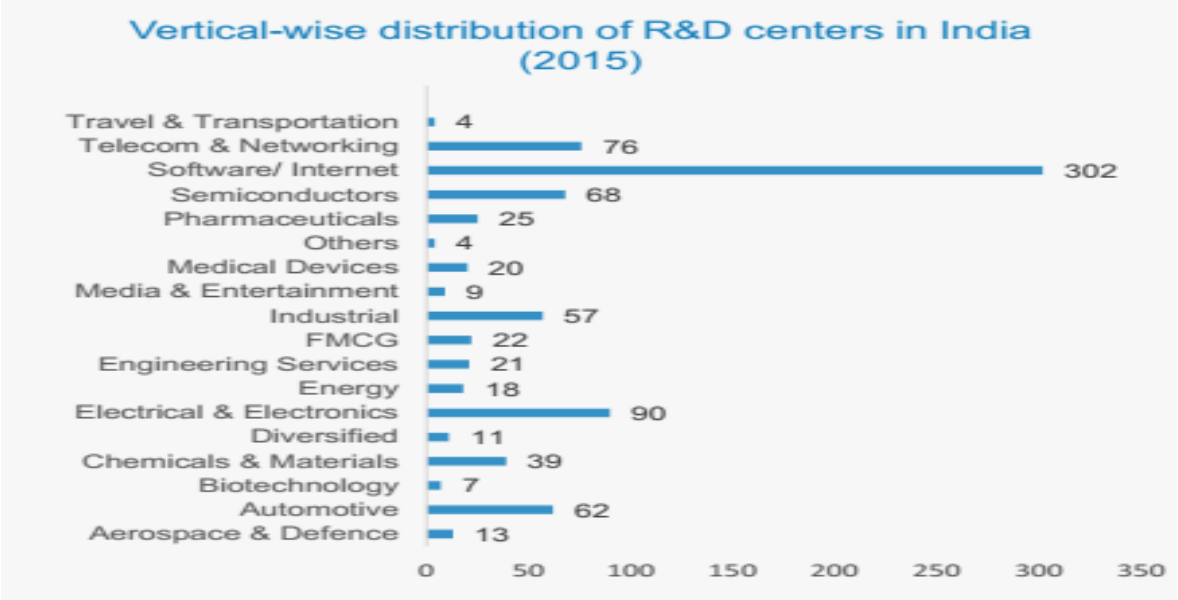

Figure-10: R&D distribution in India vertical-wise[15].

Stakeholders in Electronics Sector value chain in India[18] see Figure-11.

Figure-11: Stakeholders in Electronics sector[18].

We have different universities and government research centers which plays important role in patent publication and innovation of electronics sector India as :- from Science and R & D as: CSIR, DRDO, G,H.R. Labs and Research Centre etc., From Applicants based Institutes and Universities:-IIT (Collective), Janardan Rai Nagar Rajasthan Vidyapeeth (Deemed) University, IISc Bangalore, Sandeep Foundation's Sandip Institute of Technology & Research Centre and many more. Foreigners as:- Qualcomm incorporated, Philips N.V., Ericsson (PUBL, Samsung Electronics Co. Ltd etc..).

Overall analysis is shown in Figure-12.

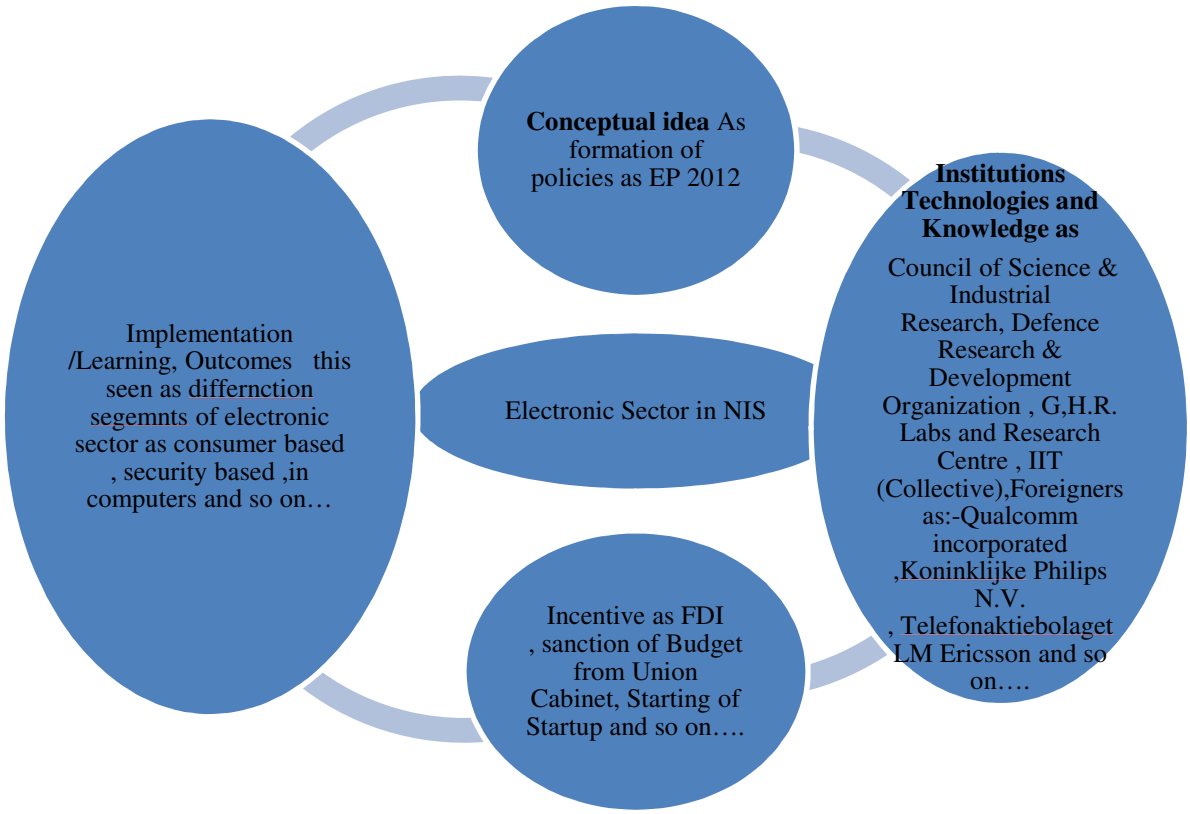

Figure-12: Overall Analysis.

Issues and challenges: Various challenges and issues which comes into picture during analysis as: the improvement of efficiency, reliability, safety and lifetime, as well as the reduction of costs. Beside this there is another challenge that is the existing gap between fundamental research & claim. There is also poor integration among lab firm, because of lack of skilled manpower, which could provide better linkages between the domains of commerce and technology. Besides this, high Electronics products manufactured costs for acquisitions of IPR, lack of human and policy capacity, infrastructure and capital mechanisms are nearly non-existent. And lastly Safety, Health and Environment (SHE) risks to consumers and the public need to be addressed while commercializing product of Indian Electronics Sector.

Conclusion

While doing analysing it can be observed that, in India, industries which are based on Electronics sector are going to emerge as a foremost actor. It can also seen that the actors as universities which are basically the main knowledge production source, then there are research centres and government labs, and while talking about patenting the public research labs plays leading role. The sector which is private has also shown great prospective and had great future. Recently, India for FDI has emerged as one of the major destinations, followed by R&D alliance, voyage of knowledge workers, linkages between institutions national as well as international, collaborations of inventors, and technology transfer. Besides all above, there should also be focus on Ethical, Legal, Social and Environmental issues.

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