The Asian Journal of Technology Management Vol. 6 No. 1 (2013): 1-14

Technological Innovation and Competitivenes in The Global Economy: India's Changing Status and Its Implications

Bala Subrahmanya Mungila Hillemane
Department of Management Studies, Indian Institute of Science. Bangalore,India

Abstract. *This paper probes the changing innovation status and resultant competitiveness in the context of global economy and questions the recent ranking improvements of India on the basis of hard economic facts. This paper has made use of secondary data comprising innovation indices and competitiveness rankings published by international organizations and reputed business schools from time to time since 1996 to analyze the changing status of India internationally. Later, using secondary data on key macro-economic variables published by the Government of India, the recent ranking of India is closely examined as well as recent steps taken by the government of India to improve competitiveness are elaborated. The study throws light on the changing but improving innovation dimensions and competitiveness ranking of India since 1996 till 2010. From nowhere India emerges and occupies the second slot, after China, in the global competitiveness ranking. But hard core macro-economic variables do not justify India's elevation to the top in any way. Given this, the study throws light on the recent policy measures announced by the Government of India and its implications as well as policy imperatives.*

Keywords: *Technological Innovation, Competitiveness, Innovation Index, Emerging Economies, India*

1. Introduction

The degree of competition among different countries across the global economy has been intensifying over time, particularly since the early 1990s. This is due to a variety of factors, the most significant among them being (i) economic liberalization pursued by various developing economies and erstwhile socialistic countries, and (ii) ICT revolution. The former has been aided and promoted initially by dismantling of domestic controls and regulations for industrial enterprises, particularly for Foreign Direct Investment (FDI), and later by the formulation of WTO, which resulted in the removal/slashing of quantitative and non-quantitative restrictions for foreign trade. The onset and spread of ICT revolution is heralding a new era in the field of telecommunications leading to instant spread of communication between people and firms. All these have been leading to intensified global competition.

*Corresponding author. Email: bala@mgmt.iisc.ernet.in

DOI: http://dx.doi.org/10.12695/ajtm.2013.6.1.1
Print ISSN: 1978-6956; **Online ISSN**: 2089-791X.

Therefore, how to sustain competitiveness has been one of the primary concerns for Policy Makers in industrialized countries whereas how to enhance and achieve competitiveness has been one of the primary concerns of Policy Makers in industrializing countries like India. While competitiveness has to be achieved/sustained with respect to the whole economy, manufacturing sector has always been at the forefront of achieving/sustaining competitiveness because it is the manufactured – technology intensive – products which aid and encourage competitiveness enhancement not only in industry but also in agriculture and service sectors.

Given this, it is appropriate to understand why is competitiveness important? What factors promote competitiveness of a nation? Where does India stand in terms of competitiveness in the global market? What are the macro indicators of Indian manufacturing competitiveness? What are its implications and what are the future prospects for India? These are some of the issues that are dealt with in this paper. The paper is structured in terms of six sections. Section 2 deals with basic concepts and issues. Section 3 describes briefly the methodology adopted for the study and section 4 traces the changing innovation and competitiveness status of India relative to other economies in the world. Section 5 describes the recent policy initiatives taken by the Government of India for innovation promotion in the country and section 6 comprises conclusions.

2. Technological Innovation and Competitiveness: What are they? Why are they significant?

Several factors contribute to a country's competitiveness such as labor & material cost, energy cost, quality & quantity of economic infrastructure, local business environment, quality of human resources, regulatory framework and government policies, etc. But what stands apart is innovation. According to the pioneering work of Nobel Prize winner (in Economics) Robert Solow (1987), technological innovation is the ultimate source of productivity and growth. It is the only proven way for economies to consistently get ahead (Senor and Singer, 2010). Technological innovations promote the economic competitiveness of the whole country (Ciemleja and Lace, 2008). Innovation and competitiveness have a dynamic and mutual relationship. By virtue of its relationship with competitiveness, innovation emerges as a major factor promoting competitiveness and economic growth. Innovation can be a critical driver of increasing productivity and competitiveness. Thus innovation is the necessary core competence to remain competitive in the global landscape.

A report from the US Council on Competitiveness (World Business, 2007) declared, "Innovation will be the single most important factor in determining America's success in the 21st century". According to The Economist (2011) innovation is today's equivalent of the Holy Grail. Rich-world governments see it as a way of staving off stagnation and poor-world governments see it as a way of speeding up growth whereas business executives everywhere see it as the key to survival.

But what is technological innovation? What is competitiveness? Broadly, technological innovation comprises the development of new products/processes or the improvement of existing products/processes (OECD, 1997). Both of them give an edge to enterprises at the micro level and economies at the macro level to compete against their rivals. A globally competitive economy will be able to create increasing employment opportunities, encourage domestic and foreign direct investment and improve its Balance of Payments (BoP). A competitive economy, in turn, can boost its intellectual capital and innovation capabilities, push its technological frontiers and drive the growth in demand for skilled workers and scientists. However innovation capabilities and global

competitiveness of nations are undergoing a transition, particularly since the 1990s as reflected in the changing innovation and competitiveness indices over a period of time.

Competitiveness in general refers to the ability of a nation to achieve high rates of economic growth on a sustained basis by penetrating the international market steadily in such a way that it will result in favourable balance of trade as well as balance of payments. National competitiveness refers to a nation state's ability to produce, distribute and service goods in the international economy in competition with goods and services produced in other countries, and to do so in a way that earns a rising standard of living (Scott and Lodge, 1985). Competitiveness should be understood as the ability of companies, industries, regions, nations and supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis (OECD, 1994).

The competitiveness of a country in general and that of the manufacturing sector in particular, is critical to its long-term economic prosperity and growth. A globally competitive manufacturing sector will be able to create increasing employment opportunities, encourage domestic and foreign direct investment and improve its Balance of Payments. A competitive manufacturing sector can boost a country's intellectual capital and innovativeness, push its technological frontiers and drive the growth in demand for skilled workers and scientists.

In this context, it is appropriate to understand how innovation status and competitiveness of countries are changing since the 1990s and where does India stand? What are its implications? What do India's macroeconomic indicators indicate? What kind of policy support has been extended to enterprises in Indian economy in recent years? What needs to be done if we have to promote innovation capability of enterprises and that of the economy as a whole? These issues are addressed in this paper, based on secondary data gathered from reports of international organizations and national ministries, pertaining to the late 1990s and after.

3. Objectives, Scope and Methodology

The present study has the following specific objectives:

1. To trace the changing innovation ranking of India since the 1990s and analyze its implications
2. To examine the current macroeconomic indicators in the light of India's recent innovation ranking
3. To ascertain the policy support extended by the government of India for innovation promotion in the recent period

These objectives will be studied for Indian economy in comparison with other major developed and developing countries. Primarily, the published reports and innovation rankings of the US Council on Competitiveness (COC) will be used for ascertaining the changing innovation status of India. In addition, innovation/competitiveness rankings of economies made by other international organizations will be used. Further, to ascertain whether the current innovation ranking of India is justified, we would look at current macroeconomic indicators published by the Reserve Bank of India. Subsequently, recent policy initiatives taken by the government of India for innovation promotion will be examined, to bring out policy implications of the study. Thus the entire analysis will be based on secondary data and published reports and documents of international institutions and Government of India.

4. Innovation Status and Competitiveness of Countries: Changing Dimensions?

According to the Council on Competitiveness, USA (1999), technological innovations contribute significantly to build up national competitiveness. While competitiveness in the

short-run can be improved by cost cutting and deficit reduction, national innovative capacity is a lynchpin of national industrial competitiveness in the long run. Further, improvements in national innovative capacity are not a zero sum game. If many nations improve innovative capacity, all will enjoy rapid growth in productivity and with it an improved standard of living. Improving competitiveness in one country can also benefit other countries through the diffusion of knowledge and products.

To create a quantitative benchmark of national innovative capacity which highlights the resource commitments and policy choices that most affect innovative output in the long run, the Council on Competitiveness created an Innovation Index initially for 17 OECD countries from 1973 to 1995 and projected the Innovation Index into the future (up to 2005) for each country. The relative positions of 17 OECD countries in terms of their national innovation capabilities based on Innovation Index are presented in Table 1.

Table 1. Innovation Status based on Innovation Index for OECD Countries

Actual				**Projected**	
1980	**1986**	**1993**	**1995**	**1999**	**2005**
Switzerland	Switzerland	Switzerland	USA	Japan	Japan
USA	USA	Japan	Switzerland	Switzerland	Finland
Germany	Japan	USA	Japan	USA	Switzerland
Japan	Germany	Germany	Sweden	Sweden	Denmark
Sweden	Sweden	Sweden	Germany	Germany	Sweden
Canada	Canada	Denmark	Finland	Finland	USA
France	Finland	France	Denmark	Denmark	Germany
Netherlands	Netherlands	Canada	France	France	France
Finland	Norway	Finland	Canada	Norway	Norway
UK	France	Australia	Norway	Canada	Canada
Norway	Denmark	Netherlands	Netherlands	Australia	Australia
Denmark	UK	Norway	Australia	Netherlands	Austria
Austria	Australia	UK	Austria	Austria	Netherlands
Australia	Austria	Austria	UK	UK	UK
Italy	Italy	New Zealand	New Zealand	New Zealand	New Zealand
New Zealand	New Zealand	Italy	Italy	Italy	Spain
Spain	Spain	Spain	Spain	Spain	Italy

Source: Council on Competitiveness (1999)

Later based on recent data, the US Council on Competitiveness calculated the current Innovation Index and projected it for the future for eight emerging economies: China, India, Ireland, Israel, Malaysia, Singapore, South Korea, and Taiwan. Perhaps this was the maiden attempt for evaluating the innovation capability and potential of these emerging economies. Though the data are likely less reliable for these economies and there is more uncertainty associated with their innovative potential, these data provide a starting point for evaluating the potential of these economies to become international centers of innovative activity (Council on Competitiveness, 1999). In addition to

calculating the Index up until 1995, based on recent trajectory of resource and policy choices innovative capacities of these economies were projected for the future. The projected Innovation Index for emerging economies is presented in Figure 1.

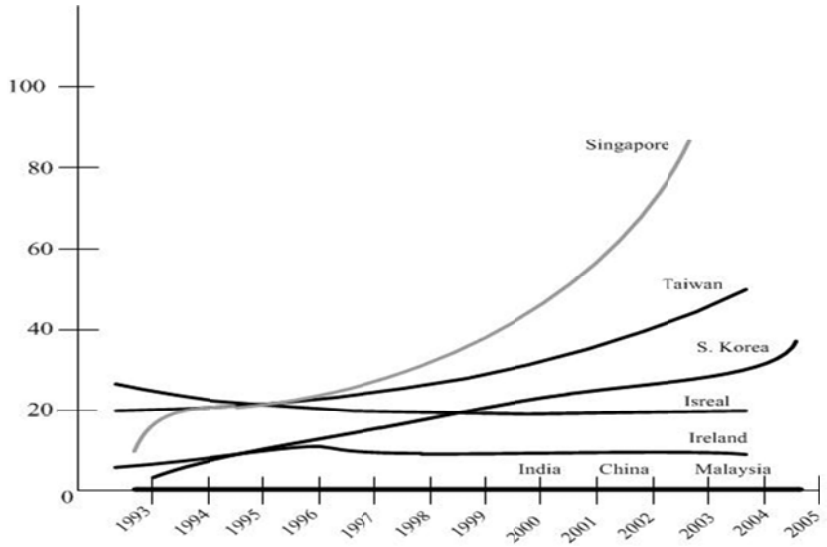

Figure 1. Projected Innovation Index for Emerging Economies, 1993-2005

The analysis suggested that a number of Asian economies, particularly Singapore, Taiwan and South Korea are developing innovative capacities by making substantial investments to upgrade innovative capacity. Beyond the Pacific Rim, both Israel and to a lesser extent Ireland seem to have built up innovation infrastructure towards strengthening their respective national innovation capacities. But what is significant to note is that several countries such as China, India and Malaysia that drew attention as potential economic powers did not invest rapidly as much as required to improve their innovative capacity across economic sectors to levels similar to OECD countries. Even by standards of absolute levels of innovative activity, India, China and Malaysia registered virtually no international patenting through the mid to late 1990s in sharp contrast to Taiwan and Israel. Though these three economies had increased their investments in areas related to innovation, they were at modest levels compared to historical innovator economies on a per capita basis. Therefore, the Council on Competitiveness (1996) concluded that each of these large but still developing countries was still an imitator, and not innovators.

In 2001, UNDP (2001) calculated Technology Achievement Index (TAI) for 72 countries based on (i) technology creation, (ii) diffusion of recent innovations, (iii) diffusion of old innovations, and (iv) human skills. The TAI varied from a highest of 0.744 for Finland to a lowest of 0.066. The second highest TAI was that of the USA (0.733). The TAI value of India was 0.201 and it ranked 63rd among the 72 countries of the world. Based on TAI, UNDP classified countries of the global economy into four different groups: (i) Leaders, (ii) Potential Leaders, (iii) Dynamic Adopters, and (iv) Marginalized countries. The classification of countries into the four groups is presented in Table 2. As given in the Table, India was classified as one of the dynamic adopters.

Table 2. Four Categories of Countries based on Technology Achievement Index

Leaders	**Potential Leaders**	**Dynamic Adopters**	**Marginalized**
Finland	Spain	Uruguay	Nicaragua
United States	Italy	South Africa	Pakistan
Sweden	Czech Republic	Thailand	Senegal
Japan	Hungary	Trinidad and Tobago	Ghana
Korea	Slovenia	Panama	Kenya
Netherlands	Hong Kong	Brazil	Nepal
United Kingdom	Slovakia	Philippines	Tanzania
Canada	Greece	China	Sudan
Australia	Portugal	Bolivia	Mozambique
Singapore	Bulgaria	Colombia	
Germany	Poland	Peru	
Norway	Malaysia	Jamaica	
Ireland	Croatia	Iran	
Belgium	Mexico	Tunisia	
New Zealand	Cyprus	Paraguay	
Austria	Argentina	Ecuador	
France	Romania	El Salvador	
Israel	Costa Rica	Dominican Republic	
	Chile	Syrian Arab Republic	
		Egypt	
		Algeria	
		Zimbabwe	
		Indonesia	
		Honduras	
		Sri Lanka	
		India	

Source: UNDP (2001)

Another important indicator of competitiveness and innovation capability is the Competitive Industrial Performance (CIP) index developed by UNIDO. Over the past few years, UNIDO has developed the CIP index to help assess national industrial performance in the global economy. This index aims to capture the ability of countries to produce and export manufactures competitively in a single, intuitively appealing measure. The CIP index combines four main dimensions of industrial competitiveness:

(i) Industrial capacity: Manufacturing value added (MVA) per capita.

(ii) Manufactured export capacity: Manufactured exports per capita.

(iii) Industrialization intensity: This intensity is measured by the simple average of two indicators: the share of manufacturing in GDP and the share of medium and high technology activities in MVA; and

(iv) Export quality: This is measured by the simple average of two indicators: the share of manufactured exports in total exports, and the share of medium and high technology products in total exports. The above four dimensions are given equal weight in the calculation of CIP index. Table 3 presents the changing CIP index values for some of the important Asian economies including India for 1985, 2000 and 2005. Though the CIP index of India improved considerably between 1985 and 2000, it declined marginally between 2000 and 2005. However the global rank of India only worsened from 50th in 1985 to 51st in 2000 and further to 54th in 2005.

Table 3. Competitive Industrial Performance Index of India and other Asian Economies

Rank			Country	CIP Index Value		
1985	**2000**	**2005**	**← Year →**	**1985**	**2000**	**2005**
6	1	1	Singapore	0.587	0.887	0.890
2	3	3	Japan	0.725	0.694	0.678
22	12	9	South Korea	0.247	0.528	0.575
30	19	17	Malaysia	0.116	0.509	0.474
43	26	25	Thailand	0.058	0.408	0.423
61	31	26	China	0.021	0.387	0.418
45	30	30	Philippines	0.044	0.388	0.391
65	38	42	Indonesia	0.012	0.301	0.282
36	43	43	Turkey	0.082	0.268	0.280
50	51	54	India	0.034	0.256	0.252

But the economic power and expectation about the innovation potential of India and China has been changing dramatically since then. According to the World Business (2007), with the emergence of Indian and China as economic powers in their own right, the shape of the global competitive landscape is changing. Accordingly, INSEAD and World Business have developed the Global Innovation Index (GII) for 107 countries (World Business, 2007). GII is a new model put forward to measure that examines the degree to which individual nations and regions are currently responding to the challenge of innovation.

As per the new measure, innovation is directly linked to a country's ability to adopt and benefit from leading technologies, increased human capacities, organizational and operational developments, and enhanced institutional performance. The GII aspires to bring together a number of complementary concepts aimed at providing a holistic framework for measuring innovation performance. Based on a 7 point scoring mechanism on various components and also normalized on a seven point scale to the country, the GII is developed. The GII ranking for 107 countries is given in Table 4. While the US with an index of 5.8 topped the list, Angola with an index of 1.53 is at the bottom whereas India with an index of 3.57 ranked 23rd among these countries. Overall, while the relative position of India may be debatable, it may not be far off the mark if we infer that the innovation status of India is on the rise in recent years.

Table 4. Global Innovation Index

Rank & Country	Score	Rank & Country	Score	Rank & Country	Score
1. USA	5.80	37. Mexico	2.88	73. Pakistan	2.24
2. Germany	4.89	38. South Africa	2.87	74. Egypt	2.24
3. UK	4.81	39. Portugal	2.86	75. Ukraine	2.24
4. Japan	4.48	40. Brazil	2.84	76. Morocco	2.23
5. France	4.32	41. Tunisia	2.84	77. Venezuela	2.22
6. Switzerland	4.16	42. Malta	2.82	78. Kenya	2.22
7. Singapore	4.10	43. Slovenia	2.81	79. Namibia	2.21
8. Canada	4.06	44. Barbados	2.79	80. Tanzania	2.14
9. Netherlands	3.99	45. Turkey	2.75	81. Bulgaria	2.12
10. Hong Kong	3.97	46. Cyprus	2.73	82. Moldova	2.11
11. Denmark	3.95	47. Lithuania	2.71	83. Algeria	2.11
12. Sweden	3.90	48. Indonesia	2.71	84. Burkina Faso	2.10
13. Finland	3.85	49. Greece	2.69	85. Mongolia	2.08
14. UAE	3.81	50. Latvia	2.67	86. Armenia	2.07
15. Belgium	3.77	51. Costa Rica	2.66	87. Macedonia	2.06
16. Luxembourg	3.72	52. Jamaica	2.63	88. Uganda	2.05
17. Australia	3.71	53. Jordan	2.61	89. Bosnia	2.05

Continue (Table 4. Global Innovation Index)

Rank & Country	Score	Rank & Country	Score	Rank & Country	Score
18. Israel	3.68	54. Russian Federation	2.60	90. Ecuador	2.03
19. South Korea	3.67	55. Croatia	2.59	91. Honduras	2.02
20. Iceland	3.66	56. Poland	2.53	92. Nicaragua	2.01
21. Ireland	3.66	57 Colombia	2.50	93. Georgia	2.00
22. Austria	3.64	58. El Salvador	2.49	94. Tajikistan	1.95
23. India	**3.57**	59. Panama	2.47	95. Cambodia	1.94
24. Italy	3.48	60. Mauritius	2.46	96. Cameroon	1.92
25. Norway	3.48	61. Kazakhstan	2.45	97. Guyana	1.84
26. Malaysia	3.47	62. Romania	2.44	98. Bangladesh	1.82
27. Spain	3.38	63. Argentina	2.41	99. Nepal	1.79
28. New Zealand	3.35	64. Azerbaijan	2.40	100. Albania	1.78
29. China	3.21	65. Vietnam	2.38	101. Kyrgyzstan	1.76
30. Kuwait	3.14	66. Philippines	2.38	102. Bolivia	1.72
31. Estonia	3.12	67. Uruguay	2.37	103. Mozambique	1.72
32. Czech Republic	3.10	68. Guatemala	2.36	104. Ethiopia	1.71
33. Chile	3.03	69. Peru	2.35	105. Lesotho	1.68
34. Thailand	3.01	70. Dominican Republic	2.29	106. Paraguay	1.66
35. Slovak Republic	2.97	71. Sri Lanka	2.27	107. Angola	1.53
36. Hungary	2.88	72. Nigeria	2.27		

Source: World Business (2007)

Yusuf and Nabeshima (2010) attribute the improving competitiveness ranking of India and China to emerging homegrown multinational corporations with the ambition to innovate. According to them, Chinese and Indian firms will begin exerting great pressure on the established firms from Japan, Korea, and Taiwan. Their ability to sustain their lead over competitors from China and India will depend upon the productivity of innovation systems and the agility of firms in developing and marketing new ideas. The improving global competitiveness of India may be attributed to, among others, growing innovation output over the period. An important globally referred yardstick of innovation capabilities of nations is their innovation output measured in terms of number of patents granted by the United States Patent and Trademark Office (USPTO). Though India is far behind that of Japan, Korea, Taiwan and even China in terms of patents granted by USPTO, there has been a more than two-fold increase in the number of patents obtained by India between 2000 and 2008 (Table 5). In fact, the number of patents obtained by China was marginally higher than that of India in 1992 as well as in 2000 but the gap widened in favor of China by 2008.

Table 5. Number of Patents granted by the USPTO

Country	1992	2000	2008
Japan	23151	32922	36679
Korea	586	3472	8731
Taiwan	1252	5806	7779
China	41	163	1874
India	**24**	**131**	**672**
Singapore	35	242	450
Malaysia	11	47	168
Thailand	2	30	40
Philippines	7	12	22
Indonesia	9	14	19

Source: The World Bank (2010)

More recently, however, due to the high economic growth rates achieved more or less on a consistent basis, China and India have been attracting more and more global attention. The rapid growth, diversity, and strategic importance of the emerging Chinese and Indian economies have fired the world's imagination both with hopes and fears for the future. In the context of changing institutions, demographics, and politics, Dobson (2010) paints a thoughtful and surprising picture of India and China as the economic powerhouses by the year 2030. According to Dobson (2010), India will come into its own, making major strides in modernizing its vast rural population, vanquishing illiteracy, and emerging as an innovative manufacturing powerhouse. However Dobson is not alone in assigning a premier position to India, along with China globally. The recent Global Manufacturing Competitiveness Index report presents a similar picture (Deloitte and Council on Competitiveness, USA 2010). This report is derived based on the responses of more than 400 senior manufacturing executives worldwide to a wide-ranging survey discussing the current business environment and global competitiveness in the manufacturing sector. The study also draws on select interviews with key manufacturing players as well as unique insights provided by the professionals at Deloitte, the Council on Competitiveness and Clemson University, USA. The Global Manufacturing Competitiveness Index and relative ranks of 26 countries for 2010 as well as anticipated competitiveness in the next five years, are presented in Table 6. While China accounted for the highest index score of 10 and occupied first rank, India accounted for the second highest index score of 8.15 and occupied the second rank among the 26 countries. The third rank is accounted by South Korea followed by the USA, Brazil, Japan and so on. What is significant to note is that though India is expected to continue to hold on to the second rank, its index score is expected to increase further and cross 9 out of 10.

Table 6. Current Competitiveness and Competitiveness in 5 Years

Current competitiveness			**Competitiveness in 5 years**	
Rank	**Index score***	**Country**	**Rank**	**Index score***
1	10.00	China	1	10.00
2	**8.15**	**India**	**2**	**9.01**
3	6.79	South Korea	3	6.53
4	5.84	USA	5	6.32
5	5.41	Brazil	4	5.38
6	5.11	Japan	7	4.84
7	4.84	Mexico	6	4.74
8	4.80	Germany	8	4.53
9	4.69	Singapore	11	4.52
10	4.49	Poland	9	4.35
11	4.38	Czech Republic	12	4.30
12	4.17	Thailand	10	3.95
13	4.11	Canada	13	3.71
14	3.07	Switzerland	18	3.47
15	3.07	Australia	15	3.40
16	2.90	Netherlands	17	2.63
17	2.82	UK	20	2.63
18	2.78	Ireland	21	2.62
19	2.67	Spain	16	2.52
20	2.58	Russia	14	2.51
21	2.42	Italy	22	2.43
22	2.28	South Africa	19	2.37
23	1.70	France	23	1.92
24	1.18	Belgium	26	1.53
25	1.03	Argentina	24	1.32
26	1.00	Saudi Arabia	25	1.00

10=High; 1=Low Source: Deloitte and CoC (2010)

The relevant question is what drives global manufacturing competitiveness? The various factors, which have been identified are grouped under ten broad factors and have been ranked in terms of importance in Table 7. Overall, the classic factors of production – labour, materials and energy – are the most important drivers of global manufacturing competitiveness, as defined by the senior manufacturing leaders who participated in the study. But it is important to note that there is a qualitative difference between the classic view of production and these findings. Labour is defined in terms of talented people – scientists, researchers, engineers and production workers – who drive manufacturing innovation and influence its overall competitiveness. Coupled with the cost and availability of materials and energy, the three drivers are the "foundations" of manufacturing competitiveness (Deloitte and CoC, 2010).

Table 7. Drivers of Global Manufacturing Competitiveness

Rank	Drivers	Driver score (High=10; Low=1)
1	Talent-drive innovation	9.22
2	Cost of labour & materials	7.67
3	Energy cost and policies	7.31
4	Economic, trade, financial and tax systems	7.26
5	Quality of physical infrastructure	7.15
6	Government investments in manufacturing & innovation	6.62
7	Legal and regulatory system	6.48
8	Supplier network	5.91
9	Local business dynamics	4.01
10	Quality and availability of healthcare	1.81

Source: Deloitte & CoC (2010)

While the growing innovation capabilities and increasing recognition for the innovation potential and innovation achievements of Indian economy are heartening, it is appropriate to look at some of the core macroeconomic variables which indicate India's external competitiveness and innovation capability. Let us look at two sets of macroeconomic variables: (i) Trends in the annual growth rates of India's total exports and the resultant trade balance; shares of manufactured exports in India's total exports and shares of India's total exports in total world exports, and (ii) Share of high-tech exports in manufactured exports of India vis-à-vis other leading economies. Table 8 presents the former whereas Table 9 comprises the latter.

India's annual growth rate of exports has improved significantly since 1990 but that has not enabled the country to achieve the much needed trade surplus (Table 8). Rather India has been perennially a trade deficit country. This is because India's import growth rate has always exceeded its export growth rate. The other important indicator is the proportion of manufactured exports in total exports. In the process of international trade growth of an economy, it should be able to shift from resource-based exports to manufactured exports. India has succeeded in increasing its manufactured exports as a share of its total exports from about one-half (50%) in 1975 to almost four-fifth (80%) in 2000 but thereafter the share of manufactured exports declined to reach about two-third in 2010. What is more significant is a country's share in total world exports. India's share in world exports was a meager 0.4% in 1980 and increased steadily to reach almost 1.8% by 2010. However this figure is much less than what China has achieved in the meantime. China's share in world exports reached about 10% in 2009 and it emerged as the largest exporter in the international market.

Table 8. Competitiveness of Indian Economy: Some Macroeconomic Indicators

Year	Annual Growth of Exports (%)	Balance of Trade (US$ million)	Share of Manufactured Exports in Total Exports (%)	India's Share in World Exports (%)
1975	1.62	-1415	51.86	0.5
1980	-5.69	-7381	55.83	0.4
1985	-12.96	-7162	58.50	0.5
1990	3.63	-5927	72.92	0.5
1995	17.43	-4880	75.43	0.6
2000	17.08	-5976	78.92	0.7
2005	19.36	-46075	71.97	1.1
2010	42.32	-98172	66.07	1.77

The other important indicator is the share of high-technology products in the total manufactured exports of a country. Though India's share more than doubled between 1990 and 2005, and increased further by 2010, the percentage share of high-technology products in India's total manufactured exports is much less compared to other leading Asian economies such as Japan, South Korea, Singapore, Thailand, Indonesia and even China (Table 9). Thus the relevant statistical figures indicate that India is far away from reaching the top of the world rankings. In this context, it is appropriate to examine what kind of policy support has been extended to industrial enterprises and entrepreneurship in India to promote technological innovations and competitiveness.

Table 9. High-tech Exports in Manufactured Exports

Country	**1990**	**2005**	**2010**
Australia	11.9	12.7	12
Sweden	13.3	16.7	14
Japan	23.8	22.5	18
USA	33.7	31.8	20
South Korea	17.8	32.2	29
Singapore	39.7	56.6	50
China	6.1	30.6	28
Thailand	20.7	26.6	24
Indonesia	1.2	16.3	11
India	2.4	4.9	7

5. India's Policy Initiatives to promote Innovation Capability

Till recently India did not have any policy emphasis on innovation capability building or innovation promotion. In order to promote competitive manufacturing industries, Government of India set up a National Manufacturing Competitiveness Council (NMCC) in September 2004. Among others, the NMCC has been formed to suggest various ways and means for enhancing the

competitiveness of manufacturing sector including identification of manufacturing sub-sectors which have the potential for global competitiveness (NMCC, 2006). To unleash the creative energies of Indian entrepreneurs, businessmen, scientists, engineers and other professionals and to create the right type of employment, the manufacturing operations will have to grow faster than other sectors. The share of manufacturing should be raised to 30 to 35 percent of the GDP by 2020. Towards achieving this objective, NMCC formulated a "National Strategy for Manufacturing" in 2006 which was intended to serve as a guideline for future work (NMCC, 2006).

Among the various strategies suggested for accelerating the growth and enhancing the competitiveness of Indian manufacturing, the National Strategy emphasized on the need to invest in innovations and technology. It recognized that innovation holds the key to increasing productivity, and productivity gains are the key to both economic growth and raising the standard of living. Increasing productivity is the key to maintaining competitiveness in manufacturing. Both major and incremental innovations improve the competitiveness of the manufacturing sector and the economy as a whole. Therefore, investing in innovations is one of the pre-requisites to attain global competitiveness (NMCC, 2006).

Accordingly, the National Strategy recommended, among other things, constitution of a special group to study the potential for manufacture and export of Advanced Technology Products. It called for establishing priorities for supporting advanced manufacturing technologies; and prototype development and design innovations. Further it suggested for a coordination mechanism on Manufacturing Research and Development and creation of Common Testing Centres and Centres of Manufacturing Technology Excellence. What is more important is that, on the lines of those existing in the USA, it recommended the establishment of technology parks (similar to The Stanford Research Park in Stanford University) around institutions of higher technological learning (NMCC, 2006). However on the implementation front, nothing substantial has emerged as a result of this National Strategy.

Another important development is the formation of draft National Innovation Act 2008 (DST, 2008). The preamble to the Draft Act presents three main objects. Firstly, to facilitate public, private or public-private partnership initiatives for building an innovation support system to encourage Innovation, secondly, to evolve a National Integrated Science and Technology Plan, and thirdly, to codify and consolidate the law of confidentiality in aid of protecting Confidential Information, trade secrets and Innovation. The government of India originally (in 2007) had taken a decision to draft a legislation to give fillip to research and innovation and position the country as a leader in the 21st century. The DST has thus attempted to frame an Act towards that end.

According to the Draft Act "innovation" means a process for incremental or significant technical advance or change, which provides enhancement of measurable economic value, and shall include: (a) introducing new or improved goods or services; (b) implementing new or improved operational processes; and (c) implementing new or improved organizational / managerial processes. Thus it comprises both technological and non-technological innovations. The main provisions of the Draft National Innovation Act 2008 include: (i) National Annual Integrated Science and Technology Plan; (ii) Measures for supporting Innovation; (iii) Private and Public-Private Partnership; (iv) Confidentiality Measures; and (v) Rules & Regulations. Of course, the Draft Act has not yet been passed and implemented.

A more recent development has been the introduction of *Science, Technology and Innovation Policy 2013*. The policy, at the outset, makes it clear that Science,

Technology and Innovation (STI) have emerged as the major drivers of national development globally. The policy proclaims that as India aspires to achieve faster, sustainable and inclusive growth, the Indian STI system needs to play a defining role in achieving these national goals. Given that India has declared 2010-20 as the "Decade of Innovation", the policy aims to bring fresh perspectives to bear on innovation in the Indian context (Ministry of Science and Technology, 2013).

The major objective of India's Science, Technology and Innovation Policy 2013 is to position India among the top five global scientific powers by 2020. Towards this objective, the policy aims, among others, at (i) establishing world class infrastructure for R&D for gaining global leadership in some select frontier areas of science, (ii) facilitating enhanced private sector participation in R&D, (iii) seeding S&T based high-risk innovations through new mechanisms, (iv) fostering resource-optimized, cost-effective innovations across size and technology domains, (v) triggering changes in the mindset and value systems to recognize, respect and reward performances which create wealth from S&T derived knowledge, and (vi) creating a robust national innovation system.

What kind of an impact this recently announced policy will make on the growth of innovation system and innovation contributions in the country will be known in the coming decades.But it is important to note that the wheels of India's entrepreneurial activity are just beginning to blossom. The international community has very high expectations from India in the decades to come and it is high time that India rise to the occasion and respond to the expectations of the international community appropriately by exploiting the innovation talent and innovation potential of its enterprises, entrepreneurs, and people at large.

6. Conclusions

The era of globalization since 1991 has been leading to increasing competitive environment among nations across the global economy. While the industrialized countries aim at strategizing how to sustain their competitiveness over other economies, the primary concern of industrializing countries is how to build up their competitiveness against other economies. Both have increasingly realized the imperative role of technological innovation in enhancing national competitiveness and therefore focusing on innovation capability building. In the process, the innovation capabilities of nations are undergoing transformations.

Among the global economies, India and China have been attracting increasing global attention due to their consistent and higher economic growth rates over the period. Accordingly their innovation capabilities have also seen considerable improvements, particularly in the last decade. From being branded as mere "imitators" in the late 1990s, they have come to occupy the top slots in the global manufacturing competitiveness table, thanks to substantial improvements in their capabilities of talent driven innovation.

While expectations about India's innovation capabilities and competitiveness are increasing, the economy as a whole has to go a long way, if it has to really emerge as one of the most competitive economies in the world in the coming decades. Towards that end, developing a national innovation system to facilitate firm level and regional level innovations involving industries and institutions should be given a top priority.

Accordingly, of late, India's Policy Makers have taken appropriate policy initiatives to promote innovations in manufacturing industries by means of a National Strategy for manufacturing in 2006 and Science, Technology and Innovation Policy in 2013. It is important to implement these policy initiatives in the right spirit at the earliest. To

conclude, global economy has a very high expectation from India and it is high time that we rise to the occasion to prove our worth in the global economy.

References

Ciemleja, G and N Lace. (2008). The factors determining innovation-based attitude of Latvian SMEs towards sustainability. Paper presented at *5th International Conference on Business and Management*, 16-17 May, Vilnius, Lithuania.

Council on Competitiveness. (1999). *The New Challenges to America's Prosperity: Findings from the Innovation Index*, Washington, DC.

Deloitte and Council on Competitiveness. (2010). *2010 Global Manufacturing Competitiveness Index*, Deloitte Touche Tohmatsu.

Dobson, W. (2009). *Gravity Shift: How Asia's New Economic Powerhouses will shape The 21st Century?* Hachette India, Gurgaon.

DST. (2008). *Draft National Innovation Act 2008*, Department of Science and Technology, Government of India, New Delhi.

Ministry of Science and Technology. (2013). *Science, Technology and Innovation Policy 2013*, Government of India, New Delhi.

NMCC. (2006). *National Strategy for Manufacturing*, National Manufacturing Competitiveness Council, Government of India, New Delhi.

OECD. (1994). *Globalization and Competitiveness: Relevant Indicators*, OECD Directorate for Science, Technology and Industry, Paris.

Scott, B and G Lodge. (1985). *US Competitiveness and the World Economy*, Harvard Business School, Boston.

Senor. D., and S. Singer. (2009). *Start-up Nation: The Story of Israel's Economic Miracle*, Twelve, Hachettte Book Group, New York.

Solow, R., M. (1987). Growth Theory and After. Nobel Prize Lecture, December 8, *http://nobelprize.org/nobel_prizes/economics/laureates/1987/solow-lecture.html.*
The Economist (2011): "Schumpeter: Think Different", August 6-12, p-53.

UNDP. (2001). *Human Development Report 2001*, Oxford University Press, New York.

UNDP. (2008). *Human Development Report 2008*, Oxford University Press, New York.

UNIDO. (2002). *Industrial Development Report 2002/2003*, Vienna, Austria.

UNIDO. (2009). *Industrial Development Report 2009*, Vienna, Austria.

World Business. (2007). *http://worldbusinesslive.com/search/article/625441/the-worlds-top-innovators/*

Yusuf, S., and K. Nabeshima. (2010). *Changing Industrial Geography in Asia*, The World Bank, Washington, DC.