

A Comparative Study of Indian Smartphone Manufacturing Ecosystem with Global Best Practices for Strategic Insights

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Abstract

In this study we provide an overview of ecosystem indices of successfully smartphone manufacturing countries like China, USA, Taiwan, and South Korea by comparing some key parameters with that of peer average. The main purpose of this research is to compare various key manufacturing statistical parameters of other countries with that of India. It also brings out the current state of manufacturing in India, the market potential and the institutional frameworks developed to create an ecosystem conducive for manufacturing to grow. A SWOT (strengths, weaknesses, opportunities and threats) analysis is performed across all countries and analyzed for working out the SWOT matrix in Indian context to help formulating the strategy.

Keywords: Ecosystem, Smartphone Manufacturing, SWOT

1. Introduction

Mobile handset in today's world has become one such device which we cannot live without having and it has evolved from being just a phone to a million other things. It is one device that serves as our email device, camera, games console, multimedia device, Twitter dashboard and our social network controller all fitted into single equipment. The situation is going to get even more difficult as the manufacturers to up their game continue to put more and more functions in to the device

As more and more players are moving into the mobile market mobile handsets are going to get cheaper and inexpensive. This will intern open opportunities for marketing and commerce in emerging markets as many consumers will have access to basic smartphone service like the internet. Meanwhile in established markets smartphones will mature more and will quickly shift the pattern for consumer media usage forcing the market to become more mobile centric. The number of smartphone users in the world today has exceeded the two billion mark in the year 2016 (emarketer, 2016) and India is also not far behind in this race. It is currently the third top most on the list of countries ranked by total number of smartphones users and it is believed that it will even leave United States behind by the end of year 2016 with over more than 200 million smartphone users. Since it is the one of

the fastest growing smartphone market it holds a great future and has many ongoing opportunities in this domain.

It has recorded a total shipment of over 103.6 million smartphones in the year 2015 which is an increase of 28.8 percent as compared to the previous year 2014, thus outperforming even China. (IDC, 2014). Also the narrowing of difference of price between feature phones and smartphone has increased the consistent growth in the demand. As more and more individuals are subscribing to wireless services, the demand for phones, especially smartphones has increased compared to even larger devices such as a laptop.

In this paper we demonstrate the current state of smartphone manufacturing in India, the market potential and the institutional frameworks developed to create an ecosystem helpful for the manufacturing to grow.

2. Global Manufacturing Scenario

The following parameters are indicative of high potential market conditions for successful smartphone manufacturing:

- **Low Smartphone penetration:** The smartphone penetration in India which is 10% leaves a vast potential for growth, makes India a great market for Smartphone production.

- **Presence of Multi-National Corporations (MNCs) and Original Equipment Manufacturers (OEMs):** India has about a hundred VLSI design companies with semiconductor design capabilities, which makes it a great centre for research and development.
- **Presence of Indian IT Companies:** The smartphones are mostly software driven and the cost of hardware is shrinking while that of software is increasing. Applications developed around the smartphones are pure software driven and is a rapidly growing ecosystem in India. The IT companies are rightly poised for investment in this process for enabling cost effective smartphone production.
- **Low-cost skilled labor force:** The Labor costs are among the lowest in the world till date in India. A large pool of talented scientists and researchers offer cost-efficient research and development. There is an abundant availability of engineers and English-speaking workforce in the services as well as manufacturing industry.

Table 1 shows the Smartphone manufacturing data statistics for the countries like China, USA, Taiwan, and South Korea which are explained in detail as shown below.

Table 1. Manufacturing Data Statistics (Source: Deloitte, 2013)

Statistics	China	USA	Taiwan	South Korea	Peer Average
Manufacturing GDP CAGR (2005-2010)	11.9%	0.5%	7.9%	6%	2.9%
Manufacturing GDP as %age of total GDP	32.4%	12.9%	27.1%	30.5%	18.3%
Labor Costs (US\$/hour) (2011)	2.8	35.4	9.2	17.6	21.9
Manufacturing exp %age of total exports	93.2%	64.3%	88.2%	85.3%	59.9%
Manufacturing Jobs created/100 persons	3.1	-3.1	N.A	-4.5	-0.8
Highest Corporate tax rate	25%	40%	17%	24.2%	26.2%
Researchers/ million population (2009-2013)	963	4,663	N.A	6286	2,980
Per capita income (US\$) (2012)	6,070	51,163	22,002	23,053	15,886

2.1 SWOT Analysis for China

China has emerged as the manufacturing backbone of the world in almost every sector. As of 2012, China produced a staggering 1.18 billion mobile phones, which accounts for more than 50% of all the handsets sold worldwide and this number is increasing every year. As per reports of Ministry of Industry and Information Technology (MIIT), more than \$1.13 trillion pooled into the domestic electronics manufacturing sector of China.

OEMs established at different parts of the world, depend on China for electronic components. Approximately, 75-80 % of global handsets are sourced from China. If China has grown to this size and scale, it is primarily due to the efforts of the government which supported the industry through a series of both fiscal and non-fiscal incentives and initiatives. Under the country's 12th Five-Year Plan favorable policy actions also helped China for future competitiveness to maintain its top ranking. This plan includes the establishment of policies in technology innovation, infrastructure, work force development, health, safety and substantiality (Deloitte, 2013). Hence, despite the recent slowdown, many favorable policy initiatives that were supported with investments in key strategic industries have helped China to maintain its strength in the manufacturing industry.

The SWOT matrix of is given in Figure 1

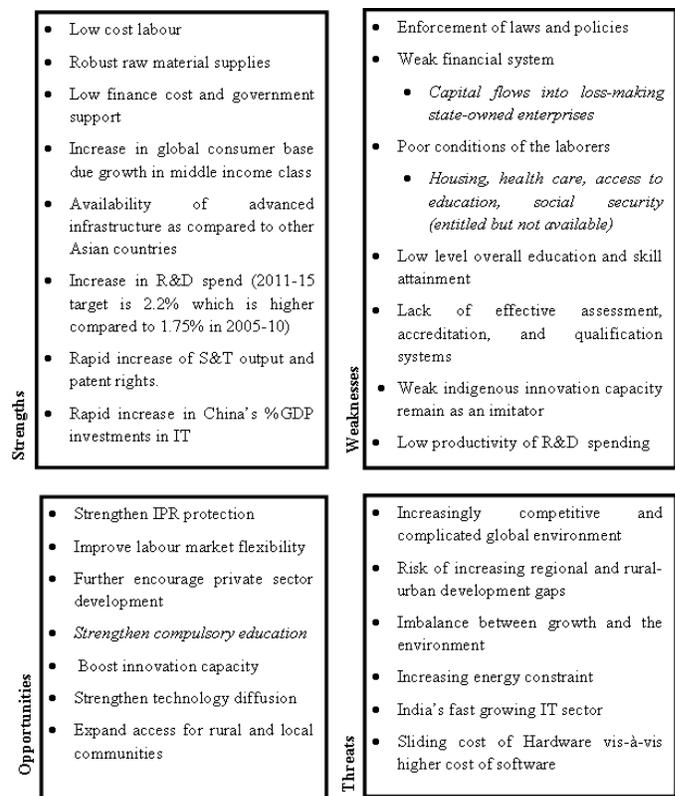


Figure 1. Strengths and Weaknesses of Smartphone manufacturing in China.

2.2 SWOT Analysis for United States

The United States is the third most competitive manufacturing nation as per the Global Manufacturing Competitive Index Report by Deloitte 2013. While there are several advantages for manufacturing in the US, a few weaknesses that may become threats in the near future can hinder with the growth of the country's economy. Some of the factors that improved US appeal as a manufacturing destination include physical infrastructure, talent driven innovation, strong legal, and established supplier network. Apart from this, laws of intellectual property protection and technological transfer, integration and adoption have undoubtedly been a valuable asset in attracting MNC's to enhance the growth of the country as a manufacturing hub (Deloitte, 2013).

Despite all these attractive incentives an increasing sense of uncertainty has started to plague much of the U.S regulatory system. CEOs and senior executives participating in 2013 GMCI survey almost concerted expressed concern over the consequences of uncertainty. In a nutshell, factors like regulatory disadvantages and policy along with corporate tax, high labor, sluggish GDP growth rate and unemployment rates have projected a fifth place for U.S in the list of competitive manufacturing nations (Deloitte, 2013).

The SWOT matrix of is given in Figure 2

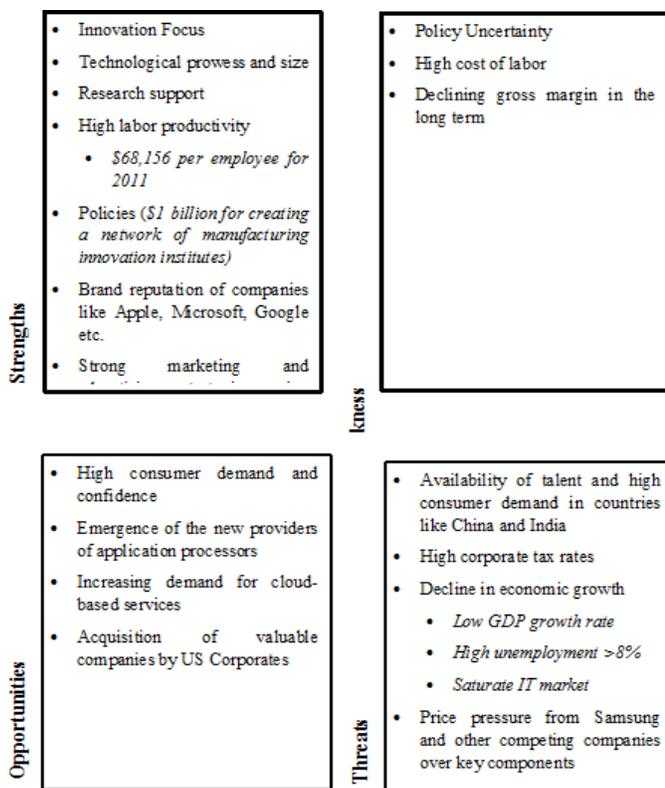


Figure 2. Strengths and Weaknesses of Smartphone manufacturing in USA.

2.3 SWOT Analysis for Taiwan

Handset manufacturers in Taiwan started with contract manufacturing and finally established themselves as OEM (original equipment manufacturer). Many firms from Taiwan are going into brand manufacturing such as HTC, ACER and ASUS. This has led to a considerable increase in the R&D facilities of Taiwan mobile industry. In 2012, the performances of Taiwan's own handset manufacturers decreased due to patent litigation and shortage of key components while the manufacturers were affected by the poor sales performance.

Taiwan is proliferating as a handset manufacturer mainly due to the government incentives and schemes such as tax rebates. "Statue for upgrading industries" was one of the major steps taken to promote handset manufacturing. Certain companies were categorized as upgrade industries and they were awarded with a sales tax rebate of 20% of invested amount over the next 5 years (Deloitte, 2013). High economic freedom, emphasis on Infrastructure development and some government initiatives such as Taiwan's free trade zone are some of the important factors contributing to handset manufacturing in Taiwan. The corporate tax in Taiwan is 17 percent and the investment in education by the government is 18 percent, which is greater than other Asian countries. ITRI (Industrial technology research institute) is the largest applied technology R&D institute in Taiwan. With all such strategies and policies, Taiwan is playing an important role in handset manufacturing ecosystem and as a supply chain partner for many other countries (Deloitte, 2013).

The SWOT matrix of is given in Figure 3

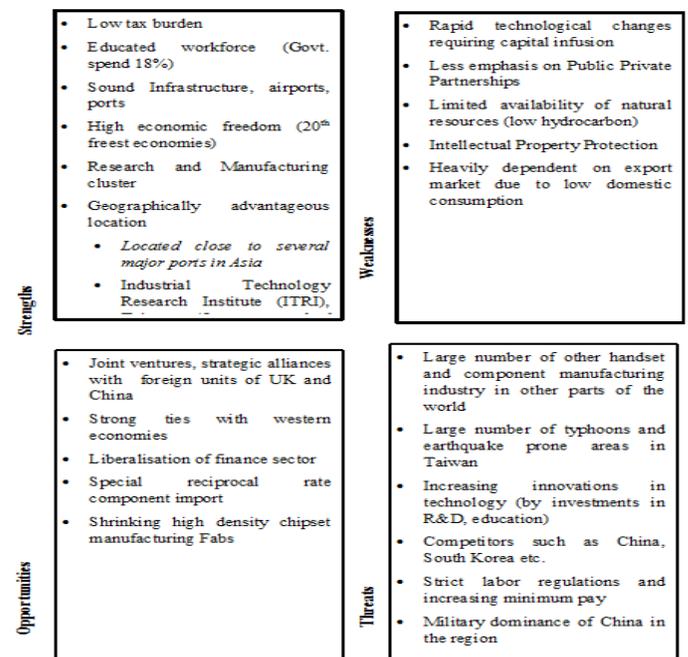


Figure 3. Strengths and Weaknesses of Smartphone manufacturing in Taiwan.

2.4 SWOT Analysis for South Korea

South Korea in terms of current manufacturing was ranked as the fifth most competitive nation by the 2013 GMCI survey. Competitive costs and better quality were the major factors that have contributed to the emergence of handset manufacturing in South Korea. In US, the average manufacturing wages per hour is \$33.4, which is almost double of that in the South Korea. The country has a good number of free trade agreements in force. Samsung is a leading South Korean manufacturer and now ranks among the top manufacturers of Smartphone. It is considered as one of the best in terms of design features and technology.

South Korea has invested a lot in research and development and for innovation in ICT sector it is currently top ranked country. Japanese favors South Korean components over Chinese components. Well-educated workforce and favorable industrial policies are some of its major strengths. However, bureaucratic complexities of licensing, approval requirements and registration are major disadvantages to South Korean handset manufacturing. During last economic declines and slowing global economy, there were difficulties in conducting business in South Korea (Deloitte, 2013).

The SWOT matrix of is given in Figure 4

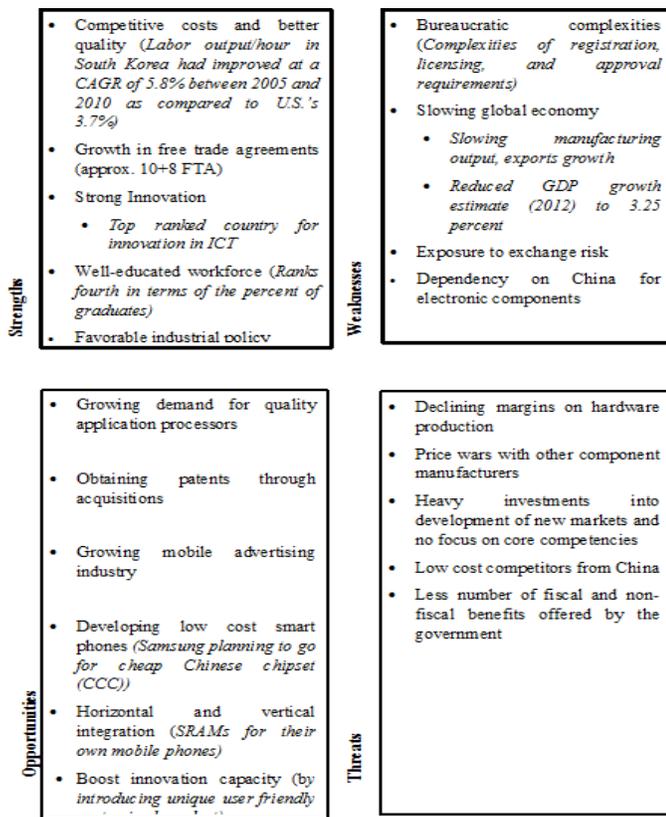


Figure 4. SWOT of Smartphone manufacturing in South Korea.

2.5 Synthetic Learning

Among all the countries analyzed, China has emerged as world's most competitive manufacturing nation. Manufacturing GDP growth rate of China is 11.9% which is much higher than the world average of 2.9% during 2005-2010. It has been consistently observed that China's labour and material cost advantage, high expert oriented manufacturing, strong government investment and innovative approach to manufacturing are its key strengths and this makes China favorable market for smartphone manufacturing. But, researchers per million populations are lowest as compared to world's average and even lowest among all the countries analyzed. This shows that the country has weak indigenous innovation capacity and remains as an imitator or adaptor of technologies. United States is the third most competitive manufacturing nation due to its core competency for talent-driven innovation. While the Apple products, including their components mostly, are manufactured in China, The US economy gets the primary benefits as Apple keeps software development, product management, marketing functions, product designs in U.S. Thus, China's economy gets only 15% of the revenue share whereas U.S. gets 85% of the revenue share of Apple product due to its consistent focus on innovation. If China boost innovation capacity and strengthen its IPR protection, strengthens its financial support for innovation, it can become major competitor to USA.

Taiwan has large semiconductor and electronics industry and has evolved as one of the largest chip fabrication country in the world.. But, intellectual property protection in Taiwan remains a challenge despite being removed from the watch list of the United States Trade Representative. If IPR policies are made favorable most of the countries can outsource chip manufacturing to Taiwan where maximum fabrication can be done. Establishment of ITRI (Industrial Technology Research Institute) was a step towards industrial transformation and innovation to create economic growth in Taiwan. Similarly, South Korea spending on education is highest amongst OECD countries. Higher the spending in education, more prosperous will be the nation in terms of manufacturing and this in turn will enhance the economic growth.

2.6 Current Scenario of Indian Smartphone Market

Smartphone sales in India increased by 166.8% making it the world's fastest growing Smartphone market in the last quarter of 2013, according to Gartner. It also revealed that worldwide, Smartphone sales in 2013 account for 53.6% of overall mobile phone sales, exceeding annual sales of feature phones for the first time. The top five foreign countries smartphone shipments and market share, 2013 and 2017 (units in million) vis-à-vis India are brought out in Table 2.

Table 2. Comparative Analysis of Smartphone Shipments and Market Share (Source: IDC,2012)

Country*	2013 Unit Shipments	2013 Market Share	2017 Unit Shipments	2017 Market Share	2017/2013 Growth
China	301.2	32.8%	457.9	30.2%	52.0%
USA	137.5	15.0%	183.0	12.1%	33.1%
UK	35.5	3.9%	47.5	3.1%	33.8%
Japan	35.2	3.8%	37.7	2.5%	7.1%
Brazil	28.9	3.1%	66.3	4.4%	129.4%
India	27.8	3.0%	155.6	10.3%	459.7%
Others	352.5	38.4	568.1	37.5%	61.2%
Total	918.6	100.00%	1516.1	100.00%	65.0%

In the competitive Indian market, Samsung, featured with its android operating system, has captured 27% of market share by the end of Q4, 2015. Local manufacturers like Micromax and Lenovo group are runner-ups with occupancy of 14% and 12% of market share, respectively. The smartphone market share of the companies, manufacturing in India, with disregard to their local value addition, is brought out in Figure 5.

2.7 Comparative Study of Smartphone Manufacturing Practices

In this section a comparative study is carried out on Smartphone manufacturing market in India with that of China, US, South Korea and Taiwan. Further, analysis is done with the help of SWOT analysis to identify the strategies India need to develop.

India as a global manufacturing destination has not been solidified yet. The country has dropped two spots from second

to fourth in 2013 GMCI ranking. In order to regain its former position, India has to focus on education and product-oriented research to appeal itself as a global manufacturing destination. India's economic development is relied on a low cost and limited pool of skilled labor rather than an abundant supply of semi-skilled and semiliterate labor. This means that India is specialized in ICT services rather than in manufacturing model whereas other economies such as China, Taiwan, South Korea, relied on manufacturing which is providing more jobs to the poor population of country. Taxation is always in the upper range of 30-31 % for Telecomm products in India, which is generally higher than other countries like China, USA, Taiwan, and South Korea. Also, import duties on components are high and for same feature, components are much cheaper in other countries. Present taxation structure in telecom sector needs to be made simpler by rationalizing taxation so as to make industry investor or customer friendly.

Table 3. Manufacturing Data Statistics (Source: Deloitte, 2013)

Data Analysis: Key Statistics	China	United States	Taiwan	South Korea	India
Manufacturing GDP CAGR (2005-10)	11.9%	0.5%	7.9%	6%	8.5%
Foreign Direct Investment (FDI) (USD Million)	40300	68145	N.A.	3802.25	2908
Labour Costs (US\$/hour) (2011)	2.8	35.4	9.2	17.7	0.9
Primary Energy Production (Quadrillion Btu)	97.83	79.13	0.48	1.58	16.05
Corporate tax rate	27%	40%	20%	25%	33.61%
Researchers/million population	1071	4,663	N.A.	6286	136
Expenditure on R&D per capita (US\$ PPP)	217.69	1275.64	812.69	1111.12	29.07
Expenditure on R&D as % of GDP (PPP)	1.97	2.7	2.3	3.74	0.9
VAT	17%	11.7%	5%	10%	13.5%
Other Taxes			Trade Promotion Fee: 0.04%	*MFN Duty Rate: 8% *MFN-Most Favored Nation	Landing Charges: 1% Countervailing Duty: 12%+4% = 16% Cess:3%

Telecom products require robust raw material supplies, thus managing a flexible and scalable supply chain is necessary to ensure seamless flow of products. High economic growth of India provides a vast domestic market for manufacturers. A sea of opportunities can open up within the great domestic market and India should focus on tapping potentials lying within the large and growing domestic market.

3. Comparative Analysis

3.1 India and China

The comparison of key statistical parameters of China and India is tabulated in Table 3.

3.1.1 Analysis

The analysis of this statistical data between China and India can be summarized as follows:

- China has high capital which is 93.2% of total exports in manufacturing exports whereas in India it is just 50.3%. China plans to invest U.S. \$600 billion in smart grids.
- Income tax incentives are provided by the Chinese Government for venture capital firms that invest in unlisted new and high technology enterprises, whereas India has set a target of \$1 trillion investment in infrastructure over the next 5 years (2012-17).
- Compulsory licensing for local manufacturing in China but no such policy in India.
- In China locally manufactured phones has VAT of 6% and 17% VAT on the imported phones, whereas in India the latter has a VAT of 13.5%.
- Expenditure on R&D per capita and percentage of GDP are very low in India as compared to China. The dependence of these factors can be taken vice versa also.
- Low primary energy production in India results in high utility cost required for the setup of the manufacturing units.
- However, India has ambitious manufacturing policy which offers, faster permits lower taxes and easier labor laws. It is expected to boost the manufacturing to 25% and add 100 million jobs in manufacturing by 2022 (Deloitte, 2013). The government policies off late has been very supportive for electronic manufacturing and system design.

3.2 India and the United States

The comparison of key statistical parameters of USA and India is tabulated in Table 3.

3.2.1 Analysis

The interpretation of the statistical comparison is as follows:

- In technology innovation United States stand among the top countries in terms of patents awarded and 20% of research in universities is funded through the National Science Foundation, whereas in India, expenditure on R&D per capita i.e. 29.07 US\$ PPP and as percentage of GDP that is 0.9 PPP, investment in research is very less. Therefore, the scope for innovation in India is very less as compared to United States.
- Corporate Tax Rate in India is less than US, whereas US has one of the highest taxes across the globe. But again the increased VAT in India and other taxes levied by the Indian government counterbalances the effect.
- One more advantage India has over US is the low labour cost that is 0.9 US\$/hour whereas in US it is 35.4 US\$/hour. But India lacks infrastructure required for the setup of the manufacturing units.

3.3 India and Taiwan

The comparison of key statistical parameters of Taiwan and India is tabulated in table 3.

3.3.1 Analysis

The analysis of the comparison of statistical parameters are as follows:

- In Taiwan, 88.2% of the total exports account for manufacturing exports whereas in India, it is 50.3% (Deloitte 2013). The production is export oriented
- Taiwan has a low corporate tax of 20% as compared, whereas in India it is 33.61%. Advantage of low corporate tax encourages companies to take risk and try out new production processes and techniques.
- As India has various other taxes imposed on goods and services such as Landing Charges, Countervailing Duty, Cess Tax, etc. it discourages local producers to import materials essential for production, several taxes imposed on local manufacturers (varies with state) and has forced them to import raw materials. This in turn causes rise in the price of product, due to increased bill of material (BOM). Taiwan, on the other hand does not have these high local taxes.
- India has a benefit of low labour cost where the rate is as low as \$0.9/hr. as compared to Taiwan that is \$9.2/hr. Not only this in India a large number of skilled engineers we contribute greatly to research and development.
- In Taiwan, per capita expenditure on R&D is \$812.69 PPP whereas India on the other hand has a per capita expenditure as low as \$29.07 PPP. Although India invests more in R&D as compared to Taiwan but due to high population of 1.27 billion (compared to Taiwan which is 23.4 million) per

capita expenditure is reduced in India. As a result of this, innovation is hardly achieved due to sub-critical funding and distribution of funds amongst various research groups.

- India has high value added tax (VAT) of 13.5% as compared to Taiwan that is 5%. This tax is levied on the value added to the material, during the process of manufacturing, and the mobile vendors, along with the consumers bear this cost. The mobile manufacturers obtain various materials for the process of assembling and hence have to pay VAT for such items. This causes a rise in the bill of material (BOM) of the Smartphone. Also, the end consumers have to pay VAT for Smartphone, which increases the cost of a Smartphone, resulting into a decline in demand.

3.4 India and South Korea

The comparison of key statistical parameters of Korea and India is tabulated in table 3.

3.4.1 Analysis

The comparison of the statistical data between Korea and India throws up the following conclusions:

- 85.3% of South Korea's total exports are from manufacturing sectors whereas in India it is 50.3% (Deloitte 2013). This means that South Korea has a well-developed and sound manufacturing sector, compared to its other sectors. As a result of this, its key player Samsung is world leader in the Smartphone market (Deloitte 2013).
- South Korea gets Foreign Direct Investment as high as \$3.8 billion whereas India has a FDI of \$2.9 billion. So it is observed that South Korea has FDI which is 1.3 times that of India. This means a greater emphasis is given to foreign players to invest in the countries that have manufacturing and service industries.
- South Korea has a corporate tax of 25% against India's 33.61%.
- India has lower labour rates compared to South Korea. As a result, India holds great opportunities in labour intensive manufacturing processes, as compared to that of South Korea.
- South Korea spends more in R&D.
- It has a per capita expenditure of US \$1111.12 PPP as compared to India's US \$20.07 PPP.
- South Korea has more researchers per million of its population, with the figure standing at 6286 versus India's 136. South Korea has well established research and development centers, fostering innovation & technology as well as a good number of higher-education technological institutes and large network of research laboratories.
- VAT is low in South Korea whereas in India taxes like Cess Tax, Countervailing Duty etc. leads to a rise in the cost of

Smartphone that causes poor demands. Hence, it is essential to have a favorable institutional & policy environment to support Smartphone manufacturing.

4. SWOT Analysis for India

Based on the analysis undertaken with different global smartphone manufacturing countries, the SWOT matrix has been developed with special regards to the ecosystem and analysis of each element of the matrix is undertaken thereafter.

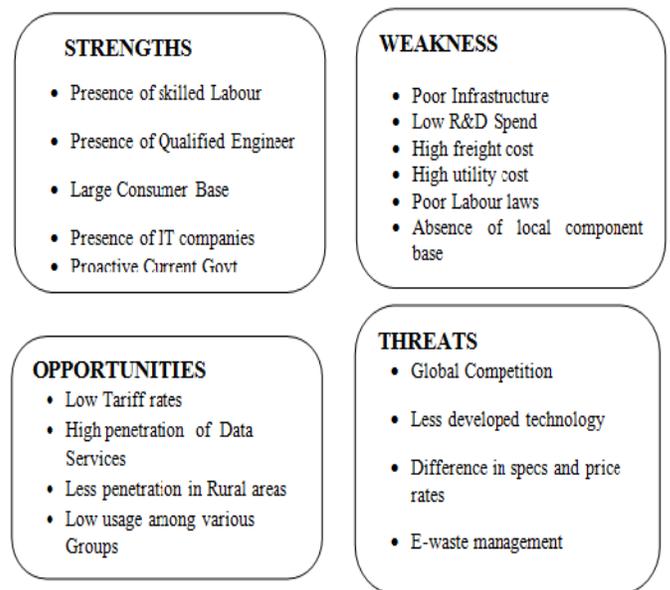


Figure 5. SWOT Matrix for Indian Smartphone Manufacturing Ecosystem.

4.1 Strengths

India's younger population is also adaptive to try out new technology that comes bundled with every generation smart phones.

1. Presence of Skilled Labour: India scores high after Singapore and USA in the category of skilled labour (KPMG, 2011). Labour is one of the essential factors required for Smartphone manufacturing as well as it also attracts other Smartphone manufacturers to India. Although many processes are automated, the large volume of product requires skilled labour for final assembly and testing of each price for its performance parameters.

2. Presence of Qualified Engineers: Engineers are needed on design of higher-end production process in any Smartphone manufacturing as they have the innovative capabilities of generating newer application which can point to niche areas that are extremely necessary for Smartphone manufacturing companies. Hence presence of qualified engineers is the greatest strength for India.

3. Large Consumer Base: In India the large customer base attracts various Smartphone manufacturing companies. The local customer base is a source of high profit as well as establishment of production houses also reduce costs and lead to greater profit margins.

4. Presence of IT companies: India has a large number of contract R&D providers who provide services such as chip design, software, signal processing and operating systems. Also, the presence of Indian IT companies is of great advantage for companies currently manufacturing in India which is able to provide cheap IT solutions to the manufacturers. Infosys, an India-based IT company has greatly influenced the manufacturing process in India. Tata Consultancy Services (TCS) is another such Indian firm.

4.2 Weakness

1. Poor infrastructure: The key impediment to handset manufacturing in India is the high cost of infrastructure services. The world has far better physical infrastructure than India. So, comparatively India lags behind other countries, which is clearly a weakness. This needs to be tackled through Public private partnership and encouraging FDI.

2. Government Policies: Government Policies which levy heavy taxes on import in India, for example, importing a US \$5 battery from Hong Kong the cost increases by US \$1.51(duty costs), whereas if the same is to be imported to the US there would be no change in price due to absence of duty costs. Manufacturer friendly policies need to be developed that boosts local value addition right from design to dispatch.

3. High freight cost: China invests 2.5% of its GDP on roads as compared to 0.3% in India (KPMG, 2011). This results in higher freight costs in India. For example the freight as a per cent of CIF import cost in India is 11%, as compared to world average of 6% (KPMG, 2011). Procedural bottlenecks in imports are also significant obstacles. While processing of imported goods in China takes 2-3 days, while the average time taken in India is about 10 days.

4. High Utility cost: It is also an obstacle to the manufacturing process in India. Peak electricity shortfall in India was 12.1% in 2003 (Deloitte, 2013) and Cost of power to industrial consumers is at least twice as expensive in India as in China. Due to frequent outages, most units in India choose to install captive units in addition to grid supply resulting in higher cost of power.

5. Labour Laws: It is widely cited bottleneck in the Indian manufacturing business case. Flexibility in labour laws, such as hiring contract labour, is critical in electronics components manufacturing, which are cyclical industries. It is thus not surprising that the World Economic Forum (WEF) ranked in India is 98th among 102 countries in terms of labour reforms while China ranked 26th (KPMG, 2011). This acts as a different to the genuine

manufacturers to set up manufacturing facility and needs to be amended.

6. Absence of local component base: Though today most of the Smartphone companies are able to import the raw material used in its manufacturing the absence of local component base can still be considered as one of the weakness in India. Having a local component base will create an environment of innovation and spin up support industries and start-ups required for technology companies.

4.3 Opportunities

1. Low tariff rates: By increasing competition amongst the telecommunication service providers the tariff rates are one of the lowest in the world which has increased the telecom penetration in urban and rural areas. Therefore the consumer has the appetite for adopting smartphone and higher data consumption. This will lead to increased sell of smartphones and hence will attract smartphone manufacturing companies to India.

2. Less penetration of Data services: The Smartphone mainly fits in when it is required to have streamlined internet connectivity, apps to attract customers, apps to address niche consumer needs so that customer can utilize Smartphone to a full extent. Hence India needs to focus more on technologies and APP development.

3. Less penetration in rural areas: There is negligible usage of Smartphone in rural India as it does not fulfil the needs of rural persons and therefore has an untapped potential. India needs to conduct surveys and hence forth identify what rural Indian needs. This needs to overcome with the help of more research and development so that it can be a positive source to attract Smartphone manufacturing companies to India.

4. Low usage among various groups: In India the age group where most of the Smartphone penetration exists is less. India need to look at the problems faced by other age groups in order to promote Smartphone sells in the country. This will depend on development of applications focused to various age profiles and their needs i.e., the need of child is different to adolescent and for that of old age.

5. Advantages to Manufacturers

- **High economic growth:** A vast domestic market for Smartphone manufacturers is provided by India. To grab this opportunity, plants in India have been set up by global Smartphone manufacturers, by introducing and using the latest technology thus competing with the local Smartphone manufacturers.
- **Ambitious national manufacturing policy:** This policy was approved in 2011, and plays a vital role in building industrial enclaves that offer lower taxes, easier labour laws and immediate permits. The market share of manufacturing is anticipated to improve from 16 % of GDP in 2009 to 25 %

by 2022. (Deloitte, 2013). The present government is very aggressive for manufacturing with focused Make-in-India mission.

- **Planning for huge investments in infrastructure:** A target of \$1 trillion investment in infrastructure over the next 5 years (2012-17) has been envisaged, which is a huge investment in infrastructure (Deloitte, 2013).

4.4 Threats

1. Global Competition: The main threat to Smartphone manufacturing industry development in India is from the external world. As pointed out earlier every country that has Smartphone manufacturing base has huge investments in research and development, freight etc. They have a good supplier chain network. Their geographical locations are suitable from trade prospective and are much developed in terms of infrastructure. Hence this is a serious threat to Indian economy in terms of Smartphone manufacturing.

2. Less developed technology: The technology such as 3G and 4G are not very much in use in India while many developed countries are aggressively working on 5G technology. Not much effort or resource is channelized in India for R&D in emerging economy. This leads to a least usage to Smartphone's in India because most of the applications operate on internet facility. The tariff of 3G and 4G are not affordable to Indian population which is also a real problem.

3. Difference in specs and price rates: The Indian local manufactures are selling their Smartphone at half price as compared to the foreign companies with same specs. This builds a problem for Smartphone making OEMs to find a suitable market in India.

4. E-waste management: India is currently importing about 1 Billion of Smart phones/year. The average life of a Smartphone is expected to be 21 months (Media, 2014). Hence discarded Smartphone waste will be huge in the country. So it is necessary for India to find a suitable disposable method in coming time.

5. Conclusion

In this study, strengths, weaknesses, opportunities and threats for various smartphone manufacturing ecosystems across globe have been identified. SWOT analysis has also been conducted. Comparative study of the five countries i.e. China, USA, Taiwan, and South Korea will help India to analyze and determine different strategic areas. These countries have strong manufacturing-base and are key markets for smartphone manufacturing. Major strengths of five countries are increase in R&D expenditures, increase in number of middle class consumers whereas major weaknesses are low productivity of R&D spending, rapid technological changes, slowing economic growth, etc. Strong ties with western economies, joint ventures, and boost in innovation

capacity are some of the major opportunities that each country is facing. International competition in terms of innovation, price wars with component manufacturers are acting as threats in introduction of a new handset in these five countries.

India can focus on weaknesses of these countries being potential competitors and transform them into India's opportunities. This will boost country's competitive advantage and help maintain its position as a strong contender on the global manufacturing front. The weaknesses should be eliminated, opportunities should be grabbed in time and threats should be handled with technical and economic resources and conviction. There is a need to look into variables for inhibitors and critical success factors to improve our Smartphone manufacturing ecosystem.

6. References

1. Allen SR, Wince-Smith DL, Echevarria J. Global Manufacturing Competitive Index Council on Competitiveness. 2013. Available from: http://www.compete.org/ncf/Council_GMCI_2012.pdf (accessed on 10th December, 2015).
2. Anwar ST. NTT DoCoMo and M-Commerce: A Case Study in Market Expansion and Global Strategy (PDF). Thunderbird International Business Review. 2002; 44(1):139-64.
3. Annual report (2013-14), Department of Telecommunications Ministry of Communications & Information Technology Government of India, New Delhi, Available from: <http://www.dot.gov.in/reports-statistics/annual-report> (assessed on 5th December, 2015).
4. Cecere G, Battaglia RD, Corrocher N. Innovation and competition in the smartphone industry: Is there a dominant design? Telecommunication Policy. 2015; 39(4):162-75.
5. Comscore. Mobile future in focus: Key insights from 2011 and what they mean for the coming year. 2012. Available from: <http://www.iab.net/media/file/comScore%2B2012%2BMobile%2BFuture%2Bin%2BFocus.pdf>
6. Corporate Geography, Labour Condition and Environmental Standards in the Mobile Phone Manufacturing Industry in India. CIVIDEP, SOMO, Amsterdam, Netherland, Available from: www.somo.nl/publications-en/Publication_3218/at_download/fullfile (assessed on 5th December, 2015).
7. Dixit S, van Nee R, Ojampera T, Prasad R. Introduction to globalization of mobile and wireless communications: today and in 2020. Springer Science and Business Media. 2011; 1-8.
8. Gartner. Gartner reveals top predictions for IT organizations and users for 2012 and beyond. 2011. Available from: <http://www.gartner.com/newsroom/id/1862714>.
9. Chen H-C, Yu Y-W. Using a strategic approach to analysis the location selection for hightech firms in Taiwan. Management Research News. 2008; 31(4):228-44.
10. Hu J, Hsu Y. The more interactive, the more innovative? A case study of South Korean cellular phone manufacturers. Technovation. 2008; 28:75-87.

11. Li M, Reimers K. Innovation in China's information and communications technology industry: Bottom up or top down? *Chinese Manag Stud.* 2015; 9:27–37.
12. Sarda A, Gangapuram R, Arun Kumar V, Chetia B, Taneja S, Jayaraman R. Strategic Priorities for the Indian Telecom Industry in the Next Decade. Prabandham. *Indian Journal of Management.* 2013; 6(4).
13. Schwab K. The Global Competitiveness Report 2013–2014. 2013. Available from: <http://www10.iadb.org/intal/intalcdi/PE/2013/12834.pdf> (accessed on 05 November 2015)
14. Suh Y, Moon-Soo K. Dynamic change of manufacturing and service industries network in mobile ecosystems: The case of Korea. *Telematics and Informatics.* 2015; 32:613–28.
15. Tang L, Breznitz D, Murphree M. Structured uncertainty : a pilot study on innovation in China's mobile phone handset industry. *J Technol Transf.* 2015. Doi:10.1007/s10961-015-9432-9.
16. Tokunga T. Japanese Smartphone Manufacturing And Strategic Agility. University of Southern California Marshall School of Business, United States. 2013.
17. Gartner.com World wide smartphone sales. Available from: <http://www.gartner.com/it/page.jsp?id=910112>
18. Available from: http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Manufacturing/gx_2013%20Global%20Manufacturing%20Competitiveness%20Index_11_15_12.pdf
19. Available from: <http://www.idc.com/research/Predictions14/index.jsp;jsessionid=766DC982382196704921A6CE4A773EAA>
20. Available from: <http://www.kpmg.com/DE/de/Documents/m-powering-India-Telecom-2011-2012-KPMG.pdf>

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