https://doi.org/10.36375/prepare_u.iei.a201

Contribution of Engineers in reaching $5trilion Economy

Vinayak Hegde

Balance of Plant Department
(Adani Power Mundra Ltd)
(Vil. Tunda and Siracha, Kutch, Gujarat- 370435)

{email: vinayak.hegde@adani.com}

Abstract

Contribution of engineers in creating the nation's GDP is key to the technology centric activities of all sectors of economy in rapidly changing world economic scenarios. The VUCA world situations in the recent conditions created by onslaught of pandemic has made the this aspect more significant. Indian economy is no exception to this as economy is growing at a rapid pace with the policy impetus to the economic environment as envisioned by the government. Actualization of the policies into the real world economic scenarios to achieve the targeted results through the engineering skills and technological efforts are entrusted to the engineers of the nation. The opportunities available for contribution by the engineers in the three main sectors of the economy in the current economic environment is discussed in this paper. Engineering innovation to the existing practices and technological up gradation potential in the identified sectors are enormous for bringing the Gross Value Addition in the short period of time ahead. The present work identifies key drivers for GDP growth, includes critical analysis of sector wise financial investments that have impact on value addition and introduces scope on possible technological developmental strategies further implementation.

Keywords - Productivity; innovation; technology.

INTRODUCTION

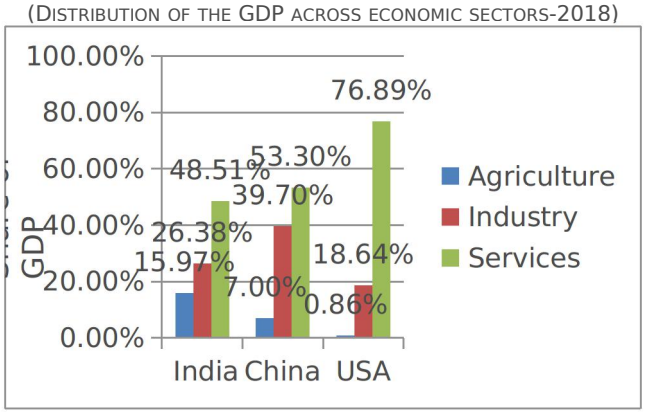
India has set a ambitious goal to become USD 5 Trillion economy by the end of FY2025 and envisioned to become third largest economy in the world. The Government has several ongoing initiatives across sectors focused on growth and the role of Engineers in achieving these initiatives is significant and challenging after the lockdown imposed halted economic activities to prevent the spread of COVID-19. A faster rate of growth is required to be achieved after relaxation of restrictions imposed in lock downs to overcome the losses happened in output during previous two years. According to the recent trends to achieve the set targets, Engineers as nation builders must contribute as catalysts to initiate the basis for loss compensated faster growth during this year only. This can happen in the identified economic sectors by connecting growth aspirations with the skills of the engineers and by the development of improved technologies and further use them as fulcrum to leapfrog.

CONNECT GROWTH ASPIRATIONS WITH ENGINEERING SKILLS AND TECHNOLOGY

The focus on growth aspirations laid by economic policies in three broad segments of the economy- Agriculture and its related activities, Manufacturing in Industries and the Services need impetus by efforts of engineering skills in the forms of innovations and technological improvements in the existing practices. The typical compositions of the three sectors characterizing the economies in varying degrees for three countries is provided in Chart-1 which indicates dominance of service sector in large GDP nations.

CHART 1

(DISTRIBUTION OF THE GDP ACROSS ECONOMIC SECTORS-2018)



Service sector itself involves gross value additions done by core innovation and technological activities and it is the key for economic growth. Technological Innovation

https://doi.org/10.36375/prepare_u.iei.a201

comes with the core feature of productivity growth which is "doing more with less". Growth in productivity improves the citizens' standard of living as greater number of services and products are generated by less production inputs compared to inputs required in the past. Activities done with productivity obviously bring greater value additions within a short time.

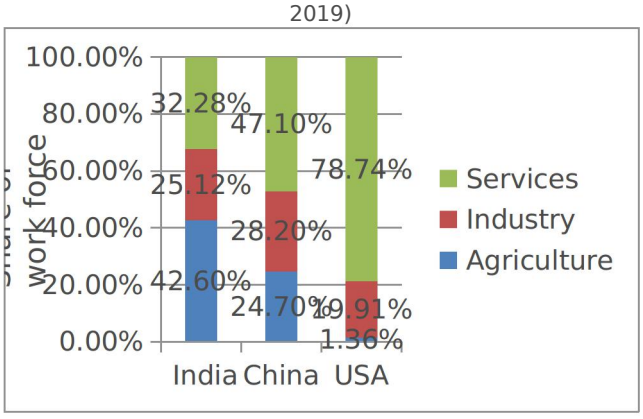
1)Agriculture and allied activities:

In the Indian economy labor force participation in agriculture sector is comparatively highest to the other sectors than that of India which indicate that enormous scope exists for use of innovations in the activities to improve productivity. It is also clear by the results that the main food grains contribution of in terms of acreage is 15 percent, while their contribution in production is less than 9 percent.

For Americans, agriculture was once a leading form of employment but now it is only a less than 2% of the population is engaged in activities of farming, even when output by Agricultural activities have increased. This is evident in the Chart 2. This also freed the major chunk of the labor community to search for other areas of production in manufacturing and services sector.

CHART 2

(DISTRIBUTION OF THE WORKFORCE ACROSS ECONOMIC SECTORS-2019)



1.1 Ways to Improve Productivity in Agriculture

Improving productivity requires engineers to adopt innovation through founding of start-ups in Agricultural activities. Start-ups with potential of human capital and intellects is the right approach for economic growth in the current Indian scenario comprising requirement of multi pronged approach solutions for creating the agricultural value chain and value addition. A key element in the improving competitiveness is the efficient use of this innovation led talents. In order to achieve the results faster, clear objectives to be set by use of technology collaborations and participation of stakeholders.

In India, agricultural start-ups are still at beginning stage and are started by some aspiring 'agripreneurs' with a aim to solve multiple problems inherent in the ecosystem of Indian agribusiness. The potential for scaling up and opportunity of disrupting the technologies is an advantage. In the global investments arena, during 2019, agri-tech start-ups from India contributed around $400 which is less than 10%. Technological interventions required in value chains in the knowledge areas of agricultural sciences like mobile apps for weather forecast, decision support systems for crops selling prices, soil management solutions, sowing techniques involving artificial intelligence and crop pest control systems. Educating farmers and get accustomed to the new technologies is also an area for policy reforms in adult education schemes which will benefit the farming community. Governmental policy frameworks to be revived through farm Co-operative sectors for promoting such educations to the majority of needy farmers community who are having technological generations gap issues.

Engineering Development of equipment and devices related to crop management, harvest management and transport is another area like Mobile controlled motor, UAVs for pest control spray, Drone services for crops management, technologies in irrigation systems for drip and sprinkler, GPS powered driverless tractors, Counting Machines for crop produces, algorithms using Machine-learning to identify weeds, Imaging technologies to sorting crops based on size, type, colour, etc.

Development of marketing support based solutions for crops and produces distribution, support on packaging technology and handling is in the urgent need looking to India's vast imbalance territorial geographies for crops and seasonal changes to cropping. Also, a mobile applications to sell agricultural products, price forecasting models on controlling inflation, dynamic mechanisms on product pricing can be a game changer for vast Indian agriculture produces.

1.2 Success story models of early starters

https://doi.org/10.36375/prepare_u.iei.a201

On a market study of agriculture start-ups, a many of new start-ups have already embraced the innovation and technological route to solve climate change challenges of Indian farmers. One such start-up, Skymet Weather Services offers weather monitoring and predicting aimed at tackling the risks in farming. These solutions offer village level measurements and predictions on yield for any crop with accuracy and weather forecasting at local level in time ranges of short, medium, and long duration. Another start-up Ecozen Solutions is offering indigenously developed solar based products for crop irrigation and harvest storage for regions having issues of disruptions in electrical supply. Crop protection methods are offered by Barrix Agro Sciences with eco-friendly features like preventing water and soil contamination which are caused by use of chemicals to tackle damages by pests and diseases.

In an effort to connect marginal Indian farmers on value chain stake holders, online and mobile based solutions are provided by eKutir Global. They offer services to connect farmers with service providers for farm soil-testing , seeds and fertilizers supply, information on banks, food-processing centres, exporters and retailers. They offer a one-stop solution with field partners for training farmers to even use mobile applications.
Some ventures initially ventured as start-ups are now turned out as medium-scale businesses owing to innovative solutions. One such company is EM3 Agri Services, which was started in 2014, has opted the farming-as-a-service business model. They offer machines on a pay-for-use basis to farm activities through their techno service centres called ‘Samadhan’.

These are the some examples of innovation and technology collaborations that are eventually turning out the business to successful ventures and making impact on economical landscape development. Indian agriculture has potential to replicate and improvise further on these business models to garner greater share in economy as it is characterised by vast variety of agricultural produces with varying geographically and climatically changing conditions.

2) Industrial Manufacturing

Dan Scheinman, Former Senior Vice President of Cisco Systems’ Media Solutions Group once said, “We originally came to India for the [low] cost. We stayed because of the quality, and now we’re investing because of the innovation”. Focus on existing high impact sectors in manufacturing is the key to achieve the target with advantages in cost, quality and scope for innovation.

2.1 Indian Industrial sectors requiring Engineering skills

Defence sector in India is having 2nd largest standing military and its spending is fifth largest in the world. Almost 60% of defence requirements are met through imports and is largest spending of 30% of total budget for importing conventional defence equipment. Forging industry-academia-R&D lab collaborations is the opportunity in this sector which is open arena for the engineers and entrepreneurs. Some Indian private business houses like Adani have started their venture in defence and aerospace with encouraging government policy of indigenous manufacturing of defence equipment. These have come up with defence collaboration in technology with foreign companies.
The engineering sector accounts about 27% of total factories in the industrial sectors and comprises 63% of the foreign collaborations. Investment in infrastructure and industrial production over recent years made India’s engineering sector witnessing a remarkable growth. It is associated with the manufacturing and infrastructure sectors which makes it a important contributor in India’s economy mix and having advantage of 100% FDI approvals. Make In India initiative by the government has attractive support schemes for new technology absorption which needs to be fully utilised by the Indian engineers and industrialists.
Electronics System, Design & Manufacturing (ESDM) sector in India is the focus area for the engineers owing to its demand met by exports. More than 60 per cent of the products under total domestic demand for electronics and 70 per cent of the components demands are met by imports. This share of imports in this sector is further rising over the years to around 75% which is a indication of huge potential for development of electronic goods sectors in India.
A sizeable Automobile industry exists in India, contributing to more than 7 per cent of India’s

https://doi.org/10.36375/prepare_u.iei.a201

GDP. Indian auto industry is the sixth largest by production in the world but India's share in exports of auto-components is around 4 per cent and in exports of overall automotive sector share is about 1 per cent. This indicates there is a lot of scope for further integration with Global Value Chains. Its employment creation potential is also huge and currently provides direct employment to 1.5 million people and indirect employment of same quantity.

Apart from the above, there are 8 emerging sectors in the manufacturing which are expected contribute significantly where Indian engineers have to upscale their skills through academic involvement to meet the opportunities of promising technologies. Namely in the areas of Robotics, Unmanned Aerial Vehicles, Biotechnology, electric mobility are at nascent stage in India offering tremendous potential in the areas of employment generation and significant share in GDP. The renewed commitments of India during recently concluded climate change conference COP26 has also opened vistas in large scale technology changes for Indian energy and environment industry.

3) The services

In India's GDP, the services sector contribution being the dominant and attracting major foreign investments. It contributed significantly to exports and it is a source of large scale employment. It covers economic activities of real estate, construction, insurance, transport, personal and social related activities, hotel business and computer software and hardware development and testing. Service sector's share in economy has been steadily increased to 54 percent and almost 80 percent of FDIs are coming into service sector.

TABLE I
(Services Sector Gross FDI Equity Inflows)

Services Sub-sectors	Percentage Share 2019-20	Inflows (US$ million) 2018-19	Inflows (US$ million) 2019-20
Financial, Business, Outsourcing, R&D, Courier, Tech Testing & Analysis	9.5	9158	7854
Computer Software & Hardware	74.3	6415	7673
Trading	4.0	4462	4574
Telecommunications	0.03	2668	4445
Information & Broadcasting	0.68	1252	823
Hotel & Tourism	1.2	1076	2938
Hospitals & Diagnostic Centres	0.69	1045	635
Education	2.56	777	3245
Retail Trading	5.21	443	472
Consultancy Services	0.46	411	1,047
Sea Transport	0.61	279	199
Air Transport	0.41	191	918
Agriculture Services	0.25	88	46
Gross FDI Equity Inflows into Services Sector (US$ million)		28265	34868
Change from Previous Year (per cent YoY)		(-)2.4	23.4
Gross FDI Equity Inflows into India (US$ million)		44366	49977
Share of Services Sector in Gross FDI Equity Inflows (per cent)		63.7	69.8

3.1 Significant successful initiatives for value creation

In India, the year 2020-21 marked with many important significant service sector structural reforms. Many of the service sector restricts are eased for investment by private and foreign investment like in space sector, telecom regulations are freed from BPO sector and regulations enforced for consumer protection for e- commerce services. So far, India was attracting and enjoying the benefit of low cost services in software support outsources but now time has to work on new technologies in digital revolution by making use of its talented pool resources. This will shift India's focus from doing cheaper works of outsources to large value based technology

development activities in software sector. India has the largest youth population in the world, developed a robust start-up ecosystems and a huge chunk of population who are yet to orient their activities digitally. These can make India to emerge as a technological super power in spite of the current economic uncertainty situations.

3.2 Some silver linings

There are some silver linings to reaffirm India's capabilities to emerge as technological superpower. India's innovation capability measure in Global Innovation Index is improved to 48th rank in 2020 which was significant achievement when compared to its past position of 81st rank in the GII list It has maintained the top position for the Central and South Asia region countries and consecutively second position for five years duration among middle income category nations list for quality of innovations. India's stands among the top 25 category for quality of scientific publications and its quality of technical universities namely IITs and IISc.

Apart from IT-BPO sector, India is able to create engineering excellences to promote tourism sector, rejuvenation of holy places infrastructure development to bring value generation through national and religious vigour. Conceptualising and implementation of tourism promotion by construction of Statue of Unity is one of the such schemes where Indian engineers contributed to improve national economy on tourism with innovative conceptualisation. Such experiments of tourism promotion developments to be replicated in other parts of the country to promote Indian tourism to higher level.

In efficiency improvement of goods handled for import and exports at Indian ports, there is significant reduction of the turnaround time to 2.62 days in the year 2020 from 4.6 days in year 2011. This will add efficiency and cost reduction to import and export activities of the nation.

In the start-up front, $28Bn has been raised till September 2021 for the 9 months and more number of start ups are entering the unicorn club. Start-up ecosystem unicorns comprised health-tech, social commerce and e-pharmacy making the total counts to 75 numbers in the unicorn club which is a encouraging sign in the service sector. With this rate of growth, there will be around 100 unicorns by end of 2023. Service sector in India is attracting more investments through start-up routes and companies are seeing good valuations for the growing demand in spite of the second Covid wave during this year. The service sector is expected further revival with the ongoing vaccination drive and ease of restrictions in contact intensive activities.

CONCLUSION

Connecting economic aspirations with engineering skills and technologies is the key factor for target achievement. Today engineering skills and technology bringing disruptions in all walks of the life. With the start of digital revolution, India is in forefront with its vast fraternity of young talented engineers who can make the dream come true in every sector of economy. The start-up hubs by the young engineers are making huge disruptions in the technology and digital landscape. They are changing the way of doing business in all sectors of the economy through e-commerce route. In agriculture they are providing real time data inputs on soil quality, weather status for increasing the productivity. Start-ups in health, education are processing information and data through artificial intelligence and machine learning to get better outcomes. The blend of government's economy oriented policy measures, schemes on business promotion initiatives are helping the engineers to realise the ease of doing business and make full utilisation their skills. The nations engineer fraternity is fully equipped to bring positive turnaround in economy in spite of pandemic challenges created in the last two years through its vast skill base and innovative spirit.

REFERENCES

[1] www.indiabudget.gov.in/economicsurvey/doc/vol2chapter/echap09_vol2.pdf. Page 310.
[2] Jan 2019, Final report working group Department Industrial Policy and Promotion, Ministry of Commerce and Industry, Govt. of India.
[3] Press Publication on August 14, 2021, Press Information Bureau
Ministry of Commerce & Industry, Govt. of India.
[4] News Article by Shailender Kumar, Regional Managing Director, Oracle India
[5] Anil Nair1 & Orhun Guldiken & Stav Fainshmidt & Amir Pezeshkan, Innovation in India: A review of past research and future directions
Published online: 9 November 2015

https://doi.org/10.36375/prepare_u.iei.a201

[6] https://www.statista.com/statistics, Published by Aaron O'Neill Jul 22, 2021.
[7] News articles, Media and Press releases of Government of India