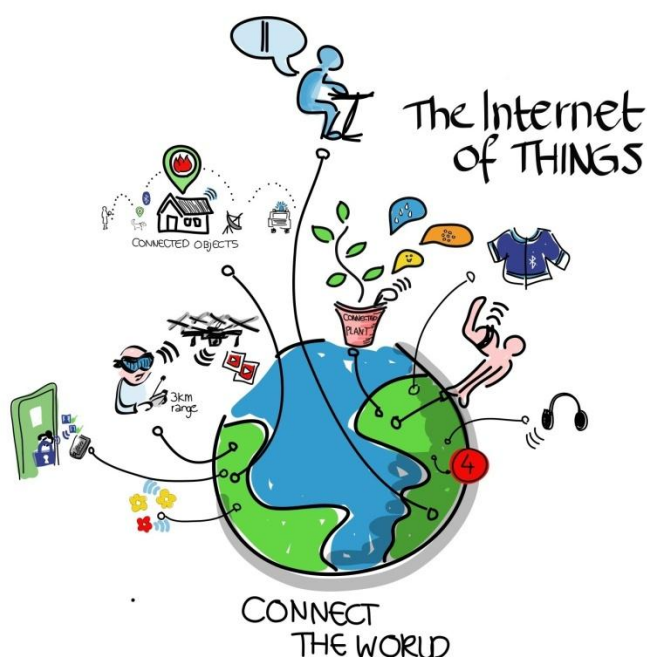


# How India can benefit by leapfrogging into Fourth Industrial Revolution?

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Last month the major agenda at [World Economic Forum in Davos](#) was discussion on Fourth Industrial Revolution (FIR). Since FIR is already underway in some of the advanced economies there are fears that it will be very disruptive and create huge unemployment. The Davos meeting was meant to discuss and allay these fears.

I feel FIR for developing countries can in fact produce more employment and benefits and is the theme of this article.



## [So what is fourth Industrial revolution \(FIR\)?](#)

Our societies are characterized by various industrial revolutions. The first industrial revolution started in late 1700s when muscle power was replaced by steam mostly produced by coal. The second Industrial revolution which started in early 1900s was driven by electricity and characterized by big machines and assembly line manufacturing. The third industrial revolution which began in early 1960s was based on computers, information technology (IT), electronics and automated production.

The present fourth industrial revolution is characterized by internet of things (IOT), 24/7 connectivity, rapid communication, miniaturization of design and 3D printing which allows for manufacturing and production of goods wherever they are needed.

I feel that this IOT and 3D or additive manufacturing has the capability of allowing countries like India to leapfrog into the FIR.

India is already a decentralized society where more than 60% of its population lives in rural areas. They live in [conditions of poverty and lack basic amenities of life](#). For example they live in one room huts with nearly non-existent electricity; cook on primitive biomass cook- stoves which produce tremendous indoor pollution; lack potable water and toilet facilities. Their lives can be improved drastically by providing livelihood opportunities and amenities for households powered by FIR.

### **Livelihood opportunities via high tech farming**

Around 80% of rural population is involved in farming sector. Presently farming is non-remunerative and it needs to be completely overhauled to make it attractive. Thus for increasing income for rural households I foresee the use of high-tech [precision farming](#) which could either be land based or container based. In container farming all the inputs of farming are applied in an efficient way in enclosed shipping containers. This container based farming as opposed to land based farming, can grow any food (grain, vegetables or fruits) or fodder with the use of precise levels of light, temperature, humidity and nutrients. All these inputs are controlled by smart sensors and computers. This type of farming requires very few laborers, very little soil and water and is based on the principle of hydroponics or aeroponics.



There are [claims by the practitioners of container agriculture](#) that it uses 90% less water than conventional agriculture and produces 150 times the yields that would have been obtained from land based agriculture. Such high-tech farms are coming up in urban areas in western countries and provide a model to be emulated in developing countries like India.

Today the biggest crisis in farming in India is the lack of labor, low prices of produce, shortage of water and very poor soils. With precision land based or container agriculture powered by solar energy and other renewable energy systems, farming can become very efficient, high yielding and hence remunerative. To my mind this is the future of farming.

The soils of the land have to be conserved and I feel container farming will help in doing that. This can be further helped by using land based agriculture for planting mostly perennial crops like grasses for fodder and trees for fruits, timber, chemicals etc. Grasses and trees can bind the soil and stop the soil erosion. Such trees and grasses will not only increase the green cover but at the same time provide useful products to mankind.

I also feel that agricultural containers will be eventually owned by restaurant owners. Hence A-Z of food production and utilization will be run and owned by the

restaurants and may give rise to large number of [rural and urban restaurants](#). This will generate huge employment opportunities.

### **Amenities for rural households**

For providing devices and amenities to rural households, I feel FIR will be based on [3D or additive manufacturing](#).

In 3D manufacturing the parts or the product is built layer by layer in any place where the 3D machine exists. The designing can be done anywhere in the world and it can be sent by internet to the 3D printer. Thus the raw material; metal powders in case of production of metal parts, or plastic wires for plastic products; together with a suitable glue or solidification of raw material, forms the end product. 3D printing is being used to [produce parts of rockets](#), whole machines and even body parts. The technology of 3D manufacturing is rapidly progressing and is already becoming mainstream technology for small specialized manufacturing facilities.

Use of 3D manufacturing will also reduce the energy consumption in transportation of goods since they will be manufactured and made available wherever they are needed.

It will also help in decentralization of production. Large scale production of goods in present scenario always works on the principle of economies of scale. With 3D manufacturing the quality and price can be maintained at any place. In fact in most cases the prices can be drastically reduced since there is no wastage of material (3D products are built up rather than machined) and the dealers' network need not be developed. We might therefore see a proliferation of high tech small scale manufacturing facilities in rural areas.

The 3D manufacturing comes closest in design to natural systems where manufacturing takes place locally once the template is embedded in the genetic code. In 3D manufacturing it is transmitted anywhere through the internet communication system.

For rural mobility [electric vehicles](#) can form the backbone and could be charged by locally produced renewable electricity. 3D manufacturing may help in production of such vehicles in rural areas.

Some aspects of FIR are already being played out in rural areas of India. An experiment called ["school in the cloud"](#) has shown that illiterate children if given access to internet can rapidly learn to get information through You Tube on how to make things. In an experiment in a rural school in West Bengal one high school student, with rudimentary materials available locally, made a fairly sophisticated device and operated it. These You Tube videos seemed to fire the imagination of these children and even without formal education helped them to make useful

products. This is what Gandhiji had predicted when he said that each and every villager given enough inputs and challenges can produce useful things. His idea of villagers designing a better spinning wheel (charkha) was a part of this exercise.

As the evolution in internet of things (IOT) is taking place, advanced economies are already working on rolling out [ultra-speed 5G internet networks as part of FIR](#).

One of the attractive aspects of 5G is that it will work in devices with very little power and thus the charge of a smart phone can last for a long time. Technologies are also evolving so that the energy for transmitting information through 5G is being reduced. Today's technology uses huge amount of power to push signals in 3G and 4G networks. Thus the era of big ungainly antennas with heavy power usage in them is giving rise to small and innumerable but more efficient antennas which use much less power to send signals.

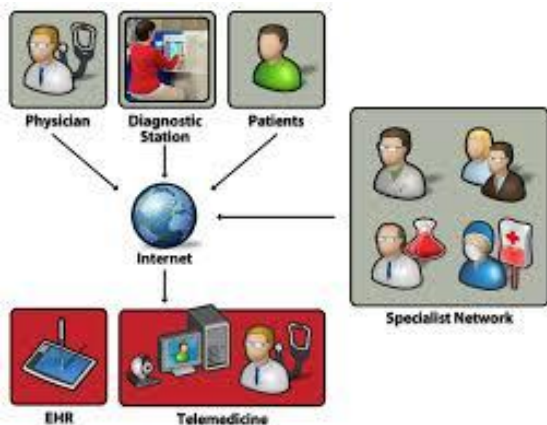
If India vigorously pursues the path of 5G and bypasses 4G networks then this can improve further the chances of India's leapfrogging into FIR. For most of the consumers in western countries Wi-Fi is extremely fast. This is because of extensive network of fiber optics connecting the homes. But for developing countries like India where fiber optics has not reached the density needed, 5G offers a very high speed network in remote areas.

There is fear [expressed by some of the proponents of FIR](#) that it will lead to large scale unemployment or only knowledge based-employment. However I feel that this fear is unfounded because to maintain and run these machines and infrastructure will require a huge force which can be available in rural areas.

It is food for thought that whether one is rich or poor, highly educated or uneducated, children are produced in the same way. The sophisticated machine that is human body does not require for us to know the mechanics of reproduction as the act itself is simple and nearly foolproof.

Similarly whether one is rich or poor, educated or uneducated we all use a smart phone with ease for lot of our activities. We are not concerned about the mechanics of phones but only about how it can be used for our purposes. Besides there is no special education needed to operate a smart phone. There is therefore a great lesson to be learned from both these examples that for the spread of FIR in India we may develop workforce which can be rapidly trained to run these services. This may give rise to huge service industry and employment in rural areas.

Health sector can also benefit from FIR. Smart phones together with suitable attachments and apps are being developed which allow the vital medical data of the patient to be transmitted to the hospital. The doctors then recommend the medicines or the course of action. This is a part of [telemedicine](#) that exists and is rapidly



developing and helping patients in rural areas of the world. Only in the emergency case, requiring surgeries, that the patient need to go to the hospital.

Telemedicine has the potential of providing huge employment for primary health workers who will visit the patients and use smart phones to take and transmit medical data and then administer medicines to them based on doctor's recommendations.

However for FIR to be accelerated incentives to industries and enlightened policies by Government of India are required. Also needed are excellent engineers and scientists who will be knowledgeable in precision agriculture, 3D printing and whole host of technology bouquet used in FIR.

I feel that FIR can usher in a decentralized and democratic society since the control of the means of production and usage will be in the hands of locals. However for it to spread and produce a sustainable and holistic society there is a need for us to curb our greed for resources and goods. That can be achieved when all of us become spiritual. Spirituality helps simplify our life and brings happiness. Thus the mantra of development should be [spirituality with high technology](#). I feel FIR may help us achieve that goal.

## [HOME](#)

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Syndicated by IANS and published on February 24, 2016 in many news lines like [Economic Times](#), [WiKiNews](#), [Business Standard](#), [One India](#), etc. The article was carried [prominently in The Quint](#).