

FUTURE TECHNOLOGY AND ECONOMICS

M.M.K. Sardana *

[Abstract: *Even before the onset of industrial revolution in the eighteenth century everything we value was available. Technology interventions became sustained during the age of the industrial revolution on the back of capital accumulation and vision developed that it was possible to increase the wealth of nation as a whole which would strengthen the monarchy and sustain its rule. Adam Smith in 1777 presented a blueprint for the monarchs to follow advising that prime mover of the economic activity would be the supply side and market would determine the prices and wages. The Unprecedented Depression of 1929 affected the nations at large to such an extent that market and people and their rulers were in a state of despair. John Maynard Keynes, a British Economist, pointed out that such a state had come about when the accumulated capital was unprecedented and the then prevailing despair had come about because of the efficient technologies of the time had resulted in technology induced unemployment which needs to be absorbed expeditiously without waiting indefinitely for market to set the correction, which the adherents of the market economy were waiting for. Governments slowly and surely, adhering to the advice of Keynes, took on to the interventionist approach with success in mitigating the hardships in the pre war period and in the post war period set to reconstruction and recovery of their countries. Market economy took a back seat and its practitioners continued to be skeptical of the Keynesian economics in the long term. Meanwhile, following WW II, many new countries emerged who embarked on development processes totally different ranging from a centralized control economy and planned economy to mixed economy suiting their genre with positive results. U.S. had emerged as the most powerful nation economically and militarily in post WW II and on its strength was able to influence the economies of the world. Following, its involvement in Vietnam War and other military interventions and the reluctance of its democratic government to finance such interventions through taxation measures and further because of oil shock in mid seventies, there arose a situation of inflation and stagnation which the monetarist economists dubbed as the failure of Keynesian economics. Government in U.S. and governments of other developed countries sought to bale themselves out by lending their support to the Monetarist School of Thought and once again Market Economy came to be favoured by the world economic institutions. Technology, with its success, was intertwining with the economic development and was impacting the economies of the world globally. Resultantly it was becoming the carrier of globalization of production and services necessitating the growth of international arrangements to protect IP Rights and Dispute Settlement Mechanisms traversing the different sets of economies. Rapidly advancing technologies of the 21st century which enabled transfer of funds with the speed of light from one scenario to another, caused crisis worldwide affecting the developed world most. In the original crisis, which has lingered since 2007, the impact of technology is relentless and so are the growths of inequalities. Fears are being expressed that technology induced unemployment would be so intense that average citizenry and even brighter one would lose their jobs disrupting demand supply chains and the economic cycle, essential for growth, would be shattered. There is need to reorient the theoretical framework in appreciating that the technology and internet of power is now leading to democratization of manufacturing while information is freely available setting mechanism to bring 40 per cent of world population living below poverty line as equal partner of world economic development providing a huge market to provide the much needed supply side for developed economies provided these economies contribute towards the creation of facilitating infrastructure and look at the prism of world economy as whole rather than being obsessed with their side of economy.]*

* The author is a Visiting Fellow at the Institute.

From the earliest times of which we have record back, say, to two thousand years before Christ-down to the beginning of eighteenth century, there was no very great change in the standard of the average man living in the civilized centres of the earth. Progress was achingly slow almost invisible. Animals and farms, wars and empires, philosophies and religions failed to exert much influence pervasively. Almost everything which really matters and which the world possessed at the commencement of the modern age, reckoned to have begun two hundred and fifty years ago, was already known to the man e.g. language, fire, domestic animals, wheat, barley, the wine and olive, the plough, the wheel, the oar, the soil, leather linen and cloth, bricks and pots, gold and silver, copper, tin, lead and iron. Even banking, statecraft, mathematics, astronomy and religion predate the beginning of the modern age. But just two hundred and fifty years ago, something sudden and profound arrived and bent the curve of human history-of population and social development-almost ninety degrees. For the first point in time both increase of GDP per capita and population occurred. The technical improvements that took place in England at this point of history commenced on the back of capital accumulation; a process begun under the patronage of Queen Elizabeth whose sea faring adventurers like Drake brought treasure from other lands in the late sixteenth century. In the absence of capital accumulation supporting the earlier technical achievements, though remarkable by themselves, failed to generate sustained development to push the graph of economic development of average man appreciably. Earlier advances did not yield the process in which countries could become industrialized^{1, 2, 3}.

At the turn of the first industrial revolution, setting the beginning of the modern age, rulers dominated the planet earth. Most ruled by divine right who treated their realms as their property, to do as they saw fit. The dominant economic doctrine of the time was Mercantilism. It called for rulers to treat the finances of their realms as

¹ Economic Possibilities for Our Grand Children, J.M. Keynes [www.econ.yale.edu/smith/econ116a/keynes 1.pdf](http://www.econ.yale.edu/smith/econ116a/keynes%201.pdf)

² The Second Machine Age, Work Progress and Prosperity in a time of Brilliant Technologies, Erik Brynjolfsson: Andrew McAfee; [tanguduavinash.files.world press.com](http://tanguduavinash.files.worldpress.com)

³ Historical prospective of the role of technology in economic development by Jurica Simurina Josip Tica, faculty of economics and business <http://www.efzd.tr/wps>

anyone would treat to finances of their own household: to exert as much control as possible; to take in as much income as possible, and spend that money judiciously. Rulers of the era were happy to abide by the first two parts of that doctrine. They were not less in exercising their power domestically, including economic activity. They were both diligent and imaginative when it came to increasing their incomes, especially the part that came from taxes. Their spending, however, was another story. They spent money on themselves, on wars to expand or defend their realms and on exploratory missions with the aim of expanding their territory. Such a system benefited a small set of people. Given their prosperity to spend, monarchs almost always “needed” more money, even though they did not hesitate to tax their realms to the breaking point.

The comfort of accumulated capital with the monarch in U.K. was conducive to birth of the thought process of increasing the wealth of nation as a whole and the blue print for this development was provided by Adam Smith in his work, “An Inquiry into the Nature and Causes of the Wealth of Nations”, published in 1776 who argued that the lowering taxes and ending barriers to business, both domestically and internationally, would spur economic activity, sustain prosperity and in the end make a nation as a whole wealthier. Since the wealth of nations determined how much money monarchs could get their hands on, it would be in their interest to adopt the proposed policies⁴. Adam Smith’s theory recognized supply side as the prime mover of the economic activity which would if not interfered by government, allocate through an invisible hand, resources and determine prices and wages. Suffice to say that pursuing of the prescription of Adam Smith, the European nations went through unprecedented growth and capital accumulations in their economies; technology continuing to be a permissible resource of the development process. It appeared that Mercantilism had given way to free market economy to lay the contours of economic development. Needless to emphasize that the mercantilism was characterized by money being concentrated in a few hands who spend lavishly on themselves whereas in free market economy money would be dispersed and would

⁴ Smith and Keynes: The economic insight they shared by Stephen year wood, July 28, 2013, the globalization <http://www.thegloblisation.com/smith-andKeynes-the-economic-insight-they-shared>

be spent and invested to the best of advantages. The free market economy thus envisaged circulation of money widely and any slowdown in circulation of money would create the scenario of mercantilism and its consequences. This is precisely what happened one and half a century later when wealth came to be concentrated in the hands of a few big businesses and like the mercantilist monarchies before them, they spent lavishly on themselves and made personal investments on enormous scale causing widespread unemployment and the world economies went into the grip of the Great Depression in the period beginning in 1929. Such a situation came about in the midst of unprecedented rate of capital growth and on a scale which was far beyond a hundred fold of what any previous age had known. John Maynard Keynes explained that such an anomalous situation of unprecedented unemployment had come about because of inability of the system to adjust itself to the over rapid changes brought about by the technical efficiency leading to a situation when it had not been possible to deal with the problem of labour absorption being displaced as a result of increasing technical efficiency. Apparent improved standards of life because of improved technical efficiency blinded the system to an extent that it did not gauge under the surface to allow true interpretation of the trend of things. Keynes held out that the system would respond towards economic bliss with purposive experimentation to seek balance of economic and social life⁵. Keynes diagnosed the underlying problem as being shortage of aggregate demand and government should be intervening to shore up the demand by increasing its spending and create resources for such spending by borrowing as necessary and also by taxing. Government would act as a pump, collecting taxes and returning that money to the tax payers by increasing expenditure. Such an approach was in contrast to the approach of Adam Smith of governments not interfering with the markets and yet there was identity of the goal; keeping the money circulating sustaining economic activity and thus employment⁶. Approach of Smith was to deal with the issue of wealth getting concentrated into the hands of a few and to get it circulated for maximizing the good of many and approach of Keynes was towards steering the economy back to the free market economy path with the intervention

⁵ Op cit 1

⁶ Op cit 4

of visible hand of government consisting of monetary and fiscal policy instruments. The superimposition of visible hand of government on the invisible hand of Adam Smith was beyond the comprehension of installed wisdom which undoubtedly had brought about unprecedented capital accumulation over a period spanning a century and half in the midst of unprecedented unemployment. Economy had accumulated wealth which needed to be deployed for creating demand matching the potential of supply side overcoming the then theoretical basis of price and wage theory as its basic components, namely, price and wage were proving to be sticky. Governments were required to create jobs even if they had to resort to taxing the producers and also undertake borrowing so that cycle of demand and supply is energized. Keynes believed that the 'Classical Theory' practised over a century and half was a 'Special Case' that applied only to the particular conditions prevalent in the 19th century⁷. In the era of technology efficiency when there is unprecedented capital accumulation and unemployment; the theoretical foundations of the economic theory would be required to accommodate the emerging phenomenon to build up a response. Keynes came up with the General Theory of Employment, Investment and Money justifying the intervention from government for tackling a recession. In a scenario of recession, demand and not supply would be the key variable governing the overall level of economic activity. In a situation of unemployment and unused production capacity, one can enhance employment and total income by increasing expenditures on employment and investment which can be done significantly by the government only through its policy interventions.

Business cycle theorist Schumpeter was also seized of the central economic puzzle of time "The Great Depression" and was to record that periodic depressions are not, like tonsils, separate things that might be treated by themselves, but are, like beat of the heart, of the essence of the organism that displays them. However, these economists were unable to advance ways to move out of the Depression. Keynes, on the other hand, provided a clean road map to policy makers to get the economy out of the despair of recession and depression. Business Cycle Theorists like Schumpeter

⁷ John Maynard Keynes-Wikipedia

clearly stated, “I recommended no policy and propose no plan”. In times of desperation like the Great Depression even Schumpeter went on to acknowledge that Keynes formulation would apply to special situation reproaching that it would be inappropriate to call his theory as “General”⁸. In the situation of despair of Deep Depression, governments did start treading Keynesian path with promising results. However, orthodox economic opinion remained generally hostile regarding fiscal intervention to mitigate the depression, until just before the outbreak of war. Keynes’s efforts begun to have a more than marginal influence on U.S. economic policy after 1939⁹. Economists and governments thus, though reluctantly, responded to the blueprint to bring about balance in economic and social life.

World War II had been the most transforming happening of the 20th century where impact has been all pervading bringing about the birth of several new nations through various types of mergers and demergers and end of military backed colonization. U.S. emerged as the sole economic power with command over resources and advanced technology. European Nations had to look up to U.S. for their reconstruction and submit to the dominance of U.S. in the establishment of international financial institutions and also to the U.S. \$ becoming international currency of trade. India and China emerged in Asia who had fought for their newly found status riding on their respective contrasting ideologies and were eager to rediscover and restore their rightful cultural and economic status in the comity of nations. The task before the diversified groups were multifarious and varied and it would not be possible to lay a framework of economic development which would fit them all.

Analyst economists of the most dominant nation i.e. U.S. sought answers for the low standards of living in many countries of Latin America, Africa and Asia and were to recommend deployment of scientific application of scientific advances and industrial know-how of the U.S. and its allies. Development Economics emerged as a new discipline to craft tools for economic development of these countries to give shape

⁸ Dividends from Schumpeter’s Nobel failure by Thomas k. Mc Craw, <http://hbswk.edu/item/5626.html>

⁹ Skidelsky, Roberts (2003), John Maynard Keynes, Economist Philosopher Statesman Pan Mac Millan Ltd. P 494-508, ISB No-330-488678

to the new era of economic growth as conceived by U.S. President Truman. As a result, The U.S. and its allies established a chain of institutions and experts had a common set of formulations for countries of different regions and for all the cultures. The countries seeking economic development were required to follow a set of “good policies” and create “good institutions”. The set of good policies prescribed included the system of democratic governance, adoption of free trade and free markets, and removing all barriers of trade such as tariffs and quotas¹⁰. Very few nations have developed via this model in spite of liberal dozes of financial aid. The western developed nations as on date continue to consume over 75 % of world’s output¹¹.

China completely undermines the belief that progress is exclusive to western formula of free markets; democracy and liberal values. It maintains extensive involvement of government across all market sectors. By being centrally driven, China has been able to direct its resources in one direction, which has propelled it into a regional power and the largest economy in the world after U.S. China has shown that an independent, nation first policy driven centrally can attain economic success¹².

The development model as practiced in India is distinctively different than practiced in the Western World or that practiced in China. The Indian model of development has been based on a democratic policy in an atmosphere where State has played a significant role even in the era of globalisation¹³. There has been steady growth and containable upheavals and corrective solutions keeping the democratic institutions intact. The Indian economy has reasonably kept itself immune to the economic shocks as witnessed by the economies of western countries and allies since 2008.

Thus after World War II, European Nations took on to Keynesian path in order to reconstruct their nations and regained their status to be recognized as developed world and many countries, notably India, practised mixed economy and there was a

¹⁰ The Myths of Economic Development; International Issues, 24th July, 2010

¹¹ Ibid

¹² Ibid

¹³ Ibid

bloc of countries led by the Soviet Union who practised state control. Most of the countries in Europe and the countries following mixed economy path enjoyed a period of high growth and low unemployment during the decade of 1950-60 so much so that some writers termed the period of golden age capitalism. Time Magazine in a cover page article in 1965 noted, "Washington's economic managers scaled their heights by their adherence to Keynesians central theme: The modern capitalist economy does not automatically work at the top efficiency, but can be raised to that level by the intervention and influence of government". The optimism expressed by Keynes in his short essay written in 1930 under, the title 'Economic Possibilities of our Grand Children' seemed to be getting fulfillment and growing pains of rapid changes and associated pains seeking adjustments were being overcome with the purposive experimentation by bringing in the visible hand of government to guide the invisible hand in the economy.

In the post war period, U.S. has remained the most influential economic and military power and has been the undisputed leader in rapidly advancing technologies. U.S. economy influenced the economies of other countries across the continents in a significant way. Its economists have belonged to analytical school of economic thought and have enjoyed the patronage of U.S. government¹⁴. This group of economists got into the institutional arrangements created to implement the Great Deal agenda of President Truman and were to guide the development agenda of assisted developing countries. This group of economist remained skeptical about the Keynesian path despite its success in Anglo Saxon developed world. Absence of mathematical models in his 'General Theory' was partly due to Keynes skepticism about whether phenomenon as inherently uncertain as economic activity could ever be adequately captured by mathematical models. Some economists did develop models to explain elements of General Theory. Models create and set conditions for their applicability which are forgotten seeking mathematical precision in the real world of economic activity. One such exercise resulted in Philips curve which predicts an inverse relationship between unemployment and inflation. Monetarist economist

¹⁴ ISID Discussion Note 2013/03

Milton Friedman came out with a formulation to prove that such a relationship does not exist necessarily. Rather in an environment of inflation there could be stagnation and the phenomenon was termed as stagflation, the signs of which appeared in the U.S. economy and in other economies during the crises of Vietnam War and oil shock. Monetarist economists provided the theoretical gist to the governments to mask their failures of raising taxation to finance Vietnam War and further failure to address the causes of shock by damming the Keynesian practices so much so that Keynesian economics was officially discarded by Anglo Saxon countries.

The stage was set for yet another shift in economic theory particularly following the defining collapse of Soviet Union in 1991 resulting in the emergence of fifteen newly independent resource rich states in a world which had been rapidly getting linked through international trade under regimes like GATT and WTO and coming a closer community on the wings of exploding information technology loosening the international borders and facilitating cross border movements goods, services and technology reducing overall transaction costs and tariff structures. A significant development also happened in China at around the same time when the Anglo Saxon economies bid a good bye to Keynesian economics to embrace monetarism which was not to move towards globalization initially, haltingly but hurtlingly with the collapse of Soviet Union in 1979 and also on the wings of technology which wired up the entire globe reducing the globe to a village set itself to this path. With the ascendancy of China in late 1978 of Deng Xiaoping, China started embracing globalization in earnest to lead China out of its global isolation. The command economy of China met its demise with tragedy at Tiananmen Square in 1989. Chinese accommodated some of the hither to controversial institutions like IMF and World Bank without fuss and its accession to WTO did not face any serious hurdle. Such orientation to globalization and integration of its economy was achieved despite the skepticism raised about the peaceful designs of the Capitalist Nations when Soviet Union disintegrated in 1991. Setting aside such skepticism, it was ordained by Deng Xiaoping that sustained economic growth alone would justify the party's claim of 'social stability' (i.e. continuation of its authoritarian rule) and went on to argue for more foreign investment and integration deeply with

international economy. Chinese leadership bearing three generational changes up to Hu Jintao presently has been able to maintain the hold on party, taking economy from strength to strength despite the side effects of globalization showing their rising by quelling the noises made by Western World on human rights issues damning those concerns as their design to subvert the communist party rule¹⁵. Thus the process of globalization of economy and free market economy continued to be advanced and adopted by world economies regardless of the increasing intra and international inequalities becoming essential feature of phenomenon which The Nation States have been trying to address as far as practicable without coming in the way of globalization process¹⁶. However, without success. The globalised world economic system did not escape the visit of depression compounded by the financial crises of 2007-08. Once again there emerged challenge to the idea that society and those who govern it ought not to make any judgment about what is desirable for people, but just leave individuals as free as possible to pursue their own aims, whatever those may be i.e. Capitalism is an end in itself and expression of people's will be relayed via market. Opposing view that capitalism is a means rather than an end itself swings back to Keynesian economics¹⁷, which lay buried since 1980 giving way to the school of monetarist economics like Robert Lucas of University of Chicago¹⁸. The ongoing financial crises finds no solution in the Lucas's "rational expectations"; the theory of booms and slumps and rather asserts that market economies cannot possibly experience the kind of problems they are, in fact, experiencing as much as the theory of "Business Cycle" Schumpeter was helpless in the Great Depression of 1929-30. Keynes blue print was created precisely to take care of situations like this. Keynes went on to emphasize recognizing the fact the long term future is very hard to predict and it is very rarely justified for politicians to implement policies that cause short term pains to their populations for long term gains. Keynes relevance to the current age as of 2009 recession would be a macroeconomic policy, with a greater emphasis on balanced growth and with a somewhat large role of government in ensuring there is smooth flow of investment

¹⁵ China's win-win Globalization, Michael Yahuda, <http://yale.global.yale.edu>

¹⁶ Op cit 14

¹⁷ The Returns of the Mater by Robert Skidelsky-Synopsis, Wikipedia

¹⁸ Keynes: Return of Master by Robert Skidelsky-Synopsis by Paul Krugman www.theguardian.com/books/2009

to help protect the economy from unpredictable shocks caused by the global savings glut and guides capitalism to a tolerant view towards differences arising out of needs to maintain social “cohesion” and “Consensus”¹⁹. However, the current crisis has been perceived largely as financial in origin without pausing to think if the rapidly advancing technology has contributed significantly to severity of the downturn and what impact will technological acceleration have as we anticipate recovery from current crises in the decades ahead? It may be recalled that Keynes in 1930 noted that the efficient technologies of the day were somewhat responsible in contributing to the depression prevailing at that time in the midst of unprecedented capital accumulation as the nations were being afflicted by the technology induced unemployment and had not a relook at the economic practices under the glare of apparent wealth accumulation²⁰. Very few economists have included the dimension of rapidly advancing and much more efficient economies impacting the economic system relentlessly so much so that fears are being expressed that almost the entire population of average citizenry across the globe may be reduced to seeking absorption and the technology impacted system may not permit it to do so as expediently as the citizenry and governments would desire. A distinctive feature of the current economic scenario is that in addition to traditional developed economies of the West, a large number of newly industrialized economies across the continents, where about 40 per cent of world’s humanity lives below the poverty line along with affluent and industrialized classes, are intrinsically linked with the developed countries in their endeavor to frog leap to level with the developed world. Such economies have come up to compete with developed economies pursuing paths which have not been in tune with the economic theories and free/market economy and have proved that there are alternate routes also leading to flurry of economic activities with growth with social justice. Rapidly developing and somewhat disruptive technologies are giving an opportunity to leap frog in the race for growth on the one hand and on the other the usual advantage of cheap labour associated with these economies is losing its ground and burdens these economies towards strategizing for skill development of their labour to maintain the advantage of

¹⁹ Op Cit. 17

²⁰ Op Cit. 1

manpower excess with them. Challenge would be to address the emerging economic system not able to absorb citizenry of average caliber and thereby destroy the balance between demand and supply for sustaining the market economy^{21, 22}. Technologists have proven credentials to place in market intelligent machines progressively in relatively short time frame and in the process ensuring that a large fraction of human workforce would be threatened with permanent and structural unemployment. Mainstream economists continue to hold on to the belief that in the long run, technology would result in more prosperity and more jobs. Thus it is believed that as the technology comes along, the economic issues will somehow work themselves out. This widely held belief since the days of first industrialization which has come to bear the sanctity of economic law may not remain valid in the environment of machines which are capable of surpassing the mental capabilities of average and even outstanding brains. Even if it does remain valid, there would be pains of adjustments and the economic and social system should be ready to go through meaningful experimentation and adjusting the theoretical framework to include the emerging technology impacted scenario. While the march of technology continues to be relentless and technology discovers technological solutions to hurdles coming its way, economic and social issue remain sticky and are slow to adjust to the impacts being brought on them. For example, there can be no doubt that India has made many significant gains in Science and Technology, the resultant benefits have not been percolating to a large segment. Therefore, economists and social scientists need to prepare well in advance of the impending impact to provide inputs worked out on the basis of emerging scenario impacted by rapid technologies, to the policy planners so that the required adjustments are brought out with minimum of pains.

Over the last fifty years, there has been a lot of transformation in the working of the economy. The once-unquestioned value of unlimited economic growth has given way to the idea of sustainable economic growth which has given way to the idea of sustainable economic development. The conventional, top down, centralized

²¹, The Lights in Tunnel: Automation, Accelerating technology and the Economy of the future Motion Ford, ISBN-101-4486-5981-7

approach to organizing economic activity that characterized the fossil based first and second industrial revolution is being challenged by the new distributed and collaborative models that go with the Third Industrial Revolution. The hallowed nature of property exchange in markets has been partially upended by shared access to commercial services in open-source social networks. National markets and nation state governance, once the spatial milieu for all economic activity, are giving way to continental markets and continental governments. Thus much of the conventional economics has to redesign itself to explain the present and for forecasting the future²³.

Intensification of contribution of technology in the economic activity would require the pursuers of economic theory to have increased conversation with professionals like Engineers, Chemists, Ecologists, Biologists, Architects etc. adopting the language of energy as these professionals would increasingly produce economic activity in order to lead to a synthesis between economic theory and commercial practice and the emergence of a new , explanatory economic model to accompany the Third Industrial Pradigm²⁴. Scholars working for developing economic theories explain the existing and projected economic scenario would be required to sift through the continental approaches adopted by the economies situated there who have successfully maintained the conflict potentials manageable while planting development schemes appropriate to the absorptive capacity of their societies which are steeped in cultures and traditions totally alien to the developed world and at the same time stand aligned with their nations' aspirations of developing with dignity.

A paradox has already been appearing at the heart of capitalism. Many goods and services are becoming nearly free, abundant, and no longer subject to market forces. While economists have welcomed a reduction in marginal cost yet they never anticipated the possibility of the costs becoming nearly zero through the application of freely available technology. Such huge reductions have shaken many industries related to media e.g. music, newspapers, publishing so much so that products are

²³ The Third Industrial Revolution: How Lateral Power will Transform Society (Except) by Jeremy Griffin;
www.huffingtonpost.com

²⁴ Ibid

available for free and conventional markets for such products have disappeared. Similar phenomenon is already reshaping energy, manufacturing and education. Zero marginal cost economy is creeping in real. The resultant savings would be enticing the sale of high end products and specialized services ensuring large enough profits for the capitalist market to continue to grow; though the number of participants in such a market would be limited.

The phenomenon of internet of things would push further the economic life to near zero marginal cost over the course of next decade. Through this technology platform everything and everyone would get connected. Already more than 11 billion servers are attached to natural resources, production lines, the electricity grid, logistic networks and recycling flows, and implanted at homes, offices, stores and vehicles, feeding data to Internet of Things. It is projected by 2020 at least 50 billion sensors will connect it.

It provides an opportunity to data analytics and algorithms to accelerate efficiency and lower the marginal cost of producing and sharing a wide range of products and services to near zero, just as it is done with information goods. According to an estimate, by 2022, the private sector productivity gains wrought by the Internet of Things will exceed \$ 14 trillion and according to another estimate, the internet of Things should affect half the global economy by 2025²⁵. Thus the functioning of future economy would be construct of Internet of Things infrastructure that would optimize collaboration, universal access and inclusion, all of which would be critical to the creation of social capital and ushering in of a sharing economy. A collaborative commons would flourish alongside the capitalists market.

Zero marginal cost phenomena are impacting the labour market in developed markets where workless factories and offices, virtual retailing and automated logistics and transport networks are becoming more prevalent. The new employment opportunities get shifted to collaborative commons fields strengthening the social sector e.g. education, health care, aiding the poor,

²⁵ The Rise of Anti Capitalism, New York Times (March 15, 2014)

environmental restoration, child care and care for the elderly, the promotion of arts, culture and recreation. Not surprisingly, in the U.S. the number of nonprofit organizations grew by approximately 25 per cent between 2001 to 2011, from 1.3 million to 1.6 million, compared with profit making enterprise, which grew by a mere ½ of 1 per cent. In the U.S., Canada and Britain, employment in the non-profit sector currently exceeds 10 per cent of the workforce. Revenue generation by the non-profit sector in many developed countries is nearly 50 per cent of its expenditure and for the rest it is dependent on governments and Charity. In the U.S; revenues of non-profit sector grew by 41 per cent after adjusting for inflation-from 2000 to 2010; more than double of the GDP.

Thus the capital markets in the coming decades would be emerging as aggregator of network services and solutions while the world would be entering a world partly beyond markets, where the imperative would be to live together in an increasingly independent, collaborative; global commons²⁶.

Wider spread of the Internet of Things and Internet of Energy would also impact the economies of developing countries as much as, if not more. These economies have experienced the benefit of democratization of information through internet. Democratization of Energy through the Internet of energy on the one hand and democratization of manufacturing with the diffusion of 3D like technologies would trigger economic activities at grass root and community level overcoming the deficiency of conventional infrastructures which would result in structural changes in economies of these communities significantly releasing in the process dynamism in such national economies not imaginable in the past. Such a process, as it gets going, has the potential of allaying the apprehensions expressed in 'The Lights in The Tunnel' and 'The Second Machine Age' by opening up new and un satiated markets. The democratization of power has the potential of integrating the now excluded 40 per cent of the population below the poverty line to the mainstream economic activity and if this potential is realized, the world capital markets would have a breather. For giving shape to the process of democratization of power with the twin

²⁶ Ibid

objectives of improving the lot of populations below poverty line and also for sustaining the markets, the governments of the world have to intervene squarely and determinedly to take appropriate investment policy decisions and take measures to raise matching resources overcoming the machinations of the school of thought opposing such interventions taking shelter behind the so called tested theories.

Economic theories of the past attempted to capture the economic scene of a limited world of colonial powers and later including that of U.S. Theoretical framework of the present economic scenario and that of the future would be required to take into account the globalised phenomenon spanning over continents and including diversified practices rooted in traditions and yet twinned with an aspiration to develop economically and the technology providing means for leapfrogging overcoming the requirement of conventional infrastructure of the first and second industrial revolutions. Such a framework is bound to be beyond the traditional bindings of fiscal and monetary policies. Yet the roadmap for the future is perhaps nowhere as complicated if there is willingness to undertake purposive experimentations, setting aside the blinkers brought on by the schools of thought which have competed with one another to maintain their hegemony and continue to have scholars adhering to these respective schools ready to lend their voice to nip an altogether novel approach and yet offering no solution. Political leaders holding the responsibility of running the affairs of the states have the mindset of engineers who develop their skills based on scientific theories and yet do not mind to be practical in their approach when they encounter, say, geological surprises to work out solutions. Certainly such solutions if investigated would have scientific foundations and yet an engineer does not have the luxury of waiting for theoretical basis. Suffice to say that while the purists among economists would search for an appropriate framework of theory, the men of practical professions have to work on blueprint of intense collaborative efforts to bring about intensified economic affinities that are available across the countries for flow of capital and technology towards reconfiguration of the infrastructure to take advantages offered by technology for wider benefits. In an integrated world, seeking to develop economically, there is sufficient demand

potential available awaiting to take care of the supplies that industrialized and technology intensive developed world is capable of generating. A considerable mass of world population is yet to get to meet its basic needs, which stand fulfilled for the developed world much before the deadline of 100 years set by Keynes in 1930 in his essay on Economic Possibilities for our grand children²⁷. Technology applications give a glimpse that there is very large market available to take care of supplies of the industrialized world which is getting concerned with the shrinking demand. It has to take initiatives from its end by facilitating the deployment of technologies to enable the populations residing in the other parts of the world to be participants in the economic growth when both parts grow together. Fear gripping the developed world of joblessness under the impact of rapid technology is because they have not been seeing the other side of the world where opportunities are offered by the same technology which has raised their fears-reinforcing the fact that economic system of the world is an integrated whole. Technology has shrunk the expanse of the globe and interlinked everything it holds setting aside conventional modes of production altogether seeking a unique infrastructure supporting such productions which would tend to happen increasingly at community level making excluded sections of the populations partners in the altered scenario of world economy; which the economic theories need to capture in full measure without excluding the core realities for the sake of simplification of models.

²⁷ Economic Possibilities for our Grandchildren Progress and prospects after 75 years.