ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

Understanding the Social and Cultural Dynamics of Science and Technology: A Social Sciences Approach for Understanding Science and Technology in Relation to Society and Culture

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Abstract:- This approach seeks to formalize the study of impact of science on society, and institute it as a robust discipline within the social sciences. Among the fundamental constituent principles of this paper is that this approach could be gainfully employed for both science and technology, and the differentiation between the two could sometimes be razor thin. Secondly, it is important to note that not all technologies or scientific paradigms impact society in the same way, or different sections and segments of society in the same way. Therefore, the very nature of the technology, the vertical percolation of science within society needs to be studied along with its spatial spread. Furthermore, the percolation of science and technology across societies may vary, along with its spatial spread within a society. These factors must be juxtaposed with the very nature of a given culture, its more, norms, receptivity, along with a study of cults, ideologies, and dogmas associated with that culture. We hope and expect that this paper which extends the concepts of our previously published paper on the "sociology of science", would become a vibrant and emergent field of study in social and cultural anthropology, and would also be allied inalienably with our globalization of science movement. Although similar programs exist (these are also reviewed), we believe our approach will take such studies one step further, because it is social science based, and extend its aims and objectives as well.

I. INTRODUCTION

"Once a new technology rolls over you, if you're not part of the steamroller, you're part of the road." – Stewart Brand

"The real danger is not that computers will begin to think like men, but that men will begin to think like computers." – Sydney Harris

"One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man." – Elbert Hubbard

This approach seeks to formalize the study of the impact of science on society, and institute it as an extremely robust and a vigorous discipline within the social sciences; needless to say, this would be limited to not just one, but several diverse and distinct societies around the globe. Among the fundamental constituent principles of this paper is that this approach could be gainfully employed for both science and technology, and the differentiation between the two could sometimes be razor thin, at least from our perspective. Secondly, it is important to note that not all technologies or scientific paradigms impact society in the same way, or different sections and segments of society in the same way. Therefore, the very nature of the technology, the vertical percolation of science within society needs to be studied along with its spatial or its geographical spread. Furthermore, the vertical percolation of science and technology across societies (and to all sociocultural and socioeconomic groups for example, besides gender and age groups) may vary, along with its spatial spread within a society.

These factors must be juxtaposed with the very nature of a given culture, its more, norms, receptivity, along with a study of cults, ideologies, and dogmas associated with that culture. We hope and expect that this paper which extends the concepts of our previously published paper on the "sociology of science", would become a vibrant and emergent field of study in social and cultural anthropology, and would also be allied inalienably with our globalization of science movement. While we do admit that this field of science does already exist, it is not cogent or coherent enough, and exists in bits and pieces. Many parts of this paper are deliberately and intentionally kept somewhat vague and ambiguous. This is because many researchers may not be able to comprehend the wide implications of this field of study. Indeed many scholars from different parts of the world, and holding different cultural and intellectual orientations must participate. This must literally become an army, and a battalion of scholars and researchers, before a worldwide impact can even begin to be felt.

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We begin this paper by discussing the meaning of science and technology, and by exploring their importance in relation to society and culture, particularly as a game changer. We do this by exploring the impact of science and various technologies over the ages. We also then debate the pros and cons, benefits, and limitations of science and technology, and discuss the notion of ethics with respect to science and technology as well. Earlier historical attempts to position science and technology for the benefit and betterment of society by eminent scientists and intellectuals of yore such as Francis Bacon are also briefly reviewed. We also place the paper in context with our previously published papers such as the sociology of science, practicalism, theories of sociocultural change, structured apperception tests for sociocultural change, historiography, and even language dynamics. We then explain how paradigm shifts can be materialized and brought about through the medium and mechanism of science and technology, so that the world can be made a better place for everybody to live in. One way to achieve and accomplish and achieve this is by measuring social and cultural attributes against technological variables. Of course, there are many others, and we do review them briefly wherever possible. [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]

There are several emerging fields at the intersection of science and technology on one hand, and society and culture on the other hand, which may one day revolutionize the way science is taught and communicated to the masses. One such promising field of study is "Science and technology studies" also known as "science, technology and society studies" (which is often abbreviated to STS) and connotes the study of how society, politics, and culture affect scientific research and technological innovation bi-directionally and multi-dimensionally. This field of study was introduced by Elting E Morison and others based on earlier work done by Ludwik Fleck and others. Per this paradigm, different technologies such as the internet, smart phones, and automobiles do indeed impact society and culture, often for the better, though not exactly in the same way. The "Sociology of scientific knowledge" which is known as SSK in short, is a British program which studies as a primarily social activity, and deals with the social conditions and social (equal or unequal) structures which give birth to science and effects of science on society including the elimination of pre-scientific ideas and ideals. Science communication is also being increasingly taught all over the world, and there are even some doctoral programs offered in science communication. The sociology of scientific ignorance is a field that is closely related to the sociology of scientific knowledge and probes and investigates the social impact of ignorance on science and intellectualism, and how it prevents society from shaping and evolving to reach its full potential. In addition, this subfield also studies the causes of scientific ignorance, and traces them to cultural and personal factors to draw meaningful conclusions. Studies must also be more active than passive, and must satisfy the principle of practicalism; we will swear by this principle at all times. [11]

[1] Articulating comprehensive frameworks on socio-cultural change: Perceptions of social and cultural change in contemporary Twenty-first century Anthropology from a 'Neo-centrist' perspective Published in ELK Asia Pacific Journal of Social Sciences Volume 3, Number 4 (July 2017 – September 2017)

[2] The relevance of Culture and Personality Studies, National Character Studies, Cultural Determinism and Cultural Diffusion in Twenty-first Century Anthropology: An assessment of their compatibility with Symbiotic models of Socio-cultural change ELK Asia Pacific Journal of Social Science Volume 4, Issue 2, 2018

[3] Towards scientific apperception tests for twenty-first century social sciences research: Formulating 'Structured apperception techniques for socio-cultural change' in twenty-first century social sciences research Sujay Rao Mandavill

[4] Unleashing the potential of the 'Sociology of Science': Capitalizing on the power of science to usher in social, cultural and intellectual revolutions across the world, and lay the foundations of twenty-first century pedagogy Sujay Rao Mandavilli Elk Asia Pacific Journal of Social Science, October – December 2020

[5] Propositioning Investigative Historiography as a niche subfield within Twenty-first Century Historiography: Making a case for Investigative historiography in Twenty-first Century Social Sciences Sujay Rao Mandavillli IJISRT, August 2023

[6] Presenting the art and the science of Qualified Historiography: Anchoring history-writing in the event of uncertainty and unreliability of narratives Sujay Rao Mandavilli IJISRT Volume 7, Issue 7, July 2022

[7] Historiography by Objectives: A new approach for the study of history within the framework of the proposed Twenty-first Century school of Historiography Sujay Rao Mandavilli ELK International Journal of Social Science Volume 1 Issue 2 (2015)

[8] Enunciating the Core principles of Twenty-first Century Historiography: Some additional extrapolations and inferences from our studies and observations on Historiography Sujay Rao Mandavilli ELK Asia Pacific Journal of Social Science (ISSN: 2394-9392) in Volume 2, Issue 4 July to September 2016

[9] Introducing Anthropological Historiography as an integral component of Twenty-first Century Historiography: The role played by Anthropological Historiography in the attainment of long-term Anthropological goals and objectives International Journal of Innovative Science and Research Technology, February 2018, Volume 3, Issue 2 Sujay Rao Mandavilli

[10] Embedding "practicalism" as an intrinsic constituent of the philosophy of science: Positioning "practicalism" as an essential prerequisite for rapid scientific progress Sujay Rao Mandavilli IJISRT, June 2024

[11] Wynn, Thomas 1989 *The Evolution of Spatial Competence*. University of Illinois Press.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

Another interesting field of study is "Science communication" (which is also sometimes known as the Public communication of Science and Technology or PCST in short) This field comprises the practice of communicating, educating, and raising awareness among the public about various aspects of science and using this knowledge to raise society to a higher level of consciousness. Therefore, while a great deal of work was initially done in the realm of science, this was eventually expended (primarily by the 1980's) to include technology as well. Fields such as the social construction of technology (SCOT) began to emerge along with other concepts such as technological determinism and technological constructivism. This is only a brief summary. For further details, refer to our paper "Unleashing the potential of the 'Sociology of Science': Capitalizing on the power of science to usher in social, cultural and intellectual revolutions across the world, and lay the foundations of twenty-first century pedagogy". In this paper, we had explained the need to investigate social and cultural orientations in society, and develop better educational and social remediation paradigms both within the realm of pedagogy, and outside of it. The importance of the social sciences was greatly stressed and emphasized in this paper, and in a way previous approaches did not. This paper does not conflict with the core concepts and tenets with the core tenets of the aforesaid paper. Instead, it complements them fairly beautifully and harmoniously. This paper is also indeed integrated with or other papers such as pedagogy, which can push the envelope further, and achieve faster scientific progress, by creating scientific awareness. These papers explored theories of pedagogical content, among other things, and studied pedagogy as a mechanism for technological progress. [12] [13] [14]

II. WHAT IS SCIENCE?

Today science and technology have impacted society and culture to such an extent that it is inconceivable to think of any world or a society, leave alone an advanced or a western-centric one, without it. However, the potential of science in relation to social and cultural emancipation and development has yet to be fully realized, and we have a lot of work to do here. But what exactly is science? Science may be defined as a strict systematic discipline that systematically created and builds upon knowledge in a way that can be tested and verified. Science can be said to comprise of three major branches which includes the natural or the physical sciences (e.g., of fields falling under this head are physics, chemistry, and biology which in turn comprises of botany and zoology), the social sciences (examples of which are economics, psychology, social and cultural anthropology, and sociology), and the formal sciences (e.g., logic, mathematics, and computer sciences), etc .

We then also have applied sciences which are disciplines that use scientific knowledge for more practical purposes, and extend theory to real-world applications. Examples of applied sciences are engineering and medicine.

The term "Science" is of hoary antiquity, however, and has been used in some form since ancient times. It is believed to have been derived from the ancient Latin word "scientia", which means knowledge or "the state of knowing", and may be considered to be a systematic endeavour that creates new knowledge in the form of empirically testable facts, principles, explanations and predictions through a careful study and observation of evidence. Many definitions have been provided for science. One of the more common definition of science is "Science is a systematic method of continuing investigation that uses observation, hypothesis testing, measurement, experimentation, logical argument and theory-building to lead to more adequate explanations of natural phenomena." Another common and popular definition by Britain's science council is as follows, "Science is the pursuit and application of knowledge and understanding of both the natural and social worlds following a systematic methodology based on reliable and trustworthy evidence." Scientific methodology therefore includes in its fold, many different components such as objective observation, the quest for objectivity, reliability, and accuracy, the empirical measurement and quantification of data, etc, along with a proper communication of scientific findings to the masses. (Kuhn, 1962)

Science also naturally encompasses research which forms an intrinsic part of science. We have discussed the meaning and scope of research in depth previously, and it is meaningless to reiterate it here. Science has eventually managed to triumph, and mould society fairly deeply, at least in some parts of the world. This has happened in spite of the persecution of scientists such as Giordano Bruno, and Galileo Galilei by the Church in periods immediately preceding the renaissance and the enlightenment. Therefore, the attempts by the Church to stifle science largely failed. We have yet to see a scientific awakening in developing countries. For example, in most of the Islamic world apostasy is outlawed, and in some countries, may even lead to death. There is no freedom of religion or freedom of expression in many countries in the world. Teaching evolution is officially banned in Saudi Arabia. Much of the western academia is outmoded in its orientation, and mainstream western academic scholarship has done very little to modulate the scourge of religious fanaticism

[12] Introducing Anthropological Pedagogy as a Core Component of Twenty-first Century Anthropology: The Role of Anthropological Pedagogy in the fulfilment of Anthropological and Sociological objectives, Sujay Rao Mandavilli, *International Journal of Innovative Science and Research Technology(IJISRT) Volume 3, Issue 7, 2018 (Summary published in Indian Education and Research Journal Volume 4 No 7, 2018)*

[13] Sapiens: A brief history of humankind, Yuval Noah Harari, Harvill Secker, 2014

[14] Evolution: The remarkable history of a scientific theory, Edward J. Larson, The Modern Library, New York, 2004

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and religious extremism which is raising its ugly head in many societies around the world. Even social sciences research techniques have failed to create an impact, and mould society for the better.

Many researchers and scholars of the likes of William P. Scott, Ian Robertson, and W F Ogburn consider social sciences to be as valid as other sciences, but these must indeed rise up to the occasion in the days, years and decades to come, and must prove their worth in today's postcolonial, post globalized world. In many ways social sciences are still somewhat of a joke, as they have not attained the precision they can attain through bona fide and valid techniques such as quantification. There are also not only Eurocentric, but are also associated with ivory tower pursuits and the "White man's adventure" of colonial yore; this is particularly true of much of ethnography and fieldwork. There are other extreme accusations of social sciences too, and it must convincingly surmount all of these. Some people still consider anthropology to be handmaidens of colonialism and exploitation, and its history is still somewhat blighted in this regard. Indian stooges were also sometimes referred to disparagingly as Brown Sahibs, a name that has stuck ever since. We also then had armchair anthropology and verandah anthropology. This observation was particularly true in the 1960's and 1970's, and this accusation has only become marginally blunted in the recent past with the emergence of new strands of postcolonial research. The philosophy of science must also encompass the search for, and definition of holistic and universal philosophical worldviews and ideologies, as these have the potential to uplift scientific output to a higher level. It may, in many or most cases, also require cascading changes to researcher's mindsets and thought processes. As such the principles and tenets of this paper must be tightly integrated with all the concepts of the papers we have been publishing over the years, and most of which are referenced here; that would naturally set it apart from other approaches in the market. (Guba 1990) [15] [16] [17]

III. WHAT IS TECHNOLOGY?

The term "technology" is so widely used in modern, daily life that it has become an intrinsic part of the vocabulary of many vernacular languages. The term in its modern connotation and form, is dated to the early part of the seventeenth century, in the French and German languages, where it was called technique and technik respectively, meaning "a way of doing things", though it indeed has much more ancient Greek roots. In its modern context, it is inexorably associated with science and scientific invention, though that was not always the case. A couple of centuries ago, even non-technical skills were considered to be "technology". In the English language, the term entered mainstream usage in the twentieth century, when its use became deeply entrenched. Technology as most people understand it, refers to more practical application of conceptual knowledge in order to achieve practical goals, and meet practicable ends. This is often done through the use of machines and tools, or processes and systems. Technology possesses an intrinsic ability to change society mostly for the better, sometimes for worse. The term technology is often associated with mass production and reproducibility by commercial means so that it may play a vital and a central role in the lives of humans.

Even though most common people on the street think technologies were invented over the past century or so, (when we use the term technology, the internet and artificial intelligence spring readily to mind) anthropologists think of technology rather differently. To them, technology first arose in pre-historical times, even in the lower Paleolithic age which began over one million years ago, when rudimentary stone tools were first produced. Tools increased in sophistication in the upper Paleolithic age, and the use of copper in the Chalcolithic age and bronze began a few thousand years ago, followed by the use of iron. There are claims for the use of fire in southern Africa from the Wonderwerk Cave in Northern Cape Province, though the earliest clear evidence of the habitual use of fire, though, comes from caves in Israel around 300,000 years ago, when it may have been used in cooking, heating, and other purposes. Agriculture is also traced to the Neolithic revolution, and this began ten thousand years ago. This was a game changer, and set the tone for modern society by leading to food surplus societies. All these are technologies to anthropologists, even though the layman may sometimes sneer at the usage of the term technology in this context.

It therefore goes without saying that the impact of technology on society and on culture must also be assessed on a historical i.e. a deep historical perspective. This will allow naturally also for a larger number of case studies to be dissected threadbare so that generalized principles can be drawn. At the same time, it would be necessary to identify unique ways in which different technologies impacted societies; at the same time it would pay to identify how the same technologies impacted different societies in different ways, at the same time, or in different time periods. It would also be illustrative to prepare a root cause analysis at all times, and identify areas for improvement and remediation. As always, our mantra is "practicalism". Keeping in mind our core philosophy of the "globalization of science", we also emphasize a study of

[15] Asad, T. (1973) 'Introduction', in Asad, T. (ed.) *Anthropology and the Colonial Encounter*. New York: Humanity Books, pp. 9-20

[16] Foucault, M. (1980) in Gordon, C. (ed.) *Power/Knowledge: Selected Interviews and Other Writings 1972-1977*. London: Pantheon Books.

[17] Stocking, G, W. Jr. (1987) *Victorian Anthropology*. New York: The Free Press.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

geographical (i.e. spatial), social and cultural differentials in the percolation of technology, including age and gender for example. We have always called this slice or dice analysis or dimension analysis. We had also used this in our "Structured innovative thinking techniques for Social Sciences Research". [18] [19]

IV. BENEFITS OF SCIENCE

Science is an explicit and a structured form of knowledge building regarding all forms and all types of observable phenomena. It is a no-holds barred approach, and seek to uncover mysteries regarding almost everything under the sun. These efforts and endeavours naturally gestate new ideas and theories, illuminate the word, and make it a much better place for all its denizens to live in. in spite of all this, we believe that science must be a controlled activity, and scientists, academicians and of all hues and colours must possess and innate spirit of social responsibility and must possess the fervent desire to do good to society and to the world around them. Even though initial ideas are almost tentative, they are often tested and retested repeatedly, often against more comprehensive data, until they become more rock solid theories. This almost always eventually does happen, even if there is a time lag. We had referred to this as the latency period for the acceptance of new ideas, and this time frame must be consciously reduced through the execution of a root cause analysis. This will naturally improve scientific progress, and scientific performance. Science also helps us greatly and immensely in the process of decision making; it also has a huge downstream impact by allowing the development of new technologies – science is almost always the basis of new technological progress and invention – even innovation, so much so, that the world that we see today would be inconceivable without science.

Technology, which is based on science, has often changed society fairly deeply and extremely rapidly. For example, we know that our modern lifestyle would be inconceivable without the motor car, the internet, the television, the computer, the telephone, the smart phone, and the radio. Advances in medicine have increased the human longevity, and the human life span. Even the discovery of the double helix structure of the DNA by James Watson and Francis Crick, led to advancements in agriculture and medicine - these benefits were never even anticipated in the 1950's, and as a crude rule of thumb, one scientific invention has a huge ripple and multiplier effect, both technological and non-technological. Social science to possessed great and enormous potential to change the world as we see it and know it, and can change the world positively, and for the better. We have barely scratched the surface yet, and are still skimming on the surface. Social sciences are also sensitive to scientific ideologies – a term first proposed by Canguilhem, biases, prejudices and personal proclivities and judgment, often non-epistemological ones. The ideas and concepts various fields of the social sciences birth and gestate are often culture-specific and even sometimes context-dependant. This is a factor that we must always bear in mind. This must form the springboard and the basis of all meaningful remedial action.

Teaching scientific method also portends and augurs extremely well for society and societal progress. For example, it teaches students objectivity, rigour, creativity, curiosity, the hunger and thirst for knowledge, discipline and also critical thinking skills. It is the spring board, therefore for creative and innovative thought. It overrides old and antiquated shibboleths and dogmas, often old religious values and mores. Most people are not even aware of the strengths and positives of other cultures; many people are not even linguistically empowered, and lack proficiency in their own language or in a dominant language. New technologies like artificial intelligence are helping a little, and are slowly making their mark, and their presence felt. This process has however yet to be fully executed, and has not yet taken place in many parts of the world. For example, in countries such as India antiquated superstitions and old religion-driven and religion-inspired notions still prevail, and some people do not have access to technologies. Theories of pedagogical content do not even exist for the most part. We must change all this during the course of the present century. This must form the basis of the agenda for change. However, we are some way off before this process can unravel itself, and be put to practical work. Let us see how much ground we can cover over the next couple of decades. Many scientists and researchers wax eloquent on how much science has changed society for the better; most of them however, barely mention the role played by social sciences in this regard. This may even be because its role is limited, or even non-existent. Sociology and some other fields of the social sciences for that matter, remain pretty much of a joke. (Ambag 2019) (De La Cruz 2017) (Rogayan & Dantic 2021) [20]

V. DISADVANTAGES OF SCIENCE

At the same time, there are many disadvantages and many drawbacks of science as well. Science can be easily handled by irresponsible people who may use it to the wrong ends. At times, the right kind of prioritization may not be in place, and science may not be used to solve humanity's most pressing problems. Instead, researchers may dabble in ivory

[18] Kuijt, I. (2006). Life in Neolithic Farming Communities: Social Organization, Identity, and Differentiation. Springer Science & Business Media

[19] Mumford, L. *(2010). Technics and Civilization. University of Chicago Press.* ISBN 978-0226550275.

[20] Wilson, E.O. (1999). "The natural sciences". *Consilience: The Unity of Knowledge* (Reprint ed.). New York: Vintage. pp. 49–71. ISBN 978-0-679-76867-8

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

tower pursuits. For example, the Hungarian physicist and inventor Leo Szilard conceptualized the atom bomb in the year 1933, and got it patented in 1936. The first atomic bomb was built in Los Alamos, New Mexico, during the Second World War under the Manhattan Project. The atomic bombs were subsequently dropped on Hiroshima and Nagasaki in August 1945. This proved to be a veritable catastrophe. People may also grow too dependent on technologies, and there is an invasion of privacy and private life. Traditional ways and modes of life and living are gradually and systematically destroyed. When technology fails, people become helpless. For example, when there is a power outage or a power blackout, people in advanced countries may not be even able to cook their own food. People residing in cold countries may even starve to death. People who get hooked on to, or addicted to technologies, may become zombies, or couch potatoes. There is an increasing level of anxiety and stress caused by modern life. People may also become extremely complacent and lazy if they are hooked on to gadgets. This impacts their health adversely, and obesity is becoming a pandemic worldwide. This reduces human longevity and the human lifespan, and makes them vulnerable to other diseases.

Technology may also sometimes fall into the wrong hands. For example, we have cyber criminality and non-ethical hacking in today's world which can lead to a systematic theft of personal information. There is pollution and environmental degradation as lakes and rivers become increasingly polluted. Deserts are expanding, while heat waves and wildfires are becoming more common. Higher temperatures are also causing more intense storms, droughts, and other weather extremes. This impacts wildlife and other forms of life as well. Even since the industrial revolution of the eighteenth and the nineteenth centuries, human activity has been the primary driver of global warming, and this process is largely seen as being anthropogenic. The level of carbon dioxide, the largest greenhouse gas driving global warming, has increased by about 50% and is still increasing according to recent estimates. Another issue is that technology has sometimes increased the gap between the rich and the poor, the well to do, and the not so well to do; it has also increased the gap between the rich nations or the industrialized societies, and the wealthy or affluent societies, and the less wealthy or the less affluent societies. Economic development models also suit the needs of wealthy, affluent societies, and often do more harm than good in the developing world. Leftists refer to this as "neo-liberalism". Right or wrong, such policies are often advocated by the International Monetary Fund and other agencies. As scientists are sometimes highly closeted and mollycoddled, they may be unaware of reality. All this must change as we move forward. [21]

[21]Rucker, Rudy (2019). "Robots and souls". *Infinity and the Mind: The Science and Philosophy of the Infinite* (Reprint ed.). Princeton, New Jersey: Princeton University Press. pp. 157–188. ISBN 978-0-691-19138-6

VI. SCIENCE AND ETHICS

The word 'ethics' comes from the Greek word 'ethos', which means "custom" or "behavior". Ethics is also related to 'morals' which comes from the Latin terms 'mos', or 'moris'. The concept of ethics can be traced back to the works of the Greek philosopher Aristotle as he examined philosophical questions pertaining to daily life. Ethics, over the centuries, has become one of the major topics in Western philosophy when debating social and individual values, their relationship and their hierarchy in society. Ethics may or may not be codified. New ethical dilemmas frequently arise all the time. This is because society is seldom static. It is constantly evolving, and new issues arise all the time. Environmental issues may be an issue societies grapple with. At times, it can also be other issues such as data privacy. The alleged absence of it has led to new legislation such as HIPAA and PCI DSS. Developing countries must also come out of the shadow of western powers, and chart their own course and trajectory with regard to the study of ethics, particularly in relation to science. This may indeed be slowly happening. For example, Vandana Siva calls the group of companies that manufacture chemicals, "The poison cartel". These companies in her view are Bayer, which bought Monsanto, Syngenta, and Dow and DuPont which merged then split into three companies, including Corteva. This poison cartel, according to her, poisons agriculture and food, adversely impacting the fortunes of the farmers in the long-term. Another burning and pressing issue is that of pornography; children are exposed to pornography since a young and an impressionable age. Science is also largely ethically-neutral as the development of the atom bomb and the hydrogen bomb will clearly indicate. Both the steam engine and the automobile contributed enormously to environmental pollution and global warming, but there were no protests when these technologies were launched or introduced. Instead, people, societies, and governments all over the world embraced them with glee, and even with a vengeance. Lamentably, and regrettably, awareness dawned on humanity rather late. While there is no denying that all these technologies have immeasurably changed the world and human society for the better, the realization must now dawn on us, that the only way to solve the problems caused or created by technologies is through more technology.

Likewise, research projects are funded, regardless of their possible downstream negative consequences which are seldom systematically assessed upfront. Some facets of research such as stem cell research are outright controversial. There is also no prioritization or categorization of research, as the concepts of careerism and academic freedom reign supreme. The impact of such research then cascades and reverberates in industry who then adopt the benefits and fruits of such research, positively or adversely impacting society. Ethics is slowly coming of age in sociology and social and cultural anthropology; (in another domain and realm, we have bioethics) there are several other fields of study where ethics, or a formal study of ethical considerations, are yet to deeply

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

entrench themselves. Sociologists have also largely failed to study ethics in relation to science and technology, and raise red flags wherever required. Indeed, this must become a focus of intensive study. However, in 1999, UNESCO and ICSU had jointly organized a "World Conference on Science", in Budapest in Hungary, in order to discuss a diverse set of problems regarding science and society. A document, called the 'Science Agenda—Framework for Action', was prepared and this dealt with ethical issues. This is a useful starting point to identify and deal with ethical problems that stem from scientific research in general. [22]

Science has its own share of obvious limitations too. For example, science cannot ever tell us about morals and ethics, and what kind of judgments people should make under a wide variety of circumstances and situaitons. It does not deal for example, with the issue of human rights, or whether euthanasia is indeed desirable or not. Science is also often based solely on observable evidence and empiricism. There are also many natural and human limits to the accuracy of measurement, and scientific apparatus may be subject to measurement errors as well. Science does not also confabulate or pretend to confabulate on the ethics of the application of science into real world practical solutions. The techniques to distinguish science from pseudoscience are not yet sufficiently and adequately robust and fool proof, and do not mostly offer bullet proof reliability. Human ability to process, digest, and assimilate knowledge, which in epistemological terms, may be defined as justified true belief, is not necessarily limitless or infinite. Human knowledge is limited by many different natural and insurmountable constraints, including several biological factors such as natural brain and cranial capacity, sensory apparatus and sensory mechanisms, the language or languages people know, are comfortable in and are able to properly and proficiently use, people's own past aggregated and accumulated experience and their mental orientation, also known as mind-orientation, and the mental faculties and imagination of scientists which very greatly determines and restricts their ability to conceptualize complex abstract and non-abstract concepts.

The capacity of the human brain also undoubtedly and unquestionably affects the speed and the pace at which human beings can process information and recognize patterns, and this in turn greatly and severely limits people's mathematical, statistical and computational abilities as well. In essence and in sum, knowledge is only the data or information that can be effectively and efficiently processed by the conscious mind, no more and no less. All information may also not readily present itself to human beings, and at all times. People may only be aware of a few specific forms and categories of knowledge which may be fluid or crystallized, such as declarative knowledge for example (for example, knowing with a great deal of certainty that something exists), procedural knowledge (knowing how to perform, carry out, or execute a task or a series of tasks), personal knowledge (knowledge based on human past experiences and memories) and shared knowledge (true ideas that are widely accepted in specific communities and cultures). Humans are therefore, not omniscient and all-knowing, they can possess only limited knowledge at the very best. Humans may operate within definite cultural and social constraints and may not in many cases, even be ready or willing to know all that there is to know. Knowledge is also often not seamless, and manmade and artificial boundaries continue to exist between disciplines, and cultures which have not yet been fully broken down in spite of the ongoing process of globalization. [23]

Karl Popper living in the early part of the twentieth century, once famously defined the limits of knowledge obtained through empirical or scientific methods. His noteworthy and praiseworthy 'falsification' hypothesis states that genuine scientific theories are only those that can be refuted and falsified, that is, shown to be false though just one single observation. Therefore, all theories are never absolute, and knowledge is also no likewise infallible. Immanuel Kant also attempted to define the boundaries of knowledge in his noted work "The Critique of Pure Reason" which was first published in 1781, though his views were sometimes criticized by other thinkers. The noted Austrian philosopher Ludwig Wittgenstein is also believed to have gone on record stating that we also may never have compelling grounds to know everything. Technology has been able to extend the power of our senses greatly through artificial sensory amplification processes, though there will indeed be limits as to how far technology can take us. In the early part of the twentieth century, the logician, mathematician and philosopher Kurt Godel showed through his incompleteness theorem, that in any axiom-based, self-consistent, formal and reasonable mathematical system, there will always be mathematical truths that cannot be proved true using that system. There are other dimensions such as space and time we may never be able to transcend or fully understand at present, or ever in the future- for example, we may never be able to determine the specific atmospheric composition of a distant exoplanet, determine, the specific date and time down to the millisecond or nanosecond when speakers of Indo-European language landed on Indian soil from the proto-Indo European homeland, when down to the last second our ten thousandth ancestor was born, what the Indian Mughal Emperor Akbar ate for dinner on a specific day, etc. we may also never understand how time came into being, and what existed before the birth of time, or before the big bang.

[22] Talja, Sanna and Pamela J. Mckenzie (2007). Editor's Introduction: Special Issu e on Discursive Approaches to Information Seeking in Context, The University of Chicago Press.

[23] Groh, Arnold (2018). *Research Methods in Indigenous Contexts.* New York: Springer. ISBN 978-3-319-72774-5

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

Another type of limited knowledge concerns information we cannot even possibly adequately comprehend. Our minds are either too limited, or perhaps there is no satisfactory and adequate explanation presented in material terms which humans can see, comprehend, and understand. Examples of knowledge beyond our sense organs could include the understanding and explanation of consciousness etc, and why life originated, or why we exist. We cannot also adequately comprehend the mysteries of time, space and matter, and predict what will happen at a given point in time in the future. These are indeed reasonable and practical barriers to knowledge, though arch-materialists may at times tend to dismiss them off-hand as being trivialities and bagatelles. The statement that science has its own innate and intrinsic limits is not really a religious or an otherwise dogmatic argument, and may not always tend to make us more religious or fatalistic; it is chiefly a statement about science can and cannot do.

At times, philosophy can act as a counter-weight to science, but then, there are many valid and inherent limitations to philosophy as well. We may also state that the universe is under no obligation to make sense to us. This famous observation was once made by Neil de Grasse Tyson, an eminent American astrophysicist. We must also guard against scientism, extreme versions of which claim of argue that many unknown aspects of nature are already known or settled. Some scientists may also discount the importance of social science, or brush it away without much fuss or ado. The disastrous consequences and results are there for all to see. Religious fanaticism has reared its ugly head in many different parts of the world. Many people, in different parts of the world, are primarily driven by ideology, either religious or non-religious, and there are still no signs appearing of healthy and productive dialogue or reconciliation. [24] [25]

Another concept that scientists must be aware of, and guard against is scientism. Scientism refers to the misplaced view or the false notion that science and the scientific method are the best or the only way to uncover truth about the world, and understand common phenomenon. This approach heavily discounts the importance of all non-scientific activities and pursuits. This approach falsely or naively assumes that anything to do with culture or with tradition is unimportant or is irrelevant. This approach is highly misleading because human beings are essentially social and cultural beings. Some scientists also may make an appeal to scientific authority, and may erroneously believe that whatever is as a matter of fact uncertain is certain. Scientific dogmas and scientific ideologies may prevail, and the importance of the social sciences may be heavily discounted. Criticisms of scientism have been leveled by TT Jackson Lears, John N Gray, and Thomas Nagel against the likes of atheists such as Sam Harris, Richard Dawkins, and other arch-materialists. Science has not fully emerged from this vicious cycle, and a healthy via media trajectory has not yet been found. In 1998, the Biologist E O Wilson also proposed to unite the natural sciences and humanities in his work "Consilience: The unity of knowledge", though at present, this is still a distant pipedream. [26]

As pointed out by the famous British scientist and novelist CP Snow, in his 1959 Rede lecture, "The two cultures and the scientific revolution", the dichotomy of science into the natural sciences and the social sciences meant that the world's problems could not be effectively solved and tackled. He was perhaps partly right; the social sciences have yet to emerge from the shadow of the physical and the natural sciences. We have also highlighted the dangers of this on many occasions. This approach may as a matter of fact undermine the faith placed by people in science, and may take them away from it. There is an over reliance on positivism in many cases, as proposed by Jurgen Habermas and others. Scientists for example, do not often understand or appreciate the value systems of cultures and traditions other than their own. There is a desire to vindicate western civilization or condone its shortcomings. Scientist must never fall into this trap. Globalization has brought people closer to each other, yet such lacunae and roadblocks have not yet been fully overcome. It may take a generation or so to achieve it. Social scientists from all over the world must also fight for it. Our globalization of science initiative can also change things and raise awareness in developing countries. The relation between science and society is a complex one; however, in developing counties, science (and technology) are only now beginning to transform society. It is early days yet. Just a century ago, many Indians called science and technology "White man's magic". Today, Indians have not only become mass users and mass adopter of technology, but have also innovated in a few stray and isolated cases. A lot more needs to be done because people's fundamental mind-orientation needs to change with the times. Francis Bacon who is considered an important figure in science proposed, a great reformation of all processes of knowledge for the advancement of learning. This was called the "Instauratio Magna" or "The Great Instauration". Other scientists also equated scientific progress with national character. However, progress since then has been mixed, and somewhat tardy and inconstant. Particularly in many parts of the developing world, age olds dogmas remain as firmly entrenched as ever before, and show no signs of ebbing.

We therefore emphasize the need for building robust intellectualism and scientific prowess in India and other developing countries such that their own unique and individual causes, requirements and interests are advanced and

[24] The Limits of Science, Serghey Stoilov Gherdjikov, University of Sofia, Bulgaria

[25] *Feyerabend, Paul (1993) [First published 1975], Against Method (3rd ed.), Verso, ISBN 978-0-86091-646-8.*

[26] Haack, Susan (2012). "Six Signs of Scientism". Logos & Episteme. **3** (1): 75–95

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

taken care of. This is indeed lacking at the present day and time in these regions, and the kind of intellectuals revolutions, renaissances and enlightenments that the Western world has witnessed several centuries ago, have not replicated themselves in the rest of the world. Sometimes, concepts and ideas are borrowed from the first world slavishly, and without any modification, adaptation or reconsideration for local conditions. Therefore intellectualism is still widely driven by Eurocentric considerations and interests. We had attempted to remediate this by proposing twenty-first century intellectualism in a previous paper. All these factors have apparently therefore stymied economic, social, and cultural progress in various other parts of the world, and in some cases, prevented these regions from regaining their hoary past glory. The concepts, ideas and ideals presented in this paper would overlap with those in our previously published papers, and other scholars and researchers must also drive this process forward; they must also collaborate with other developing countries through horizontal collaboration, though vertical collaboration must also be pursued and followed wherever required. Globalized science activity will also naturally benefit science in general. It is also allow for fundamentally better science to be birthed and gestated. This is yet another reason why we call for an "Indian enlightenment", and enlightenments in other developing countries. This must be molded in line with older European renaissances and enlightenments, but must also always take into account and consideration, the unique requirements and realities of the region.

We still have some more way to go. For example, in India, universal literacy or near universal literacy has only now been achieved with the institution of the Sarva Siksha Abhiyan and other programs, and the quality of education is still often rather poor, there is still an observed general pre-scientific temperament, as people appear to be eternally steeped in religion and old myths, with religious-driven and religious-inspired morals and ethics rule the roost, outdated pedagogical methods are mostly followed, learning by rote is still emphasized over understanding concepts, and practical application of concepts, or the difference between science and pseudo-science is still not fully and properly understood, grasped and comprehended by the masses; there is an immaturity and lack of awareness on the part of policymakers and educational planners. We have many types of competing and rivaling ideologies galore, and also highly warped intellectualism; there is also an inadequate spend on R&D, a poor reward and recognition mechanism for scientists and intellectuals in India, etc. All these factors must be overridden and overcome, before we can hope and aspire to make any meaningful and sustainable long-term progress.

Of course, the very nature and dynamics of various fields in the social sciences must also change for the better; this is what this paper is all about. Intellectuals must also strive to make the world a better place; currently, this is far from happening. We are not even moving in that direction. We do hope and except that someone one day will come up with a test like the Turing test to assess whether or not, social sciences are aligned to social and cultural needs. One simple and acid test could be this: paradigms must make sense to, and work for peoples in all parts of the world. All the points presented in the introduction of this book must also be constantly benchmarked against to see if they are adhered too. There are a lot of people not only in India, but both in the developing and developed world who cannot distinguish science from pseudo-science. But if standards of science are to be improved, and superstition and blind faith fought, scientists, particularly social scientists, must produce science that is of a fundamentally higher quality. This is possible only if scientists are committed to serving society, and all the principles of this paper are followed.

We also believe this would produce intellectual revolutions of sorts particularly in the developing world. The first intellectual revolution from our perspective was the invention of writing, and its concurrent spread in various old world civilizations such as Mesopotamia, Egypt, and the Indus Valley. The second intellectual revolution would refer to the flourishing of science in Ancient Greece, and its unique, stellar, and unparalleled contributions to the whole of human civilization. The third intellectual revolution we believe, could be attributed to the invention of the printing press by Johannes Gutenberg in the year 1436, when knowledge could be widely shared and disseminated. The fourth intellectual revolution we believe, coincided with the renaissance in Europe, while the fifth coincided with the European enlightenment. The sixth intellectual revolution we believe, was due to the second industrial revolution of the late nineteenth and the early twentieth century, when a plethora of new technologies came into being, and people had plenty of spare time at their disposal.

The seventh intellectual revolution occurred when decolonialization occurred, and this set the stage for new and creative intellectual thought in developing countries, though this would unfortunately be marred by dictatorship and socialism for a couple of more decades at least. At least many nations won their political independence during this period. The eighth intellectual revolution occurred due to the present-day version of globalization, the collapse of the Soviet bloc in 1990, and the rise of the internet which proved to be a great enabler and leveler. The ninth intellectual revolution we believe would be attributed to the rise of smart phones and artificial intelligence, while the tenth we believe could be driven by the globalization of science the way we see it, and the emergence of intellectualism and enlightenments in hitherto unrepresented and underrepresented parts of the world. Is there anyone willing to bite the bait? This could be a potential game changer, with many ramifications not just for parts of the world, but for the entire world, indeed provided in is understood and implemented in true letter and spirit. If such a revolution fails to happen, or some other revolution supersedes it, it would be a monumental tragedy because it has

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

already everything going for it. All the essential building blocks have already been put into place.[27]

VII. WHAT IS CULTURE?

One of the earliest definitions of the term culture in a social sciences setting and a social science context was provided by the noted British Anthropologist Edward B. Tylor according to whom. "Culture or civilization when taken in its broad ethnographic sense refers to that complex whole which includes in its fold, various aspects such as knowledge, laws, customs, beliefs and belief systems, morals, arts, and any other capabilities and habits acquired by man as a member of society." According to another eminent Polish-born British Sociologist and Anthropologist Bronislaw Malinowski, "Culture comprises of different types of inherited artefacts, goods, technical processes, ideas, habits and values." The noted American Anthropologist Marvin Harris had stated, "A culture is the total socially acquired life-way or a life-style of a particular group of people. It consists of the patterned repetitive ways of thinking, feeling and acting that are characteristic of the members of a particular society or segment of society." These three definitions would suffice for the time being. For a broader and a more detailed discussion, readers may refer to our various papers on socio-cultural change. There are many attributes for culture, for example, culture is learnt, culture is symbolic, culture propagates, etc. Cultural change may also e gradually be brought about either in a directed or an undirected fashion. This is because culture is seldom static, it gradually evolves and changes with the passage of time. Science can change society too, and so can technology, in unique and in multiple ways. Different paradigms in science change society in different ways, and so can different technologies. For this to happen, societies and cultures must be flexible and adaptive. [28]

We also have several cultural orientations such as past-orientation versus future-orientation, inward-looking cultures versus outward cultures, Rigid versus flexible cultures, individualistic versus collective cultures, material and non-material orientation, contentment versus innovation, rational-orientation versus non rational-orientation, etc. Different cultures may be assessed based on all these parameters, and based on a continuum between two extremes. People is different cultures may possess different mind-orientations too. Therefore, we are essentially living in a multi-speed civilization. Cultural bottlenecks such as the over-sized presence of religious institutions in certain societies may be detrimental to the process of cultural advancement or prove antithetical to the process of cultural integration. Social sciences can also help greatly if they adhere to the concepts of pragmatism and practicalism. Social sciences must not remain a passive and an unfruitful endeavour. Instead it must seek to shape and mould society for the better; we had, in this connection, also spoken about cultural remediation and structured apperception tests for socio-cultural change earlier. We had also reviewed several theories of sociocultural change earlier such as historical particularism, functionalism, evolutionism, neo-evolutionism, social Darwinism, cultural diffusion, culture and personality school, etc. [29] [30]

We had also proposed the symbiotic approach to sociocultural change, according to which cultures could be categorized as dominant or influential cultural systems, non-dominant cultural systems, fringe or marginal cultural systems, closed or autarchic (autarkic) cultural systems, etc. Cultural boundaries also then had to be identified in a way that would make eminent practical sense and facilitate ease of comprehension and administration based on various parameters such as linguistic boundaries, ethnic boundaries, political boundaries, religious boundaries, economic systems followed, etc. Both impacting and absorbing factors had to be understood, and we had explained these as well. Examples of impacting factors include technological superiority and military hegemony, cultural hegemony and soft power, economic Influence, population and population growth, etc. Example of absorbing factors could include technological superiority, perceived superiority, allure or glitz, the solutions they provide to problems, comparison with substitutes, economy, utility and practicality, the cultures own receptivity, etc. From the point of view of this paper, the spread of science and technology has to be understood against the backdrop of this model. That is why we have reproduced and reiterated it here.

The process of cultural symbiosis would comprise many stages such as awareness generation, seeding, acceptance, internalization, feedback, etc. We also described modes such as the push mode, pull mode, push-pull mode, subconscious adoption, etc. Changes may also occur through the top-down mode, the horizontal mode, spatial spread, bottom up mode, changes due to mass mobilization, generational change, functional spread, multimodal spread, etc. There would also be areas of cultural lag, and these need to be identified proactively. The concepts proposed in our paper on the

[27] Talja, Sanna and Pamela J. Mckenzie (2007). Editor's Introduction: Special Issue on Discursive Approaches to Information Seeking in Context, The University of Chicago Press

[28] Attempting Diachronic Extensions of Symbiotic Approaches to Socio-Cultural Change: Developing Techniques to Assess Socio-Cultural Changes Over A Period in Time, Sujay Rao Mandavilli, Institute for the Study of the Globalization of Science, IJISRT, September 2023

[29] Holloway Jr. Ralph L. (1969). "Culture: A Human domain". *Current Anthropology*. **10** (4): 395–412

[30] Anker, Guy (2000) [2000]. *Global communication without universal civilization, vol.1: Coexisting contemporary civilizations: Arabo-Muslim, Bharati, Chinese, and Western*. INU societal research. Geneva: INU Press

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

sociology of science would also naturally help, as also the concepts that we had proposed in our papers on pedagogy. Social sciences would also of course greatly help, provided it is properly attuned to the needs of the present day and time. It must also move away, as far as is desirable and necessary, from mathematical and statistically derived and inspired models such as the Markov chain.

In the recent past, (i.e. particularly in the past few decades), literacy levels have increased by leaps and bounds. This phenomenon and occurrence has been observed not just in India, but in also many other parts of the developing world. In the early years of India's independence primary enrolment in schools was totally neglected leading to low literacy rates. However, after the introduction of Sarva Siksha Abhiyan and other movements, India's literacy rates shot up, and enrolment in schools is nearly universal. This process appears to have taken place briskly and smoothly. However, controversies such as the medium of education remain. Concerns about the quality of education also remain, and also the use of computers, artificial intelligence in education. Progress in these fields is often stymied because of infrastructural bottlenecks such as the absence of a reliable power supply. Education alone may not change everything, but the right kind of quality education can. We are anticipating a lot of progress in future, but conceptual misunderstanding must be sorted out. Pedagogy refers to the science of education. Education levels have greatly increased and improved, yet the science of pedagogy has yet to mature, evolve and change with the times. Pedagogy is not aligned yet with cultural perceptions, and our other concepts such as mind-orientation and cultural orientation. This science falls very much within the realm of the social sciences. For example, many people cannot distinguish yet between science and pseudo science, and are not aware of scientific method. Social science research techniques are seldom used in pedagogy and linguistics, and there is no comprehensive approach to lexical development of non-dominant languages. Pedagogy and linguistics, like many or most other fields of the social sciences, remain a white man's perspective, and are blighted by ivory tower perspectives. We can ask may pertinent and highly relevant questions here; for example, to what extent can the use of computers and artificial intelligence based tools enhance the learning experience? How do power outages and the general unreliability of power supply systems in developing countries block the adoption of new teaching and learning technologies? [31] [32]

Next to pedagogy, historiography can greatly help too, though its potential has barely been realized. We had authored a total of five papers on historiography and qualified historiography, though our core three papers comprise our papers on historiography by objectives, our core principles on historiography, and anthropological historiography. We had proposed a layered approach to historiography, and the identification of stakeholders. We had also proposed a total of thirty-nine core objectives of historiography and forty-nine core objectives of anthropological historiography to drive the process forward. Historiography can be a game changer, and can change many things greatly by driving away pre-scientific notions of history. The past can also offer and hold lessons for the future in many different ways. This is why we had proposed a concept known as DPPF or the dialogue between the past, present and future techniques. This has not been fully grasped too. As Leopold von Ranke once said in this regard, "You have reckoned that history ought to judge the past and to instruct the contemporary world as to the future. The present attempt does not yield to that high office. It will merely tell how it really was."

Cults, ideologies and thought worlds can be greatly modulated and reined in too. This will greatly modulate religion too, but must begin with a cultural assessment, and attempt to change both cultural orientation, and mind-orientation. This process may also make cultures more open and more receptive to science and technology. As of today, and rather unfortunately so, religious-inspired and religious-driven values continue to dominate. For example, Muslims consider the consumption of pork to be haraam or taboo. Some frown upon vegetarianism, which has some virtues, while some non-Muslims promote veganism. This goes far beyond food habits; for example, some countries ban apostasy and atheism both of which are punishable by death. We had discussed all this and much more in a book called "Religion in the twenty-first century and beyond: A social sciences perspective", which was published in Google books in 2024. We had also founded the think tank, "Scholars and intellectuals for mankind", or SCHIMA a few years ago with this singular objective, and have begun to reach out to others as well. We also have a large number of ideologies both scientific and non-scientific to be overcome, and this must become our principal area of focus in the days to come. Such changes are indeed possible, as the caste system in India has whittled down considerably; ethnographic studies must study the process or modernization and westernization (the two are different things) in contemporary and premodern societies. This will throw up valuable cues and insights especially if it is interfaced with a study of the percolation and permeation of science and technology in these societies. We can take up the case study of Saudi Arabia. The Saudis now claim to be technologically savvy, but there is very little scientific temper and very little religious freedom among the masses. For example, even the teaching of evolution there is banned; this kind of reform must go hand in hand with our globalization of

[31] Bruner, J. S. (1960). *The Process of Education*, Cambridge, Massachusetts: Harvard University Press

[32] Bruner, J. S. (1971). *The Relevance of Education*. New York, NY: Norton

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

science movement. Both are indeed two sides of the very same coin. [33] [34]

➢ *Positive And Negative Impact Of Technology*

Technology, which is a practical application of science, has greatly improved the world around us, and has contributed to the betterment of the world. Even in the 1980's, the kind of communicative capacity, and the kind of communicative ability that modern technology has made available and possible for us, would have been inconceivable. People can chat and meet with their friends from all corners of the earth, and from all walks of life in a jiffy, and in real-time, and without any substantial or significant cost. Progress on this front began gradually after the industrial revolution, and the arrival and the invention of the steam engine, and the telegraph, also known as the Victorian internet. The invention of the telegraph is accredited to Samuel Morse who developed early versions of it in the 1830's. By the 1840s, the electrical telegraph had superseded older optical telegraph systems, and began to be widely used as well. By the 1860's, telegraphs were widely adopted by the common public to communicate with each other with an extremely widespread social and economic impact. In 1894, the electric telegraph had led to Guglielmo Marconi's invention of wireless telegraphy, and this became the first means of radiowave telecommunication.

In the 1870's however, travelling was extremely slow by today's standards. In 1872, Jules Verne published his book "Around the world in eighty days", a proposition that was then considered ludicrous. However, it is now possible to circumnavigate the globe in less than a day in a jet plane. The rise of the internet and the smartphone have now made it possible for the common man in the street to access tons and tomes of information at his fingertips in a way that no one might have imagined even in the early 1990's. Modern gadgets have also made life easier for everyone, and medical advances have enhanced human longevity considerably. The impact of science on society has particularly become more pronounced since the rise of information technology and artificial intelligence. Most surveys have repeatedly shown that most people generally view technology positively; however, social sciences in general, have yet to make a major impact on people's lives. This is because as we repeatedly said, old Eurocentric paradigms still persist. The negative impact of technology has been relatively minor, and some concerns have been raised about, the loss of privacy and personal space, and intrusion on everyday life. Chemical warfare was unleashed on a couple of occasions in the early part of the twentieth century, when millions of lives were lost. Concerns of job losses have also surfaced from time to time, and these concerns have become particularly pronounced since the arrival of artificial intelligence. The future of course, remains to be seen.

➢ *Low-Cost Innovation*

In the recent past, several low-cost innovations have emerged to solve the problems of economically weaker sections of the society, with the goal of maximizing social welfare. This has included for example, the creation of low-cost innovation following the value for money theme that is helping to change the lives of millions of people for the better. This technique is also sometimes known as frugal innovation which means creating more with less, and making do with limited resources. This technique also leads to simple, more accessible and user-centric technologies which in all or in most ways, meet their desired on intended objectives. One is reminded of Nirma washing powder in this regard. Way back in the year 1969, one Dr. Karsanbhai Patel, a chemist working at the Gujarat Government's Department of Mining and Geology manufactured for the first time, a low cost synthetic detergent powder which could be sold at a fraction of traditional brands. Haldiram's was founded in 1937 by Ganga Bishan Agarwal, a poor Marwari boy as a sweet, savoury and a snacking enterprise in Bikaner, Rajasthan and has become an international success.

A simple type of barebones, low cost innovation practiced in India, and the rest of the subcontinent is known as Jugaad. One is reminded of the Tata Nano, which unfortunately, did not sell as well as expected, and was a commercial failure. This car was designed to sell for as low as one lakh rupees, or $ 2,500. Other home made or locally made vehicles are sometimes produced in many parts of South Asia in the informal sector, though many are of low quality. In Africa, we had Solar mamas who lighted up the lives of millions with their low-cost solar technology. In 2018, Praveen Vemula, a biomaterials scientist at the Institute for Stem Cell Science and Regenerative Medicine in Bengaluru, had proposed to produce a low-cost gel to protect farmers from the harmful effects of pesticides and insecticides. The case study method also needs to be used wherever and whenever applicable. For example, organic farming was largely successful in the Indian state of Sikkim, while in Sri Lanka, it failed disastrously.

➢ *Science, Technology, And Economic Development*

Science and technology (different forms, versions, and variants of it), can have a profound effect on economics and economic development too. Most economists widely accept the theory that technology is the key driver of economic growth of nations. This is because technological progress allows for the more efficient production of a larger quantity of superior goods and services, thereby leading to prosperity. We however, need some kind of a handshake here, and both

[33] Geertz, Clifford (1993). "Religion as a cultural system". *The interpretation of cultures: selected essays, Geertz, Clifford*. London: Fontana Press. pp. 87–125

[34] Haisch, Bernard *The God Theory: Universes, Zero-point Fields, and What's Behind It All*—discussion of science vs. religion (Preface), Red Wheel/Weiser, 2006, ISBN 1-57863-374-5

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

economist and other social scientist must participate in a formal study of science and technology on economic growth, prosperity and affluence, often through the use of statistical data and mathematical modeling, if required. All technologies may not impact economies the same way; for example, the Ford Model T, of which just of fifteen million examples were built between 1908 and 1927, almost singlehandedly led to the roaring twenties, which was a period of unparalleled economic prosperity in the 1920'. Bad economic policies and bad economic theories led to the Wall street crash of October 1929, and the great depression which was an unrivalled period of economic misery. Therefore, it is not only science and technology, but economic theory which is related to good or poor economic performance in multifaceted ways. Linkages are complex and multidimensional as all these need to be thoroughly grasped and understood before they can be formally studied.

For example, lithium ion batteries changed the world through their widespread adoption in smart phones. However, lithium is not available in large quantities on the earth's surface, and is therefore very price sensitive. Cobalt is also associated with child labour in Congo. Sodium ion batteries promise to be a whole lot cheaper, but presently lack power and range. There are therefore, many complex issues and ramifications involved in science and technologies, and there also relate to economics in many ways. We can keep asking many more questions all the time. Why did the Concorde, a supersonic aircraft, fail? Why did the Airbus A380, a massive aircraft fail? Why are large aircraft carriers not focusing on increasing speed and range of their aircraft? Why is Microsoft not brining out as vastly enriched version of its office suite? When and why does inventor and innovator fatigue occur? What can be done to improve innovation in low-income countries? What is the impact of science and technology on birth rates? What is the impact of birth rates on economic progress? Will the economic benefits of science and technology taper off, after the low-hanging fruit have been absorbed? Will technology continue to progress, or are we already reaching the end of the road? Will we have any more "artificial revelations", (A term coined by Derek Price) and transformative innovations? There are many topics, issues, and angularities to be explored and researched. The sky is the limit literally.

Economic systems can also have an impact on science and technology. For example, science and technology in the Soviet Union served as an important vehicle for the promotion and propagation of communist ideology. This observation can be said to be true right from the time of Lenin, till the dissolution of the Soviet Union in 1990. An extensive reward and recognition system was also instituted by the Soviet Union, though aberrant and mavericks, especially those critical of the government were often severely punished. The noted physical chemist and physicist Nikolay Semenov was the first ever Soviet citizen to have won a Nobel Prize, in 1956 and the mathematician Sergei Novikov was the first Soviet citizen to have won a Fields Medal in 1970. He was followed by Grigory Margulis in the year 1978 and Vladimir Drinfeld in 1990. The Soviets were particularly strong in nuclear physics, and space technology.

Space exploration was also a governmental priority; in October 1957, the Soviet Union launched the first artificial satellite, Sputnik 1, into orbit; in April 1961 a Soviet cosmonaut, Yuri Gagarin, became the first man in space. The Soviets also launched several missions to Venus, such as the Venera missions in the 1970's with mixed success. However, dissent was suppressed in the Soviet Union, and there was zero-tolerance for anti-government activity. The former USSR was noted for its gulags, and many people were mercilessly put to death. Similar programs were put into place during the cultural revolution in China, and the Pol Pot regime in Cambodia. Therefore, many communist regimes collapsed into totalitarian and dictatorial regimes. One is reminded of a quote from George Orwell's 1984, "War is peace. Freedom is slavery. Ignorance is strength." Right wing regimes were not less guilty either. For examples, the Nazis used technologies for devious and nefarious ends during the Holocaust and the gassing of millions of innocent Jews. Likewise, the Herbert Hoover administrations response to the great depression was pathetic and dismal to say the very least; however, Franklin D Roosevelt implemented several of the ideas advocated by John Maynard Keynes. This came to be known as the new deal, and was essentially a form of governmental interventionism. The New Deal comprised a series of programs, public works, and tighter government regulations to rescue the USA from the ill-effects and perils of the Great Depression, and aid in its economic recovery. This contrasted with Herbert Hoover's earlier ultraconservative, and ultimately unsuccessful measures which boomeranged and backfired horribly, both economically and politically on him. Therefore old-style capitalism and economic conservatism had been overridden, and pragmatism had triumphed.

We need economic pragmatism and not economic dogma at all times; this will lead to a faster percolation of science and technology as well among all echelons of society. Marxists have often been extremely dogmatic as well; in India, the license raj era pushed Nehruvian and post-Nehruvian India into the Hindu rates of economic growth which were barely above population growth rates. This observation has now become widely circulated. Marxist intellectualism was also disastrous as we observed previously on many occasions. Refer to our various papers on twenty-first century historiography, and twenty-first century intellectualism for this purpose. These people effectively laid a trap of mediocrity and of bad science (if not outright pseudoscience) just as Hindutva groups and Dravidian nationalists did. We may even not refer to this as the "trap of disintellectualism" caused not just by Marxists but by other vested interest groups as well. This is also something future social science researcher must study and evaluate in depth. This "disintellectualism" is somewhat different from an absence or a lack of innovation, though these

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

could overlap to some degree, and go hand in hand. "Disintellectualism" could be caused by social, cultural, economic, technological, political, and even ideological factors. It is the last set that warrants a thorough and a systematic exploration, as it seldom has been properly studied before.

- *Science, Technology And Business*

Science and technology can affect and impact business positively too. For example, entrepreneurship runs in people's blood and in their veins just as it does in the blood and veins of the Marwari community of north India. However, entrepreneurship can be formally taught to students just as any other form of science can be. Even management and entrepreneurship programs must overcome Eurocentric biases, and must don a global outlook. We had the Café Coffee day launched by VG Siddhartha Hegde, the Sree Annapoorna Sree Gowrishankar chain started by K. Dhamodarasamy Naidu in the 1960's, and the Saravana Bhavan food chain started by P.Rajagopal. The Kentucky fried chicken chain was launched by Colonel Harland Sanders in 1952, after multiple strings of failures. All these did not make use of technology in a big way, but can be studied from our perspective in a big way, at least from the impact they had on the economy and on the innovation landscape.

Alfred P. Sloane reconstituted General Motors, and made it a major commercial success by the 1920's. Sloan is credited with having established annual styling changes in the industry which Ford under the leadership of Henry Ford did not, and from which emanated the modern concept of planned obsolescence. Sloan also established a ladder like pricing structure from the ultra cheap Chevrolet to the expensive Cadillac. Walter P. Chrysler entered that automotive industry rather late, but offered a better car at a better price; he launched his first car in 1924 with innovative features like hydraulic brakes and a top speed of 70 mph or 112 km/h, which people then found extremely astonishing, if not jaw-dropping for a midrange car. Chrysler then launched his low-priced car, the entry-level Plymouth in 1928 to take on the likes of Ford and Chevrolet with some added features that the competition did not provide. The legendary Lee Iacocca was another innovator and marketer par excellence. He name is indelibly associated with iconic products such as the Ford Mustang of the 1960's, but is better known for having turned around the ailing Chrysler Motor Corporation in the 1980's with the launch of a slew of new and revolutionary products such as the minivan and the K-car.

The British too, were not without their own innovations. In 1914, the Vauxhall Prince Henry became the fastest production car in the world with a then impressive top speed of 120 km/h. in 1919, the Bentley 3 liter became the most sought after sports car of its day with a top speed of 144 km/h, and the Jaguar SS100 or 1936 with a top speed of 160 km/h, and the Jaguar XJ120 of 1948 with a top speed of nearly 200 km/h, were highly rated as well internationally. By the 1980's, Japanese cars were all the craze everywhere due to their fuel efficiency, and low maintenance costs. By the 1990's, the Japanese had also revolutionized the world with their lean production techniques and the just in time inventory management technique. The Six Sigma method around the same time had also begun to revolutionize industry. This technique was introduced by Bill Smith in 1986 when he was working for Motorola. All these case studies can be approached multi-dimensionally from both a cultural and a technological perspective. Techniques such as the root cause analysis, and the cause and effect analysis can also be used here. Technology of course, is just a cog in the chain; the downstream impact and the downstream effects of technology also need to be systematically assessed.

We deliberately and intentionally therefore keep most sections of this paper vague. This intended ambiguity is indeed our strength. This is also because other researchers need to work out case studies by themselves, and identify new subfields of study by themselves. We cannot and must not spoon-feed any one. There are many possible areas of study at the intersection of science, technology, society, and culture. For example, we could study the impact of diet and nutrition on intelligence or on reflexes, or even study the fear of flying or the new-found enthusiasm of flying in the 1920's when aeroplanes where a novelty. Additionally, we may also study technology in relation to sources of raw materials or the continued availability of raw materials, technology in relation to environmental, in relation to cultural values or the erosion of cultural values, impact on communication and communicative processes, impact on other downstream technologies, etc. We may also study the awareness of science and technology among the masses, or even the awareness of the history of science and technology, for example.

Much less importantly, we may study the also effect and the impact of Sonja Lang's Toki Pona on communication, study the underlying causes of the failure of Esperanto, or the impact of simplified Chinese and Pinyin on literacy. We can also study the impact of language standardization effects on literacy and language dynamics, if at all there is any correlation. We can also study the impact of different types of languages on language dynamics, a topic of study that is very close to our heart. A study of intercultural and intracultural variations and deviations is also of course, an underlying undercurrent throughout this paper. That is what the globalization of science movement is all about. This can of course yield rich dividends as it will provide us with invaluable grounds-up data on the basis of which important decisions can be taken, and course-corrections can be made, not just in one part of the world, but everywhere. [35] [36]

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ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

➢ *Science, Technology And Geopolitics*

Science and technology in China have both developed at an extremely rapid pace beginning from the 1980s, and this has been nothing short of impressive. China has therefore witnessed an astonishing rate of scientific and technological progress over the last four decades after its economy opened up to the world in 1978. The Chinese government also launched important missions such as the "863 Plan" and the "Strategy for Rejuvenating the Country through Science and Education", which greatly boosted China's scientific and technological prowess, and have even brought it on par with the world's most technologically advanced nations. Some examples of the Chinese government's initiatives have included higher allocation of funds to science and technology, investment in research and development, and disseminating the importance of science and technology among the masses. These measures and initiatives undertaken by the Chinese government were important foundations for boosting the nation's technological socioeconomic competitiveness and progress in turn, also changing the global socioeconomic landscape in the progress. Therefore, the axis of technological, economic, and cultural power is slowly moving to the east.

Many new cutting edge technologies are now beginning to emerge from China, and China is now beginning to take the lead in both basic and the applied sciences. China also now leads in terms of the number of patents granted, and has the highest number of research publications worldwide, (including influential and the most cited ones) followed by the USA, and then by India with a wide margin. The Chinese Academy of Sciences is the world's largest research organisation anywhere in the world today. India has also greatly improved its ranking slowly but surely. India's space mission has drawn plaudits from all over the world, and has become a force to reckon with in the information technology sector. India has also launched the semiconductor mission and the artificial intelligence mission, both of which are poised to transform the technological landscape. The rise of countries like China in science may lead to geopolitical shifts, and countries like India and the USA must collaborate more than ever before. [37] [38] [39] [40] [41]

➢ *Paradigm Shifts In Science*

The term "paradigm shift" was first introduced by the American philosopher of science Thomas Kuhn in his highly acclaimed and widely read book, "The structure of scientific revolutions". A paradigm shift is therefore, a fundamental shift in the way a scientific discipline is practiced. Some of its underlying concepts and core tenets may change in the process, too. This is usually accompanied by an initial dose of resistance, but is eventually widely adopted by all and sundry. This term was initially used in the natural sciences; its scope has however, greatly expanded since to cover many other fields of science as well. The term scientific revolution refers to a period of intense scientific activity, or phenomenal scientific progress such as what was observed during the time of the Ancient Greeks. However, in a strict and in a canonical sense, the "Scientific Revolution" refers to the emergence of modern science during the early modern period, when major breakthroughs in mathematics, physics, astronomy, biology and chemistry changed the scientific landscape completely. These also transformed society, and paved the way for the modern scientific world to emerge.

Many important discoveries and publications were made during the period by eminent scientists such as Nicolaus Copernicus and Sir Isaac Newton. This led to a scientific renaissance, and later, the age of Enlightenment which were systematically studied and thoroughly investigated by Immanuel Kant and others. There have been many important paradigm shifts in science. Important examples were the transition from the Ptolemaic cosmology to a Copernican one, the transition from Aristotelian mechanics to Classical mechanics etc. Charles Darwin's theory of evolution, and Albert Einstein's theory of evolution were likewise, epoch making. The discovery of the Indo-European language family, and radiocarbon dating likewise, had huge downstream effects. In some fields of the social sciences such as philosophy however, paradigm shifts are not so common; instead, we see claims, theories, and counter claims and counter theories in an endless vicious cycle. This is why there is seldom meaningful progress in some fields of the social sciences.

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ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

However, paradigm shifts in science must be accompanied by paradigm shifts in culture, and paradigm shifts in society. These are akin to our ten intellectual revolutions; we must now create the tenth one through the extensive and intensive use of social sciences. This must be accompanied by an alteration of mind-orientation and cultural orientation. Culture-driven approaches are required to bring about social and cultural transformation, and social science research techniques can greatly help, not textbookish ones. Sociological ninety ten rule may help, along with the certainty uncertainty principle for the social sciences – for example, if we see a general correlation between education levels and religiosity, what are the exceptions? Social science researchers must be guided by social responsibility, and must not desire academic freedom where it is irresponsible, and detrimental to the cause of society. The philosophy of science must also change wherever necessary, and we must have practicalism and pragmatism. We must always embrace creative destruction – a concept proposed by Joseph Schumpeter – this is harder to align to society and to culture, because there will always be a cultural lag- a concept first proposed by William F. Ogburn in 1922. [42]

There must also be no Western centric approaches so long as they are detrimental and inimical to scientific activity as a whole. For example, we have had scientists and science fiction writers of the likes of Carl Sagan, Isaac Asimov, and Stephen Hawking talk about space exploration, but were hardly concerned with the plight of their "third world" brethren. SpaceX was founded in 2002 by Elon Musk with the objective of reducing space transportation costs and eventually developing a human colony on Mars. Many others have spoken of the need to colonize Mars, some have even audaciously spoken about the need to transform Venus through the use of special algae. However, more down to earth concerns and considerations were relegated to the background. Examples of this include manmade atmospheric pollution and global warming, concerns about which are only now increasing. There is still no sensitivity towards poverty or the underlying causes thereof, no knowledge of poor countries, etc. Science is not largely linked to and aligned with solving the world's most pressing and urgent problems. People from developing countries can, and must take the lead here. For example, men won't start feminist movement, whites won't campaign for blacks, rich countries won't ask for globalization of science, etc. Many science textbooks, often online encyclopedia still use bombastic jargon and talk down to people. This is particularly true of some fields of science such as statistics.

These may be akin to scientific fallacies which are errors in reasoning, due to either the line of reasoning being flawed, or the objects in the premise of the argument do not align with the objects in the conclusion. Even seasoned scientists may sometimes make logical fallacies and may resort to unsound reasoning. Some scientists may make claims regarding scientific infallibilism; this is highly misleading because all aspects and all facets of science are open to revision. Truth estimation methods may often be wrong, along with their statistical adjunct which is called "Degrees of confidence". There may at times, be cognitive imperfections, cognitive errors, and cognitive biases. Cognitive errors may be made regardless of knowledge and skill levels, due to subconscious influences. This may result in predictive biases, and estimation biases. We may also have different types of fallacies such as ecological fallacies, and exception fallacies. Often, there may be no distinction made between empirical knowledge and putative knowledge. Often, there may be epistemic gaps, and bind spots in science. One such epistemic gap or blind spot in science, we believe, is that various fields of the social sciences have yet to mature and evolve with the times.

For example, we can have a criticism of Okun's law which was first proposed by Arthur Okun. Okun's Law claims a relationship between unemployment and losses in a country's production. According to this law, a 1% increase in unemployment will typically be associated with a 2% drop in gross domestic product or GDP. Whether this is good or universally applicable science, we leave it to the readers to judge. We may also provide and furnish a criticism of Milton Friedman's permanent income hypothesis. According to the permanent income hypothesis in economics, an explanation is sought regarding the formation of consumption patterns as it proposes that consumption patterns are based on future expectations and consumption smoothing. Is this based on hard data and does it take the principle of exceptionism into account? In mathematics and in statistics, we also have the Zip's law, and Zipfian distributions, but these are open to scrutiny, as much as other models such as Markov's model are open to scrutiny. Some other theorems such as the Godel's incompleteness theorem have also been subjected to criticism, but we would look forward to more constructive and formal criticism emerging. Even other theories in economics such as Cournot's Oligopoly theory, and Chamberlain's Oligopoly theory must be subjected to intense scrutiny, as not all theories are perfect. As always, we will state that a formal study of exceptions is sorely and utterly lacking.

- *Is Mathematical And Statistical Modeling Entirely Feasible?*

We also now try to identify whether mathematical and statistical modeling entirely feasible. We believe that while mathematical and statistical techniques can indeed be used not just to model social and cultural change, but also study society and culture in relation to science and technology, this umbrella of approaches will naturally have their limits, and its use must be evaluated on a case by case basis. Before such an exercise

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ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

is attempted to be accomplished, readers must familiarize themselves with our symbiotic approach of sociocultural change which we had already overviewed in an earlier part of this paper. Readers must also be familiar with the idea of a cultural taxonomy. Per our version of a cultural taxonomy, each culture has subcultures, each culture or sub-culture has subcategories or subclasses, each subsystem has components, and each component has attributes.

Cultural attributes may also be known as qualities or characteristics. These are also similar to variables. Attributes may be quantified or otherwise evaluated through the use of suitably-designed questionnaires or other apposite evaluation methods such as self-assessment or external third-party evaluation, and through the use of surveys, interviews, and other techniques. Attributes must as far as practically possible, be identified at a granular level and at a sufficiently high level of detail, which will enable questionnaires to be efficiently generated from them. Attributes may also be rated either in absolute or relative terms which will naturally result either in absolute ratings or relative rankings. Attributes could also include intangible and unquantifiable attributes, or those that cannot be naturally quantified with any degree of precision or certainty. The noted cultural anthropologist A.L Kroeber categorized aspects of culture into two primary and broad categories which were “ethos” and “eidos”. The term “ethos” refer to the intangible values of a culture such as its innate and intrinsic values, aspirations and beliefs, and these must also be included in an analysis. The social and cultural anthropologist C. Kluckhohn also differentiated between the explicit and implicit values of a culture. Explicit values of a culture refer to those values that can be easily and readily perceived and expressed. However, implicit values included elements such as motivations and impulses. From our perspective, an analysis of attributes would eventually to the identification of ‘Cultural traits’.

As a part of this analysis, we must define technological variables, and map them with social and cultural variables or attributes. For example, if we analyze an automobile, it has several characteristics or attributes such as speed, safety, cost, fuel efficiency, range in case of an electric car, etc. These may be termed as technological variables. These variables would naturally always be intrinsic to the technology or the product itself. In case of a 5G technology, we have variables and attributes such as speed, cost and bandwidth. A variable is a number whose value can change, and it can potentially take on a large number of values. We have different types of variables such as independent variables, dependent variables, qualitative variables, quantitative variables, predictor variables, discrete variables, and continuous variables. A variable is said to be independent if it can vary freely and does not fluctuate based on changes in other variables. Changes in technological variables must then be linked to downstream changes and downstream impact in, cultural attributes. For example, if a technology becomes cheaper, the adoption of it increases. If a car becomes faster, it also becomes more useful to its user and to society in general. Although this technique may have limited utility, we do not recommend it unless absolutely necessary, and unless it provides foolproof and consistent results, or does not lead to gross oversimplifications. Wherever possible it must also be used in conjunction with a qualitative analysis. The latter would typically include a detailed narrative, and an impact analysis.

A mapping must also be performed and executed across space and time. Therefore, both diachronic and a synchronic analysis must be adopted, or a combination of the two. Such a detailed and a methodological analysis will yield rich dividends, and allow for more complex analyses to be performed, and generalizations to be drawn. Therefore, the identification of lead regions or areas, and lag regions or areas also forms an essential component of such an exercise. In other words, a slice and dice analysis or a dimension analysis may be performed. The impact of technology on socio-cultural group, and its impact on socio-economic group may also be assessed. We had defined all these concepts in our paper on anthropological economics and had also reiterated them elsewhere. We may also assess the impact by age, impact by gender which is a purely cultural manifestation, and impact by educational level, etc. Therefore, the impact of different technologies on society and culture is different, and the impact of the same technology on different cultures, or different dimensions of the same culture is also different. Therefore, we may have vertical percolation, horizontal percolation (spatial spread), and technologies with both vertical and horizontal percolation. [43] [44] [45] [46]

We may also have early adoption (or adaptors) or a new technology, mainstream adoption, and delayed adoption (laggards) of a new technology which may be studied. This is known as a technology adoption curve. There may also be resistance to a new technology. There would be both impacting factors and absorbing factors which could dictate the pace of technological adoption. We had discussed all of these previously. We may also perform a root cause analysis for the delayed adoption or slow percolation of technology in

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ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24JUL892

some cases. This approach may also be linked to language dynamics wherever possible E.g. Artificial intelligence may have an impact on language dynamics, (a role-based , a function-based and a context-based analysis needs to be performed to assess this) and the impact of technologies on economics must be carried out, just at the impact of vertical or vertical percolation on economics must be carried out. Therefore, economic variables may also be identified, and brought into the mix wherever necessary. We may also adopt generalized approaches, specialized approaches, (study of one particular technology), and super-specialized approach for e.g. a study of the Ford Edsel of 1957-58.

We may also adopt long term view, medium term views, and short term views, and attempt to define generalized principles wherever possible and necessary. We may also quantify positive and negative impacts of different technologies separately, and also round it off with a qualitative analysis. Different types of technologies here could include the invention of fire, writing, horse domestication, bullock cart, steam locomotive and the railway, the telegraph, the telephone, the motor car, etc. We may also study the impact of governmental regulation on technology. For example, we had British horsepower laws, and extremely strict speed regulations in Britain in the early part of the twentieth century. This led to an increase in demand for smaller cars, and eliminated the use of large cars literally. At times, we may also want to ascertain how increasing the speed of a car will have on its overall demand. For this we may use goal seek or what if analysis. We may also use maximin and minmax analysis wherever required. The case study method may also be used, including critical cases, unique cases and revelatory cases. For example, we may analyze why some Indians glorify or exaggerate India's past scientific accomplishments, (the past as a place of reference, not as a place of residence), why electric cars didn't take off in the 1900's, why aeroplane speeds stagnated at 900 km/h, why the Concorde aircraft failed, why the Volkswagen Beetle succeeded in the USA while the Morris Minor did not, Ralph Nader's critique of the Chevrolet Corvair, the negative impact of the usage of coal or public health, public safety, and on the environment, the impact of monopoly or oligopoly on technological progress, the impact of government subsidies, various forms of government incentives, and taxation policy on technology adoption, whether government-driven research is better than private enterprise driven research, the impact of government mandated speed restrictions on vehicle design, etc.

VIII. CONCLUSION

The approach that we had proposed and recommended in this paper, sought to formalize the study of impact of science on society, and institute it as a robust discipline within the social sciences. Among the fundamental constituent principles of this paper was that this approach could be gainfully employed for various aspects and facets of both science and technology, and the differentiation between the two could sometimes be marginal and razor thin. Secondly, we had noted that not all technologies or scientific paradigms would impact society in the same way, or different sections and segments of society in the same way. Therefore, the very nature of the technology, the vertical percolation of science within society needs to be studied along with its spatial spread. Furthermore, the percolation of science and technology across societies may vary, along with its spatial spread within a society. These factors must be juxtaposed with the very nature of a given culture, its more, norms, ethics, morals, cultural receptivity, along with a study of cults, ideologies, and dogmas associated with that culture.

This kind of a bidirectional approach would be extremely useful, and stand us in extremely good stead at all times. We do then hope and anticipate that this paper which extends the concepts of our previously published paper on the "sociology of science", could become a vibrant, dynamic and emergent field of study in social and cultural anthropology with critical and extremely useful inputs from many different sides. We hope it would also be allied and interwoven inseparably with our long-drawn globalization of science movement which was spawned many different papers. Although similar programs do indeed already exist, we believe our approach will take such studies one step further, because our approaches are primarily social science based and society and culture centric. These would therefore meet many new and different objectives that purely quantitative studies cannot. These would also we hope and anticipate, drive both science and technology in the general direction of the betterment of society, and the betterment of culture.