

EXPOSING THE IMPACTS OF SPACE TECHNOLOGY ON HUMANITY

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Abstract

A concerted effort is often mustered by humanity to overcome any traces of crudity and embrace in all ramifications, modernity per excellence. Technology and development in our contemporary dispensation are like siamese twins that have refused to be separated. The impact of space technology in the promotion of commerce, research and military dominances in our world cannot be over-emphasized. Little wonder that there is a mad rush towards keying into the practice, and no nation intentionally chooses to seat at the backseat in the quest for relevance. Several nations are on space race in order to match the level attained by the world powers and if possible topple them without making this effort appear like a contest. The crux of this paper therefore is to briefly expose the intricacies involved in space technology and exploration with a view of identifying the possible impacts on humanity. The methodology this paper adopts is expository.

Keywords: space, technology, humanity, satellite, exploration

Introduction

The planet earth is the primary habitat of mankind and the goal of humanity should be the sustainability of a liveable environment. Journeying along the history lane, one discovers that ingress of man into space has created lots of improvement as well as unforeseen dangers to humanity. The quality of life has been enhanced tremendously especially in the development of satellite telecommunications and weather forecasting. This is a pointer to the words of Olla Philip in the preface to *Space Technologies for the Benefit of Human Society and Earth* that:

It has been over 50 years since the first satellite was sent into orbit, and the impact of space technology can be felt in many aspects in our day-to-day life. In addition to the convenience of knowing exactly where we are on the planet via GPS satellites; or deciding what to pack for a trip based on forecasts from weather satellites; watching CNN in a remote village via broadcasting satellites; there are now some crucial

environmental uses of space technologies in the areas of natural resources management and environmental monitoring. (Olla 2009, iv-vi)

Despite the fact that space technology is often perceived as two sides of a coin, it has become obvious that nations use space activities to gain political, military, scientific and economic advantages among others. There is no gain-saying the fact that this could be the major reason several other nations who showed no interest at the early stage are now making frantic effort to key into the programme. As Lewis James Andrew would say, “space is essential for business, research and military operations.”(Lewis 2014, 1-2) There are satellites for observing the earth which foster global cooperation in natural disaster alleviation activities and the sharing of images from space with all nations. As pleasing as this may sound, despite the closeness and relationship it encourages among nations, the dark sides of these initiatives cannot be ruled out.

The objective of this paper therefore is to examine very briefly the meanings of space technology, space exploration and humanity so as to guide our thought in exposing the possible effects these scientific endeavours could have on humanity. The paper will conclude by highlighting some justifications on the need for space technology and the way of attaining minimal adverse effects on humanity.

Understanding Space Technology and Humanity

The word technology has its etymology in the Greek word *techne*, which deals with functional excellence. What then is functional excellence? By functional excellence, it simply means that an object is good if it fulfils its functional requirements (Makela 2017, 2). The relevance of an object dwells on the fulfilment of its functions. An object that fails to fulfil its functional excellence is therefore bad in itself. For instance, if a hammer fails to drive in nails into a wood, then it has failed in its functional requirement. This is better captured in the words of Socrates when he says, “let us assume that whatever is useful is beautiful” (Hamilton 1980, 1548). Aristotle went further than Socrates to inform us on the category of objects that could count as *techne*. According to him, *techne* is associated with anything deliberately created by humans in contrast to anything not created by them. He deviates from the earlier position by affirming that anything not created by humans is attributed to nature and he denotes nature as the paradigm of functional excellence. In his words: “the absence of chance and the serving of ends are found especially in the works of nature. And the end for the sake of which a thing has been constructed or has come to be, belong to what is beautiful.”(Lennox 2003, xv). The concept ‘space’ can be viewed from different perspectives depending on the context one chooses to interpret it. According to Webster dictionary, space is “the region beyond the earth’s atmosphere or beyond the solar system (Webster 2016, 342). There is the need therefore to combine our understanding of technology and space

so as to help our focus in this paper. Space technology can therefore be defined as the practical applications of scientific knowledge to space which has contributed immensely to our daily lives (Ben-Itzhak, 2022).

It must be noted that scholars have consistently found it difficult to point out any fundamental difference between space technology and space exploration. Using the analogy of car and its four wheels might help us to douse the light of this confusion. The four tyres of the car are parts of the components that make a car what it really is. If one loosens the four wheels, that doesn't imply that the car has ceased to be a car but the absence of the wheels will be conspicuously noticed and the car will be deprived of its mobility. This analogy better soothes the relationship between space technology and space exploration. Space exploration which stands for the car uses astronomy and space technology to investigate the outer space, while space technology is like the wheel of space exploration. Space exploration on the one hand is "the investigation, by means of crewed and un-crewed spacecraft, of the reaches of the universe beyond earth's atmosphere and the use of the information so gained to increase knowledge of the cosmos and benefit humanity" (Longsdon, 2020). Space technology on the other hand is the technology developed by space for spaceflight or space exploration.

Having briefly considered what space technology is, there is the need to delimit humanity. Humankind has always been confined to the planet earth *ab initio*. With that mind-set, the world of humanity was built, raised and preserved on this planet. The launch of the first artificial satellite Sputnik and the space travel made by Yuri Gagarin paved the way for more effort in the activities of the space. One landmark achievement in the 20th century was when humanity left its ancestral home (earth) and explored the surface of another celestial body. The period between 1957 and 1991 saw the dawn of the space age with flights to the planets, footprints on the moon, and global communications (Raitt 2005, 3). It would not be out of place to assume that every effort exerted on nature is intended towards civilization. Civilization and humanity are two words that are often used interchangeably.

Humanity as it were is often referred to as mankind, that is, human beings as a group. This accounts for the reason humanism is generally known to be the belief regarding the human being as the centre and source of meaning and value. As Protagoras would say, "man is the measure of all things; things that are they are and things that are not they are not." (Lawhead 2015, 50). The dictum of Protagoras has been given so many interpretations based on different perspectives. For instance, Plato has interpreted it to mean that there is no absolute truth or knowledge and that truth is relative to the individuals. Here, we have seen this as placing so much importance on man as the centre and source of value and meaning. Man is the apex or echelon in finding meaning and development to the realities around us.

Benefits of Space Technology

The impact of space technology is felt almost in all spheres of life. There is a rising temptation for one to close his eyes to the dark side of this procedure due to the opportunity it has availed humanity. The greatest benefit of space technology to humanity is the generation of new frontiers of knowledge especially in proffering answers to the aged-long questions asked about the nature of the universe. As International Space Exploration Coordination Group (ISECG) would say:

Scientific knowledge acquired from space expands humankind's understanding of nature and frequently unlocks creative and useful earth-based applications for society. In the longer term, the knowledge accumulated over many missions and the expansion of human presence into the Solar System help people gain perspective on the fragility and rarity of life in the Universe and on humankind's accomplishments, potential, and destiny... The wider list of technological benefits encompasses improved solar panels, implantable heart monitors, light-based anti-cancer therapy, cordless tools, light- weight high-temperature alloys used in jet engine turbines, cameras found in today's cell phones, compact water-purification systems, global search-and-rescue systems and biomedical technologies. (ISECG, 2013)

The horizon of human knowledge continues to expand in leaps and bounds with the exploits into space. These exploits gave humankind the privilege to address the fundamental question of the nature of the universe and the need to know that there are no natural limits to human travel. Once upon a time when there was a misconception that the scope of existence of humankind is limited to planet earth, and that the earth was at the centre where all other planetary bodies revolve round it. Such a narrow approach to life began to change when the means of exploring the space began to surface. This is made lucid in the words of Hawking Stephen that “to confine our attention to terrestrial matters would be to limit the human spirit” (Hawking 2007, 69). Space activities therefore are ordinarily not borne out of exploratory zeal but for the practical reason of civilization which propels mankind in his struggle to stay alive.

The revolution experienced in education in which people could communicate in cyberspace through audio, visual and written discourse can be credited to the impact of space technology. Through the Facebook, YouTube, blogs, tik-tok, zoom, twitter, WhatsApp and other social media avenues, one can reveal interests, innermost feelings, core values and straightforward opinions (Bahrain 2013, 2). The advent of space technology gives access to unlimited knowledge. At the snap of one's finger, one could reach out to any grey area of life through the fascinating search engine called *google*. Live programmes taking place in any part of the world can easily be followed in the corner of the room through the television set as well as the mobile phones. There is the means of revealing one's intention or self to millions of people through uploading one's write-up, videos or audio for easy accessibility. By so doing, the room for making new friends with myriads of people becomes the order of the day. This mind-set

fulfils the humanistic theory that “the more you are able to discover about yourself and are willing to share with others, the greater your sense of self-esteem and the more successful you will be in your endeavours” (Bahrain 2013, 3).

Almost every aspect of human civilization has been positively influenced by space communication resources. In the banking and financing institutions, satellite technologies have revolutionized the everyday activities and given it an advanced ways of transaction. As Jeff Greenblatt and Al Anzaldua opine, “satellite communication allows international and long-distance national phone calls, video feeds, streaming media and satellite TV and radio to become routine completely” (Greenblatt and Anzaldua 2020, 10). In the times past, lots of lives and opportunities have been lost as a result of the inability to access the fund lodged in the bank especially after the closing hours of the financial institutions. With the advent of sophisticated applications for mobile and internet banking, there is an unlimited access to one’s fund to enable any form of business or personal transactions.

Another benefit of space technology that deserves mentioning is telemedicine, which is believed to have started in the 1950’s when some hospitals and university medical centers sought for a way to share information and images through telephone. Telemedicine allows health care professionals to diagnose and treat patients at a distance using telecommunications technology. This practice is used to connect doctors to rural or hard-to-reach areas where medical specialists are not readily available. Little wonder that Kakkar sees telemedicine as “the capacity to practice medicine and provide medical consultation and teaching at a distance through the use telecommunications, telemetry, and teleoperators” (Kakkar 2010, 8-10). It involves the use of electronic communications and software to provide clinical services to patients without an in-person visit. It can also be used for follow-up visits and management of chronic conditions in patients (CHIRON: Telemedicine).

There is no gain-saying the fact that space-based technologies have played a prominent role in advancing comprehensive health objectives. In the global and public health realms, space technology and space-based research play a crucial role in supporting decision-making and improved care in the health sector. The information from remote-sensing technologies can be used to “monitor disease patterns, understand environmental triggers for the spread of diseases, predict risk areas and define regions that require disease-control planning” (Economic and Social Council, 2020). As it has been argued, spacing monitoring is one of the best ways of monitoring the spread of diseases especially those diseases that are airborne. The applications of satellite technology in this field of medicine include tele-health, health mapping and disease surveillance structures. The scope of satellite technology goes beyond covering the monitoring of infectious diseases but also enables medical research that would have been difficult to conduct in a physical milieu.

In the field of agriculture, the importance of space technology cannot be over-emphasized. Space technologies have been vital farming innovation and natural resources management especially in the developed countries as a result of the high expenses involved. A country that uses space-enabled agricultural engagement gives much support to the agricultural ministries with a view of improving adequately the food supply. For instance, the World Meteorological Organization provides weather and drought forecasting to farmers to enable them have a better planning in their cultivation of their crops. Crops cultivated are monitored through the satellite against attacks from invaders and pests (Economic and Social Council, 2020).

The world would not have become a global village without the introduction of space technology. As earlier mentioned, the satellite installed in the space through technology avails us the opportunity to reach out conveniently without being physically present. The use of dynamic design generated by hybrid terrestrial and satellite networks can be efficiently used in internet applications for easy communications. The use of a satellite link in a network for various types of internet applications provides access to different information. As Kakkar would say, heavy multimedia applications such as video conferencing, distance learning, or telemedicine will see the greatest benefits from the use of internet (Kakkar 2010, 8-10)

Exposing The Effects of Space Technology

Just like in all science endeavours, the mission of space science is to discover the unknown and gather information that improves how we do things. To explore is to travel for the purpose of discovery. In discovering, should science be used as a means to an end or as an end in itself? There is no gain-saying the fact that the use of scientific knowledge helps us to proffer solutions to some of the problems that had lived with mankind from cradle. The current of growth runs more smoothly if skilled scientific thinkers set the research priorities within boundaries set by informed citizens on the ethical restraints of the knowledge. Space exploration creates wide opportunities to solving the modern problems and creates better opportunities to enjoy a comfortable living.

Despite the benefits space technology has brought to humanity, we cannot close our eyes to the dark side of this accomplishment. One of the dangers of venturing into space technology that is often given a second thought is the fact that many lives have been lost in the process. Sending a human person into the space, besides being wary of the safety of the person's life and it is equally a very expensive endeavour. In order to forestall the loss of more lives into this unavoidable venture, scientists saw the need to introduce the use of robotic exploration. According to Claude Piantadosi, "robotic hardware costs a tenth of what manned hardware does, and it can yield truly spectacular planetary data leading to a better understanding of the origins of our Solar System and life on our planet" (Piantadosi 2012, 18). If human lives can be saved even at a cheaper rate in a bid to have full access to space technology, then

it will be rational to settle for robotic exploration of the space rather than subjecting humans to unnecessary danger.

There is always the temptation to believe that the challenges of human exploration of space can easily be managed through technological and biological innovations. Some radiation physicists have come to accepting the reality that overcoming the problem posed by cosmic radiation seems practically impossible, but can be kept ‘as low as reasonably achievable.’ This aphorism goes by the NASA acronym ‘ALARA (Piantadosi 2012, 18). These radiations have adverse effects on the human system, causing lots of diseases such as cancer, cataracts, brain degeneration, vascular diseases and birth defects. Radiations interact with the molecules in living systems and modify them chemically so that they do not function properly. One of the common knowledge of the effects of space technology, despite the titillating benefits it obviously brings is that of the depletion of the ozone layers which would expose humanity to the direct effect of the ultra violet rays (Wuebbles 2023, 15). This makes the planet vulnerable to some fundamental challenges that are environmental, technological and humanitarian.

When there is space exploration with the aim of achieving success in the area of space technology, the effects of these actions are not selectively felt but are laden with disparities. It is a common knowledge that the advancement in technology varies from one country to another. The developing countries occupy the lowest rungs of the ladder of advancement in technology. It accounts for the reason why there is inequitable distribution of the proceeds of the natural resources and lack of universal access to information technology. This is what Olla Philip referred to “digital divide” (Olla 2009, 5-10). In the midst of the digital divide, every country appears to be struggling to meet up with the set goals in eradicating basic developmental issues. At the turn of every year, decade and even millennium, there is the need to measure the attainment of the set goals. Little wonder the Millennium Development Goals (MDGs) was put in place. The MDGs are a “set of time-bound, measurable goals and targets that are global as well as country-specific for combating poverty, hunger, illiteracy, environmental degradation and discrimination against women” (Olla 2009, 5-10). In order to attain this feat, some low-cost applications have abounded such as e-commerce, distance education, telemedicine and e-governance, which could possibly improve the quality of life. This is made lucid in the words of Olla Philip that:

the impact of space technology is ingrained in society providing a host of important established services such as communication, radio, television, weather forecasting, and navigation, there are a growing number of emerging applications such as emerging broadband services, agricultural, land and sea monitoring, and telemedicine. These emerging space applications can potentially provide enormous opportunities to reduce social and economic inequalities; support sustainable rural wealth creation by overcoming barriers of geographic isolation, along with

providing access to information and in communication services at affordable costs
(Olla 2009, 5-10)

As succinctly as the words of Olla Philip may have been delineated, the impact of space technology on humanity becomes a great concern, both on the positive and negatives sides. The advancement in technology has been so enormous despite the environmental degradation it might be causing. There is therefore a continuous research on using space technology to foster risk management ability for early warning and forecasting the occurrence of natural or man-made disasters such as windstorms, floods, forest fires, earthquakes, volcanoes, landslides and oil spills (Gonzalo 2009, 236). The need to incorporate space technology into disaster monitoring was borne out of the world-shaking disasters such as Tsunami that took thousands of lives. If there was a monitoring technology that could have foretold the disaster before happening, the disaster may have been averted or minimized, and by so doing, lives will be saved. The world has transcended the days of crudity where humans made use of simple tools in carrying out their tasks. There is the need to rise to the challenges of technology by cushioning the resultants effects and if possible, curb them.

However, it must be noted that the benefits of space technology are not evenly distributed among the different countries due to the paucity of funds on the parts of some nations, which makes them not to be fully involved or not involved at all. With or without full involvement, whatever hazard that is borne is not based on the involvement of the individuals because it is generally experienced. The highest bidder enjoys the fullness of the advantage of space technology, putting profit first at the expense of the environment while the effect is shared by all and sundry. Our dependence on space technology is enormous that any major disruptions of our access to this technology can be detrimental to our lives. The challenges posed by the use of lower earth cannot be equated with that of the exploration of the space. As Mortillaro puts it:

While space junk may seem inconsequential, the threat it poses to our daily lives is real. We largely take the importance of satellites for granted, but we have come to depend on them for anything from communications to weather monitoring to GPS. If you use a cell phone, you are dependent on satellites (Segobaesto 2018, 39).

There is a strong interplay between climate change, human activities and the state of the natural resources. Climate change happens to be modifying the weather condition which leads to warmer earth and which by consequence has effects on the natural resources. Space technology has been employed as a means of minimizing and possibly curbing these effects of climate change on human activities and natural resources by putting in place a wide variety of satellites and their ground systems. For instance, meteorological satellites are used for weather predictions to bring about substantial gain in the management of agriculture; satellite data being used in the monitoring of water bodies for detecting man-made or natural pollutants (OECD Space Forum, 2008). Technology used within the lower earth brings succour to humanity but at the same time tampering with the climate change. We cannot decide

otherwise to jettison the use of technology because it has become a part of the identity of humanity. The need to manage the effects and risks pushed researchers into space technology in order to increase the standard of living and at the same time, monitoring the risks the use of technology brings upon the environment. For instance, Satellite tracking of massive weather systems, like blizzards and hurricanes, provides early warnings that save lives. Other satellites identify and track emerging problems before they become critical, such as the size of the ozone hole in the stratosphere or the rate of the melting of the Greenland ice sheet from climate change (Lubchenco and Hayes 2012, 111-115).

Conclusion

Approaching the issue of space technology and its resultant effects on humanity might be likened with the analogy of an actor playing the dual role of a hero and the villain at the same time. At the first thought, this analogy sounds odd and may generate a lot of thought-provoking questions on our mind but a careful consideration might assist to have a full grasp of this weird correlation. It is a common knowledge that since the advancement in technology, life has become more convenient and one feels more secure with every area of life for both personal and business reasons. In today's world, life without space technology is futile and purposeless. At the same time, we cannot forget in a hurry, despite the inevitability of this technology, that there are some hazards its use has brought. The inevitability of technology makes it a hero and the consequent hazard it might bring makes it a villain. The current risk monitoring management could help to turn its supposed villainy into heroism.

To make it more succinct, during the industrial revolution, technology gains more dominance and there was a complete turn-around in the lifestyle of the people. Sophisticated machines emanated and are still emanating, which releases fuel fossils combustion into the atmosphere that are responsible for the global warming. The global warming is one of the causes of the natural disaster happening around the world. With the introduction of space technology through the exploration of the space, dangerous radiations are parading the atmosphere which are capable of causing many health challenges. All these have been reduced to the barest minimal with the use of space technological gadgets that could monitor these disasters before they occur.

No nation would imagine to be bereft of space technology especially when the world is ravaged with pandemics of corona virus. Satellites technology has helped in reducing the rate of physical contacts where countries now embrace virtual realities, with meetings being virtually held. The heroism of space technology lifted humanity *ab-initio* from the Stone Age even though it was not without a cost. Its heroism once again helps to check the villainy but devising the means of reducing them to the barest minimal. To say that space technology has come to stay is like stating the obvious but there will be need to place on the front burner the benefits it brings upon humanity rather than cost humanity would pay for embracing it.

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