Technological Innovations and Allied Ethical Trepidations

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ABSTRACT

Advancements in technology usually do not raise ethical or moral issues. Instead it is the application of these developments which raises some ethical questions; from the perspective of history, almost any use of a product of technological innovation can be made into a moral issue. Although the development of science and technology has a lot of advantages especially in the present context of knowledge-based technology, the questions of moral values and ethics are essential. Regardless of how well intended innovation and development of new technology have an ethical dimension. There is therefore, an increasing need for emphasis on the teaching of values, moral and ethics in institutions of higher learning alongside technical subjects. This paper examines the ethical implications in three broad thematic areas namely; information communication technology and the Internet, climate change and global warming and agricultural biotechnology. The paper therefore is an attempt to explore ways of minimizing the negative and adverse impact of science and technological advancement through ethical education in Kenya's institutions. The paper is hinged on the concept of humanism in ethical philosophy which elevates the individual to the global level to preserve the environment and all therein. Ethical philosophy avoids possibilities for biological or nuclear conflicts, alleviates poverty, and faces the challenge of extremism, terrorism and intolerance. In other words, science and technological education should be guided by the humanism philosophy which is concerned with an ethical life. It emphasizes that human worthiness should be valued and technological innovations should be utilized while enhancing the dignity associated with the human person thus making novelty and scientific discoveries of greater value to humanity.

Key Words: Ethics, Morality, Innovations, Information Communication Technology, Climate change , Global warming and Agricultural biotechnology.

INTRODUCTION

Background information

Although the development of science and technology has a lot of advantages especially in the present context of knowledge-based technology the questions of moral values and ethics keep popping up. Ethics is a system of moral principles. Ethics is concerned with what is good for individuals and society and is also described as moral philosophy. The term, according to *Webster's Third New International Dictionary* is derived from the Greek word *ethos* which can mean custom, habit, character or disposition. Ethics covers the following dilemmas:

1. How to live a good life
2. Our rights and responsibilities
3. The language of right and wrong
4. Moral decisions – what is good and bad?

Our concepts of ethics have been derived from religions, philosophies and cultures. They infuse debates on topics like abortion, human rights and professional conduct. Philosophers nowadays tend to divide ethical theories into three areas: meta-ethics, normative ethics and applied ethics. Meta-ethics deals with the nature of moral judgement. It looks at the origins and meaning of ethical principles. Normative ethics is concerned

with the content of moral judgemental and the criteria for what is right or wrong. Applied ethics looks at controversial topics like war, animal rights and capital punishment.

(Hans, 2003) observes that it is often held that technology itself is incapable of possessing moral or ethical qualities, since "technology" is merely tool making. But many now believe that each piece of technology is endowed with a radiating ethical commitment all the time. This ethical commitment is entered into by those who decided how it must be made and used. Whether merely a lifeless amoral 'tool' or a solidified embodiment of human values "ethics of technology" refers to two basic subdivisions:

1. The ethics involved in the development of new technology—whether it is always, never, or contextually right or wrong to invent and implement a technological innovation.
2. The ethical questions that are aggravated by the ways in which technology extends or curtails the power of individuals—how standard ethical questions are changed by the new powers.

In the former case, ethics of such things as computer security and computer viruses asks whether the very act of innovation is an ethically right or wrong act. Similarly, does a scientist have an ethical obligation to produce or fail to produce a nuclear weapon? What are the ethical questions surrounding the production of technologies that waste or conserve energy and resources? What are the ethical questions surrounding the production of new manufacturing processes that might inhibit employment, or might inflict suffering and poverty in the third world nations?

In the latter case, the ethics of technology quickly break down into the ethics of various human endeavors as they are altered by new technologies. For example, bioethics is now largely consumed with questions that have been exacerbated by the new life-preserving technologies. New cloning technologies and new technologies for implantation. In law, the right of privacy is being continually attenuated by the emergence of new forms of surveillance and anonymity. The old ethical questions of privacy and free speech are given new shape and urgency in an internet age. Such tracing devices as RFID (Radio-frequency identification) which is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader, and may be embedded in the tracked object. Biometric analysis and identification, genetic screening, all take old ethical questions and amplify their significance. (Kristin, 2003).

THEORETICAL CONSIDERATIONS

The paper is anchored on humanism ethical philosophy. Humanism is a philosophical and ethical stance that emphasizes the value and agency of human beings, individually and collectively, and generally prefers critical thinking and evidence (rationalism, empiricism) over established doctrine or faith (fideism). The meaning of the term *humanism* has fluctuated, according to the successive intellectual movements which have identified with it. Generally, however, humanism refers to a perspective that affirms some notion of a "human nature" (sometimes contrasted with anti-humanism). In modern times, humanist movements are typically aligned with secularism and with non-theistic religions. Over the years, various shades of humanism have emerged. Renaissance humanism for example is the spirit of learning that developed at the end of the Middle Ages with the revival of classical letters and a renewed confidence in the ability of human beings to determine for themselves truth and falsehood. On the other hand, western cultural humanism is a good name for the rational and empirical tradition that originated largely in ancient Greece and Rome. It evolved throughout European history, and now constitutes a basic part of the Western approach to science, political theory, ethics, and law, (Davies, 1997). Christian humanism is defined by *Webster's Third New International Dictionary* as "a philosophy advocating the self-fulfilment of man within the framework of Christian principles." This more human-oriented faith is largely a product of the Renaissance and is a part of what made up Renaissance humanism.

Secular humanism is an outgrowth of eighteenth century enlightenment rationalism and nineteenth century free thought. Many secular groups, such as the Council for Secular Humanism and the American Rationalist

Federation, and many otherwise unaffiliated academic philosophers and scientists, advocate this philosophy. Finally, religious humanism largely emerged out of Ethical Culture, Unitarianism, and Universalism. Today, many Unitarian Universalist congregations and all Ethical Culture societies describe themselves as humanist in the modern sense.

The paper therefore finds inspiration in philosophical humanism which is centred on human need and interest. Sub-categories or shades of this type of philosophy include Christian humanism and Modern humanism. Technological advancements should consider the place and dignity of the human person for such technologies to be meaningful in respecting the dignity of the human person. Humanists recognize the existence of moral dilemmas in technological advancements and the need for careful consideration of immediate and future consequences in moral decision making, (Davies, 1997).

Humanism therefore, is a philosophy of compassion concerned with meeting human needs and answering human problems for both the individual and society. This philosophy recognizes that we live in a natural universe of great size and age. That we evolved on this planet over a long period of time, that there is no compelling evidence for a separable "soul," and that human beings have certain built-in needs that effectively form the basis for any human-oriented value system that must not be eroded by technological endeavours.

Ethical considerations in innovations

Technological Innovation is generally good ethically, because they are aimed at allowing us to do new and desirable things for the benefit of the human race. Most typically, the desire for new things gets expressed in the painfully vague ambition to 'raise productivity.' (Mirman,1989). Accelerating our rate of innovation is a worthy policy objective because we want to be more productive as a society, to increase our social 'wealth' in the broadest sense. The 21st century has seen a phenomenal burst of innovation and increases in well-being, exemplified not least by the fact that life expectancies in Africa have risen in recent years. The extension and enriching of human lives are good goals, which in turn make innovation generally a good thing. Innovation therefore is a moral obligation.

Boosting productivity through innovation is a key ingredient for making progress in that regard. (Kristin, 2003). Businesses today are technology and innovation driven. There is huge competition in the sphere and therefore like other industry or business functions, ethics is essential here also. Every day we have innovative products and services that announce their arrival in the market place and others that go obsolete. It is this technology and innovation that leads to ethical issues, considering the competition to stay ahead by innovating is immense. Issues like data mining, invasion of privacy, data theft and workplace monitoring are common and critical, (Vallero, 2012). In technology we speak of ethics in two contexts; one is whether the pace of technological innovation is benefiting the humankind or not, the other is either severely empowering people while choking others for the same. Technology, for example, has drastically replaced people at work.

In the first case we are compelled to think about the pace at which technology is progressing. There are manifold implications here, be it things like computer security or viruses, trojan and other related spam that invade the privacy of people or the fact the technology is promoting consumerism with no regard for the dignity of humanity. With the advent of internet technology the world has got interconnected and data can be accessed remotely by those who are otherwise unauthorized to do the same. This is one of the pitfalls of innovation. The other one i.e. the pace of technological change also raises the question of ethics. New products make their way and leave the existing ones obsolete. In fact technological change and innovation is at the heart of consumerism, which is bad for economy, environment in general and has little regard for humanity. Increasingly technological products are adding up to environmental degradation, (Huesemann, 2011).

The other major issue in technology that brings in ethics is interface between technology and the computers. Many scientists are of the opinion that the world will come to an end with a war between the human kind and

the technology. Technology, they say will advance to an extent beyond the control of those who have made it, (Mirman, 1989). Technology has replaced people at work and made certain others redundant. New manufacturing processes are outsourced and either replace manpower or the processes are engaged for cheaper prices. Technology has also made inroads into the field of medicine and health care. New cloning techniques, genetic modifications or other life saving drugs need continuous monitoring and surveillance as they raise ethical issues. Bioethics has thus emerged as ethics in the field of medical technology.

Ethics in Information Communication Technology and the Internet

In this era of computer "viruses" and international spying by "hackers" who are thousands of miles away, it is clear that computer security is a topic of concern in the field of computer ethics. Malicious kinds of software, or "programmed threats", provide a significant challenge to computer security and information communication technology. These include "viruses", which cannot run on their own, but rather are inserted into other computer programs. "Worms" which can move from machine to machine across networks, and may have parts of themselves running on different machines. "Trojan horses" which appear to be one sort of program, but actually are doing damage behind the scenes; "logic bombs" which check for particular conditions and then execute when those conditions arise; and "bacteria" or "rabbits" which multiply rapidly and fill up the computer's memory.

Another major risk to computer security is the so-called "hacker" who breaks into someone's computer system without permission. Some hackers intentionally steal data or commit vandalism, while others merely "explore" the system to see how it works and what files it contains. This kind of threat was readily alleged in the 2017 Kenyan general elections where computer servers were blamed for the manipulation of the final results in favour of a particular presidential candidate. However every act of hacking is harmful, because any known successful penetration of a computer system requires the owner to thoroughly check for damaged or lost data and programs. Even if the hacker did indeed make no changes, the computer's owner must run through a costly and time-consuming investigation of the compromised system (Spafford, 1992).

The variety of privacy-related issues generated by computer technology has led philosophers and other thinkers to re-examine the concept of privacy itself. Since the mid-1960s, for example, a number of scholars have elaborated a theory of privacy defined as "control over personal information" (Westin, 1967). On the other hand, philosophers Moor and Tavani have argued that control of personal information is insufficient to establish or protect privacy, and "the concept of privacy itself is best defined in terms of restricted access, not control" (Tavani et al, 2001) Nissenbaum has argued that there is even a sense of privacy in public spaces, or circumstances "other than the intimate." An adequate definition of privacy, therefore, must take account of "privacy in public" (Nissenbaum, 1998). As computer technology rapidly advances — creating ever new possibilities for compiling, storing, accessing and analysing information — philosophical debates about the meaning of "privacy" will likely continue (Johnson, 1985).

Questions of anonymity on the internet are sometimes discussed in the same context with questions of privacy and the internet, because anonymity can provide many of the same benefits as privacy. For example, if someone is using the internet to obtain medical or psychological counselling, or to discuss sensitive topics (for example, AIDS, abortion, sexually transmitted disease etc), anonymity can afford protection similar to that of privacy. Similarly, both anonymity and privacy on the internet can be helpful in preserving human values such as security, mental health, self-fulfilment and peace of mind. Unfortunately, privacy and anonymity also can be exploited to facilitate unwanted and undesirable computer-aided activities in cyberspace, such as money laundering, drug trafficking, terrorism, or preying upon the vulnerable (Marx, 2001).

One of the more controversial areas of computer ethics concerns the intellectual property rights connected with software ownership. Some people, like Richard Stallman who started the Free Software Foundation, believe that software ownership should not be allowed at all. He claims that all information should be free, and all programs should be available for copying, studying and modifying by anyone who wishes to do so

(Stallman, 1993). Others argue that software companies or programmers would not invest weeks and months of work and significant funds in the development of software if they could not get the investment back in the form of license fees or sales (Johnson, 1992). Today's software industry is a multi-billion dollar part of the economy; and software companies claim to lose billions of dollars per year through illegal copying ("software piracy"). Many people think that software should be owned, but "casual copying" of personally owned programs for one's friends should also be permitted (Nissenbaum, 1995). The software industry claims that millions of dollars in sales and jobs are lost because of such copying. It is evident therefore the whole area of computing bears significant ethical concerns.

Ethical implications of Climate change and Global warming

The earth's climate is dynamic and always changing through a natural cycle. What the world is more worried about is that the changes that are occurring today have been speeded up because of man's activities. These changes are being studied by scientists all over the world who are finding evidence from tree plantations, pollen samples, and sea sediments. The causes of climate change can be divided into two categories – those that are due to natural causes and those that are created by man.

The Industrial Revolution in the 19th century saw the large-scale use of fossil fuels for industrial activities. These industries created jobs and over the years, people moved from rural areas to the cities. This trend is continuing even today. More and more land that was covered with vegetation has been cleared to make way for houses. Natural resources are being used extensively for construction, industries, transport, and consumption. Consumerism (our increasing want for material things) has increased by leaps and bounds, creating mountains of waste. Also, our population has increased to an incredible extent. All this has contributed to a rise in greenhouse gases in the atmosphere. Fossil fuels such as oil, coal and natural gas supply most of the energy needed to run vehicles generate electricity for industries, households, etc.

The energy sector is responsible for about ¾ of the carbon dioxide emissions, 1/5 of the methane emissions and a large quantity of nitrous oxide. It also produces nitrogen oxides (NOx) and carbon monoxide (CO) which are not greenhouse gases but do have an influence on the chemical cycles in the atmosphere that produce or destroy greenhouse gases (Kinderlerer et al, 2003). This evolving situation rises paramount ethical concerns.

Specifically, however, Technological innovations have directly contributed to climate change a fact that raises a number of ethical issues. Electricity is the main source of power in urban dwellings. All our gadgets run on electricity generated mainly from thermal power plants, (Gardiner, 2006). Cars, buses, and trucks are the principal ways by which goods and people are transported in most of our cities. These are run mainly on petrol or diesel, both fossil fuels. – We generate large quantities of waste in the form of plastics that remain in the environment for many years and cause damage. We use a huge quantity of paper in our work at schools and in offices. Timber is used in large quantities for construction of houses, which means that large areas of forest have to be cut down.

A growing population has meant more and more mouths to feed. Because the land area available for agriculture is limited (and in fact, is actually shrinking as a result of ecological degradation), high-yielding varieties of crop are being grown to increase the agricultural output from a given area of land. However, such high-yielding varieties of crops require large quantities of fertilizers; and more fertilizer means more emissions of nitrous oxide, both from the field into which it is put and the fertilizer industry that makes it. Pollution also results from the run-off of fertilizer into water bodies. This current situation raises ethical concerns about global climate change which encompass concerns about impacts on future generations, including distant future generations.

We speak here not only of our children and their children, but of the generations who will be increasingly ravaged by climate change effects. Scientifically speaking, some climate change models predict a rise in average temperatures and sea levels that may continue over a thousand years posing the larger question of

sustainability. Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Ethical concern about future generations is sparked by the awareness of the ability of present generations to harm future generations, by leaving them with more limited resources or opportunities than their predecessors had enjoyed and therefore with more burdens and risks to face. In addition, the present generation is always in a position to close down and delimit options that the future generation otherwise would have had, (COMEST, 2005). It is obviously unacceptable to put a future generation in a position to have to make tragic choices that it otherwise would not have had to face. As such, consideration of future generations is an essential element of the total ethical response to climate change. Implicitly, Climate change and Global warming have vital ethical considerations.

The Ethics of Agricultural Biotechnology

Through the age of technology, scientists have been able to develop more precise and powerful tools to produce crops and animals with selected traits that aim to benefit farmers and consumers. While merely a scientific tool, biotechnology has instigated worldwide debate and confusion as a result of mixed messages from various people – be they scientists, academics, activists, industry, religious representatives or consumer bodies. The worldwide debate on the pros and cons of biotechnology has been likened to a battleground and a prominent place for virtually every ethical concern. It has stirred conflicting ideas and opinions and has polarized sectors not only among stakeholders but even between countries.

While agriculture has long been a topic of philosophical, religious and political reflection, it is only in the late 20th century that systematic thinking about the values and norms associated with the food system, such as farming, food processing, distribution, trade, and consumption, began to be discussed in the context of agricultural ethics (CAST, 2005). In addition, by placing biotechnology in the light of globalization, societal debate has moved towards a discussion of ethical and social impacts (Paula, 2010).

In 2000, the Council of Europe Parliamentary Assembly recommended that it was increasingly important to include ethical considerations centred on humankind, society and the environment in deliberations regarding developments and applications in biotechnology, life sciences, and technology. A year later, the United Kingdom's Royal Society Report asserted that "public debate about genetically modified food must take account of wider issues than the science alone" (Kinderlerer et al, 2003). Ethics in agricultural biotechnology therefore encompass value judgement that cover the production, processing, and distribution of food and agricultural products. The Food and Agriculture Organization of the United Nations asserts that ethical values determine its reason for being – these being the values for food, enhanced well-being, human health, natural resources, and nature (FAO, 2001).

Many of the ethical issues that form part of the biotechnology debate can apply also to food and agricultural systems in general. Accepting the need to understand and tolerate societal norms or beliefs, many statements of concern are often general and broad with little explanation about what makes them disagreeable or wrong. Examples of such are issues more clearly articulated by Kinderlerer et al (2003); CAST (2005); the Food and Agriculture Organization of the United Nations (2001), and Thompson (2001). Genetic modification is said to involve human intervention into creation and hence, is an unnatural act. Often viewed as a religious question, it avers that the technology is "so intrusive to life processes that they amount to a form of disrespect for humanity's proper relationship to nature, a form of playing God" (Comstock cited by CAST, 2005). Some religions ascribe a particular "essence" to each living organism and hence, connect the concept of gene with the idea of essence. Others believe that biotechnology disrupts natural order and violates the limits of what humans are ethically permitted to do. Alternatively, there is the view that science and progress are good things and are God-given faculties to help mankind support life and better manage the environment.

The religious sector, notably the Roman Catholic Church and the Muslim faith, have voiced their views on biotechnology. Islamic scholars note that Islam is not in contradiction to the development of science and technology if it is intended for the betterment of mankind and does not harm the environment. Biotechnology, in particular, becomes an issue when it entails a discourse on food. Any GM food must meet the general criterion of *halalan tayyiban* which means "permissible from the sharia perspective (halal) and of good quality (tayyib)". In Malaysia, there is a fatwa (religious decree) that states that GM foods with DNA from pigs are haram (not permissible) for Muslims to eat. To date, only this *fatwa* has been issued (MABIC, 2004).

For the Roman Catholics this concern is articulated in the Jubilee of the Agricultural World Address of John Paul II in 2000 which mentioned that in agricultural production or in the case of biotechnology, it must not be evaluated solely on the basis of immediate economic interest but through rigorous scientific and ethical examination (Vatican, 2000). By October 2004, the Pontifical Council for Justice and Peace released the Compendium of the Social Doctrine of the Church which is an "overview of the fundamental framework of the doctrinal corpus of Catholic social teaching." Biotechnology is mentioned as having powerful social, economic, and political impact but that it should be used with prudence, objectivity, and responsibly (Vatican, 2000).

COMEST (2005) suggests the need to institutionalize agricultural ethics. This involves a deliberate move to include some consideration of ethics in the actions, decisions, and policies that stakeholders in the food system create or support. Each stakeholder has to "accept the fact that that if ethical issues are going to be understood, and if ethical conflicts are going to be resolved, it is our responsibility, within the limits of our place in the system, to understand and contribute." COMEST (2005).

CONCLUSION AND RECOMMENDATIONS

When considering the ethics of technological innovations, the central issue is whether the technology considers the pursuit of the greatest good together with the concept of sustainability. Specifically, technological innovations linked to the internet in general as well as the whole area of computing bears significant ethical concerns. Technological innovations have directly contributed to climate change a fact that raises a number of ethical issues while ethics in agricultural biotechnology encompasses value judgements that cover the production, processing, and distribution of food and agricultural products.

In a nutshell technological innovations should embrace the following 3 ethical considerations;

1. The central ethical principal in technological innovations ought to be respect for human dignity, integrity and welfare,
2. Technological innovations must respect the human right to life,
3. Technological innovations should encompass the principle of beneficence. This principle is also related to the principle of utility, which states that we should attempt to generate the largest ratio of good over evil in our daily actions and activities.

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