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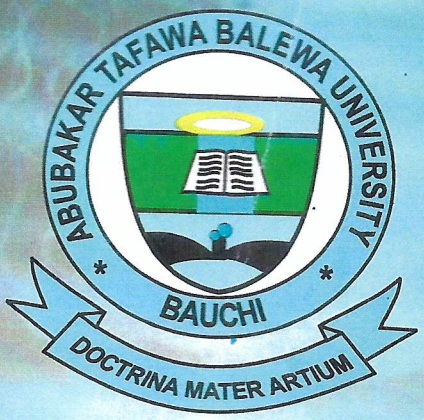

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ARTICLES IN THIS ISSUE

The Negative Impact of Information and Communication Technology Gadgets on Human Health

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Abstract

ocus of this research finds out the negative impact of Information and Communication Technology (ICT) Gadgets on n health by looking into the possible health hazard associated with ICT gadgets. A literature review was undertaken to s those ICT related issues on human health. The aim of this study is to recommend health and safety in dealing with ools. The research shows that there were perceives health hazard associated with ICT gadgets, this includes the global of power consumption, disused hardware disposal which increase the environmental burden and cause adverse health l to human and animal. Furthermore, Electromagnetic fields from antennas and mobile phones are alleged to emit ion that causes illnesses to people. Also the study found that there are links between extensive computer use and al ailments such as poor eyesight due to flickering and reflection on the screen and muscular pain caused by static and osture. At the end the research recommends the need for moderate use of the gadgets and taking precautions to avoid alth hazards.

ord: IC,T public health, electromagnetic field and environmental issues

luction

revolutionary changes in Information and nunications Technologies (ICT) have been ncing every aspect of modern life. However, ajority of users are carried away by the inherent ts of ICT but disappointingly unaware of its ve side. Of the people who are really rned, the common issues circulated often e copyrights, piracy, security and sionalism. However, there is another technical em with insidious effects that can never be d: the problem of human health.

, our environment is facing catastrophe related T. The global issues of power consumption, d hardware disposal, which can be lethal, are ng to human health and their environment. In on, ICT sector moves extremely fast. The life of ICT products and applications is often r than international standardization processes here are no any standard way of recycling these cts (ICT gadgets) which lead to electronics (e-waste) to the environment that affect the health.

s defined as "the modern world Information Communication Technologies (ICTs) are used to produce, store, process, disseminate exchange information. The term ICT passes a wide range of technologies including lder" ICTs – radio, press, TV, film, walkie-talkies and telephone to "newer" ones – email, CD-ROMS, websites, computers, cell phones, palm pilots, digital video cameras etc" (Anjana, 2006)

However, ICT plays importance role in behavioral change in communication of the people; they can raise awareness levels among people, contribute to training and capacity building and help in advocacy at the grassroots level. ICTs help in improving connectivity for individuals and communities, which in turn may provide access to critical transformational information. They are used to create, nurture and manage human connectedness, for example, equalizing opportunities across barriers of poverty, education, gender, socio-economic status, regional disparities, improving health and environmental sustainability (Anjana, 2006)

But also ICT do have their downsides, in the area of health, for example, there have been numerous allegations over the years about the dangers of excessive use of ICTs. Electromagnetic fields from antennas and mobile phones are alleged to emit radiation that can cause cancer and other illnesses (Blackice, 1998).

Studies have shown links between extensive computer use and physical ailments such as poor eyesight due to flickering and reflection on the screen and muscular pain caused by static and poor posture. Excessive movement of the wrist and hand have been said to lead to inflammation of the tendon

and carpal tunnel syndrome (National institute of Neurological Disorders and Stroke, 2001). Another modern-day illness related to increased use of computers and the Internet is *infostress* related to an overwhelming load of information (The Age, 2003). Excessive use of modern ICTs can even be deadly. In the Republic of Korea, where online game addiction has become a serious problem, a teenager died at his terminal in an Internet café after three days of continuous playing (world telecommunication development report, 2003). Also with regard to health, while the Internet has afforded greater public information and autonomy in understanding health matters, not all the information available on the Internet is reliable. The danger is that false or misleading information may be harmful to those seeking to diagnose and treat themselves, or even to treat others (Butler, et al 2003). Similarly, the growing amount of spam, viruses and hacking incidents are not only bad for the constructive benefits of ICTs and an inconvenience to users, but can also have serious safety consequences. While there has been much talk about e-government, e-education, and e-health, but e-waste is perhaps a less-documented, but increasingly distressing area of concern. Rapidly expanding ICT distribution and more computers bring with it new environmental and related health problems. The number of worldwide personal computer (PCs) in use has doubled, from 288 million units in 1997 to 584 in 2002 (Silicon Valley Toxics Coalition, 2002). With the average life span of a computer constantly shrinking, the number of obsolete PCs is increasing. ICT devices such as computers, scanners and screens are made with lead, arsenic, hexavalent chromium and other toxins. Only some parts are recyclable and toxic waste can percolate into groundwater and pose serious health hazards. The health risk associated from these toxics materials include:

- Lead—Toxic to the kidneys, damages nervous and reproductive systems, inhibits mental development in infants and young children.
- Barium—Exposure can cause brain swelling, muscle weakness and damage to the heart, liver and spleen.
- Hexavalent Chromium—can cause DNA damage and asthmatic bronchitis.
- Phosphorus—Health effects aren't fully understood, the U.S. Navy brands it "extremely toxic."
- Beryllium—recently classified as a human carcinogen.
- Mercury—High levels of exposure contribute to brain and kidney damage and cause birth defects.
- Polybrominated biphenyls, and polybrominated diphenyl ethers (PBDE)—can potentially harm a developing foetus.
- Dioxin—can cause cancer, damage the immune system and interfere with the regulatory hormones.

Indeed, ICT and the human health is a complex issue which is quite difficult to thoroughly understand and control. The reason is that too many parties are involved in the operation, that is, ICT manufacturers and consumers among others. Yet it is interesting to investigate the negative impacts of ICT on the human health as well as the social, ethical and legal problems that may arise.

This study will make an immense contribution to knowledge of the general public, as well as draw the attention of the users of ICT resources toward the negative impact associated with the utilization of these resources which most people tend not to take into cognizance.

Problem Statement

Information and communication technology (ICT) is defined as all computing and telecommunicating devices including the internet, is a new social phenomenon that has been in our lives fewer than twenty years. Despite its increasing integration into our daily lives, the effects or negative impacts of this ICT tools have gone largely unexamined. From human ecology theory we know that interactions in one sphere of our environment affect interaction in others. Yet the impact of interactions of human being with ICT in home, workplace, and play space is virtually unstudied and unknown. At first, the concept of ICT might convey an impression of "cleanliness". Indeed, most of the negative aspects of ICT on the human health remain, even in this technological age and time, unrecognized by the general public.

Objectives of the Study

The objectives of the research are:

- Investigating the possible health hazard associated with ICT gadgets and environment.
- Assessing the risk from using ICT gadgets.
- finding the relationship between health hazard and ICT gadgets
- Formulating realistic alternatives and provide recommended solutions to these relevant issue (i.e. negative impact of ICT on health)

Literature Review

As societies industrialize and the technological revolution continues, there has been an unprecedented increase in the number and diversity of electromagnetic field (EMF) sources. These sources include video display units (VDUs) associated with computers, mobile phones and their base stations. While these devices have made our life richer, safer and easier, they have been accompanied by concerns about possible health risks due to their EMF emissions. For some time a number of individuals have reported a variety of health problems that they relate to exposure to EMF (WHO, 2005)

Wireless network refers to any type of computer network that is wireless, and is commonly associated with a telecommunications network whose interconnections between nodes is implemented without the use of wires. Wireless telecommunications networks are generally implemented with some type of remote information transmission system that uses electromagnetic waves, such as radio waves, for the carrier and this implementation usually takes place at the physical level or "layer" of the network. In recent times, there have been increased concerns and research linking usage of wireless communications with poor concentration, memory loss, nausea, premature senility and even cancer (Wikipedia, 2008)

A major study into the safety of mobile phones has concluded that they may affect the health of people who use them. Research carried out by scientists in Finland suggests radiation from mobile phones causes changes in the brain. It is the first time that scientists have looked at the effects of mobile phone radiation on human cells rather than those of rats. The two-year study concluded that even low-level emissions from handsets are damaging. Scientists from the Radiation and Nuclear Safety Authority found that exposing human cells to mobile phone radiation damaged the blood-brain barrier - a safety barrier in the body that stops harmful substances in blood from entering the brain. They discovered that the exposure caused the cells in blood vessel walls to shrink which enabled molecules to pass into brain tissue. (BBC News, 2002)

According to an essay from Indian Society of Aerospace Medicine pointed out that the computer has the greatest impact on our lives in modern time. Along with smaller size and affordable prices, there has been the advent of the Internet. This has ensured that people use this technology either at their place of work or at home. Worldwide, millions of adults use computers regularly. With online training, trading and office work, the use of Personal Computers (PCs) is growing exponentially. In almost all offices, colleges, universities and homes today, the computers are becoming commonplace items. The duration of work time one spends in front of the computer is also rising. However, too few users are aware of the real or suspected dangers widespread use of computers may be invoking upon millions of computer operators. As computer usage increases so do the health disorders related to computer usage like Carpal tunnel syndrome, Repetitive stress Injuries, Computer vision syndrome, Cyber addiction etc. Ergonomic factors are often overlooked when designing or purchasing workstation equipment. Such a mistake could also lead to many ergonomic health issues known as CTDs (Cumulative Trauma Disorders). In world-wide, many of computer users are already suffering from computer related health problems.

ICNIRP (International Commission for Non-Ionizing Radiation Protection) Standing Committee on Epidemiology (2001), reported that in the 1980s, laboratory findings were reported showing that weak (approximately I μT) magnetic fields may adversely affect chick embryogenesis. In addition, clusters of adverse pregnancy outcomes were reported among users of video display terminals (VDTs), and epidemiologic data were published suggesting that maternal use of electric blankets and water beds may influence fetal development. Subsequently, several studies of the effects of electromagnetic field (EMF) exposure on reproductive health have been conducted.

The potentially negative effects of e-games include reduced physical fitness. Risk of addiction and reduced pro-social behaviour, and lowered academic

performance (Gentile, 2004). Perhaps the most troublesome aspect of e-games is that those involving a considerable degree of violence appear to be extremely popular and prevalent. Research studies indicate several undesirable effects of violent video games, such as aggravated antisocial behaviour, desensitization, increasingly violent attitudes and behaviour and delinquency (Funk et al, 2003 and Anderson, 2004).

E-waste is a global issue, especially in most African countries where there is no effective e-waste management system, the fact remains that Nigeria has remained a dumping ground for all kinds of computer scraps that come into the country from the developed economies, especially European and Asian markets by the day. Some of these products, according to finding, were brought into the country by racketeers and Nongovernmental Organizations (NGOs) as a donation which in the long run, never last the test of time. PCs, according to experts, are just like other e- products and have components that contain highly toxic substances, gases and heavy metals which can be harmful to human health and the environment. The trash from old computers, mobile phones or refrigerators, according to experts, contains dangerous substances, such as lead, mercury, cadmium, hexavalent chromium and barium among others. When piles of unwanted electronics materials which are improperly disposed of, can leach toxins into the soil, air and groundwater which later enter into crops, animals and human body systems causing contamination and pollution. The issue of hazardous content in electronic items has worried, before now, and continues to worry medical experts. With this, medical experts have warned that exposure to these substances can cause damage to blood and nervous systems, DNA, immune systems, kidneys, can lead to respiratory and skin disorders and lung cancer as well as interfere with regulatory hormones and brain development (Mathias, 2008)

Information and Communication Technologies (ICTs) are undoubtedly part of the cause of global warming as witnessed, for instance, by the millions of computer screens, mobile phones and their base station that are left switched on overnight around the world. There are a number of different causes of climate change, many of which are naturally generated (e.g., variations in solar radiation, volcanic activity etc). However, it is man-made climate change that is of major concern because it appears to be leading to a progressive and accelerating warming of the planet, as a result of the release of greenhouse gases (GHG), primarily carbon-based emissions (ITU-T Technology, 2007)

Methodology

For the purpose of this research, qualitative research methods are deployed in order to analyze the science review on ICT and the health. Science review literatures are used to provide solution to the research questions. As a general rule, scientific reports that are published in English language peer-reviewed scientific journals are considered primarily (The Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), 2007).

Relevant research for ICT health risk assessment can be divided into broad sectors such as epidemiologic studies, experimental studies in humans, experimental studies in animals, and cell culture studies. In a report of this nature it is not possible to consider the experiences of individuals. Nonetheless, such information often triggers a scientific study.

A health risk assessment evaluates the evidence within each of these sectors and then weighs together the evidence across the sectors to a combined assessment. This combined assessment should address the question of whether or not a hazard exists i.e., if there exists a causal relation between exposure and some adverse health effect. The answer to this question is not necessarily a definitive yes or no, but may express the weight of the evidence for the existence of a hazard. If such a hazard is judged to be present, the risk assessment should also address the magnitude of the effect and the shape of the dose-response function, i.e., the magnitude of the risk for various exposure levels and exposure patterns. A full risk assessment also includes exposure characterization in the population and estimates of the impact of exposure on burden of disease.

Results

Environmental Issues Surrounding ICT

As industriazed countries between 5% and 10% of total electricity demands is consumed by ICT gadgets and contribute with 1%-3% to worldwide CO_2 emission. This fraction of total electricity consumed by ICT gadgets is steadily increasing, despite tremendous efficiency improvements on the level of electronic components. The electricity

demand of new services and the more intensive use and the diffusion of existing services exceed by far the energy conserved by efficiency improvements. An important fraction of the electricity used by ICT is consumed when equipment is switched off or is not performing its main function. Today, standby looses are of the order of 50% of the electricity used by ICT. In the future standby losses may increase dramatically due to the general trend of interconnecting different types of equipment and services.

An Environmental Implication of ICT Wastes (E-Waste)

Environmental problems have to do with the short product life cycles and intensive chemical use in the sector. While production processes are constantly changing, risk assessment takes years of trials. In addition, accelerated product cycles and rapid changes in technology are generating tremendous waste problems (Wen-Ling, 2004). Consumers are encouraged to throw away short life-span electronics products. There are hundreds of millions of used computers worldwide and the systems for handling them safely are lacking or insufficient, or have not been implemented.

Recycling

More importantly, we need to take into consideration the responsibility of ICT producers. The manufacturers must set health and safety issues as a priority when making the electronic devices. Also the authorities should encourage them both to reduce as much as possible the amount of toxins that go into their products and to take active responsibility for recycling their products once they can no longer be useful. We would expect more policy to set technology standards, by encouraging energy pricing taking into account environmental costs, and by facilitating the creation of robust systems for retrieving and recycling equipment at the 'end of life'. The manufacturers, furthermore, might give precautions to worldwide users about the serious harms to health that ICT and other electronic devices can cause.

Health Effects from Living Near Base Stations or Using Mobile Phones

Radio Frequency (RF) fields penetrate tissues to depths that depend on the frequency. At mobile phone frequencies the RF energy is absorbed to a depth in tissue of about one centimeter. RF energy absorbed by the body is converted into heat that is carried away by the body. All established adverse health effects are caused by heating. While RF energy can interact with tissues at levels that do not cause significant heating, there is no consistent evidence of adverse health effects at exposures below the international guideline limits.

Some scientists have reported other effects of using mobile phones including changes in brain activity, reaction times, sleep patterns and self-reported well-being. These effects are small and have no clear health significance. More studies are in progress to try to confirm these findings.

Current scientific evidence indicates that exposure to RF fields emitted by mobile phones is unlikely to induce progress or promote cancer. Several studies of animals exposed to RF fields similar to those emitted by mobile phones found no evidence that RF causes or promotes brain cancer.

The INTERPHONE study is a major epidemiological study to determine if there is any relationship between mobile phone use and tumours in the head. It is being coordinated by World Health Organization's International Agency for Research on Cancer (IARC) and involves 14 studies conducted in 13 countries, all using an identical study protocol. Nothing untoward has emerged from the results published so far, although reports of an increased incidence of acoustic neuroma (a benign tumour of the acoustic nerve) among people who have been using mobile phones for more than ten years will require further investigation. However this result was not confirmed in a recent study conducted in Denmark.

An analysis of a set of Swedish studies conducted by the same investigators suggests an association between mobile phone use and brain tumours, but these studies have been criticized to the extent that the results they have produced are not convincing. Other recent epidemiological studies have found no convincing evidence of an increase in the risk of cancer or any other disease with use of mobile phones.

Discussions

It remains unclear to what extent the long-term use of a mobile phone is related to the occurrence of acoustic neuroma because one study has identified an association and another has not. Further, if the association is real, this appears to relate only to the

use of the older analogue phones and not the currently used digital types such as GSM phones. There is some evidence from one series of studies of an association between brain tumours and mobile phone use but these studies have been the subject of considerable criticism.

Areas of Precautionary Approach in Relation to EMF Exposure from ICT Gadgets

In the public health arena, priority is usually given to controlling risks that are clearly established; that is, involving risk factors with a clear causal relationship to known diseases. However, rapid technological developments produce an ever-increasing variety of agents and exposure situations whose health consequences are less clear, and societies increasingly wish to address these uncertain consequences.

Waiting for conclusive evidence of a health threat can have unfortunate consequences (Gee, 2001). Therefore, when an agent is ubiquitous or the potential harm great or the possible effects are irreversible, it is sensible to consider taking precaution before a cause–effect relationship has been quantified or even established. Precaution can be integrated naturally into existing public health policy and should complement conventional disease prevention measures, which are usually taken only after a cause effect relationship has been established.

Conclusion

Information and communication are often conceived as abstract, intangible and immaterial, the systems that maintain them are, of necessity, constructed with solid things such as paper, lead, concrete, rubber, glass, mercury, cadmium and silicon which are fabricated into the delivery trucks, wires, library buildings, computers, chips and CDs. In 2005, 63 million computers in the U.S. were replaced with newer models. Up to 80% of the waste is then sent to developing countries where it often contributes to environmental and health hazards. Additionally, energy is consumed often in immense quantities throughout every stage in the life-cycle of ICT products. As devices are made with shorter and shorter life-spans and the uses of ICT increases worldwide, this problem will become more critical unless something is done. Vast numbers of people are affected by the increasing "informatization" of the world. This includes people who are fortunate enough to capitalize on the new technology and those who are unfortunate enough to live with the refuse (Douglas, 2008)

However, in an analysis of each research question, the research found that there were perceives health hazards associated with ICT on environment that have adverse effect on human health.

Furthermore, the effect of mobile phone such as headache, heat, stress, ear's booing and fatigue which are temporary were clear on human health, but the relationship between mobile phone and their base station to that of cancer was still unclear. So the adoptions of Precautionary measures become very important.

Also, the health and safety measures were provided in all the new technology (ICT) gadgets to prevent the occurrences of ICT health hazard to public. Finally, recommendations were given based on the findings of the study

Recommendation

This study was conducted to explore the negative impact of ICT gadgets on human health. As such, there is still room for further investigation in this area.

Health and safety with ICT gadgets require both an awareness of the legislation governing this area and a common sense approach of the individual user. The recommendations are:

1. Taking regular breaks from working at your computer - a few minutes at least once an hour.
2. Familiarizes yourself with keyboard shortcuts for applications you regularly use (to avoid overusing the mouse)
3. Adjusting the screen height/seating so that when sitting comfortably your eyes are in line with the top of the monitor screen
4. Members should only use a mobile phone when it is necessary to do so and for no longer than is necessary.
5. Members should not use a mobile phone whilst driving and should switch off mobile phones before refueling their vehicles.
6. Avoid contact with the phone or aerial when making a call

In Addition, the policy makers and regulators should take a more proactive role in providing health advice in relation to ICT tools and managing this issue through a single agency. This agency should be established and properly resourced with a mandate

to cover both public health and environment. Ideally this agency should:

1. Have a mandate to cover all aspect of ICT gadgets on health and environment.
2. Provide advice to local and central government, and other public bodies, on all appropriate ICT tools issues. This includes advice on regulations and standards for the safe use of ICT tools.
3. Provide information to the general public and the media on health and safety aspects of ICT
4. Monitor radiation exposures from ICT devices to the public.
5. Conduct or manage research on health and safety issues related to ICT.
6. Limiting public access to antennae tower locations.

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