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**Africa in the Age of ICT: Forewarning on
Technostress as a Public Health Challenge**

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Introduction

Africa, like the rest of the world is presently in the age of Information Communication Technology (ICT). This is an age in which the remotest part of the globe could be reached in a matter of seconds. This has implications not just for the society but also for individuals. And how is this possible? The technological explosion in the use of modern computers and computer related accessories such as telephone, cellular networks, satellite communication, broadcasting media and other forms of communication has made it impossible for individuals and societies to remain isolated. The fact that ICT is extremely important to survive in the modern world is not in doubt. However, what is becoming increasingly worrisome is the *impact* of the use of Information Communication Technologies (ICTs) on the physical and mental health of individuals, which are often taken for granted or de-emphasised in our quest to understand, enjoy, apply or use the computer to attain our individual and collective goals.

Historically, human evolution over the course of millions of years has equipped us to live in a natural environment. But since the industrial revolution the living environments for the vast majority of people are becoming far from natural. Chemicals pollute and permeate every aspect of our lives; incidence of global warming is gradually re-defining our ecosystem, while the demand for energy to power desirable technological goods is on the increase. What we do not appreciate is that during this rapid technological evolution and development, our bodies have not biologically had time to adapt and evolve to this modern and technologically-driven pace of life. We are for example, increasingly seeing early warning signs of the health complications associated with the use of computer technologies. The average worker exposed to daily use of computer technologies in his or her work is gradually going blind without giving much thought to this or to the health implications for society. Our children are subtly and gradually becoming addicted to the use of computer technologies and its diverse offerings of all sorts of games and applications to the state of becoming robotic in their mannerisms. It is important to note that such early warning signals associated with excessive and unmonitored use of modern computers have been corroborated by teachers, parents, doctors, social workers and psychologists alike. Nonetheless, the warnings appear to be largely ignored. This paper is therefore one attempt at drawing our attention to the need to pay closer attention to the dangers inherent in the excessive and unprotected use of ICT gadgets even as we enjoy the benefits that these technologies provide.

This paper specifically addresses technostress, its psycho-physiological impact, its early warning signs and the public health implications. Finally, it proffers recommendations that could help curb long term public health effects of technostress on individuals and society at large.

Defining Stress and Technostress

An insight on the concept of stress and its characteristics is first presented in order to stimulate our understanding of technostress. In 1925 a medical student named Hans Selye observed that people suffering from a wide variety of somatic (physical) disorders all seemed to have the same or similar symptoms. For example, many of these people reported decreased appetite, headache, poor sleep, decreased muscular strength and endurance, and lowered levels of ambition or drive. Selye, unable to find a common disease or disorder to explain these behaviors, called this group of symptoms, the syndrome of 'just being sick'. In addition, he found that these symptoms occurred whenever the human organism needed to adapt to a changing internal or external environment. These were the first observations and identifications that eventually led to the term stress.

Selye (1956) conceptualized stress as a non-specific response of the body to any demand placed upon it, whether that demand produces pleasure or pain. Psychologically speaking, stress is a state of anxiety produced when events and responsibilities exceed one's coping abilities. Physiologically, stress is defined as the rate of wear and tear on the body.

Physiological reactions to stress can have consequences for health over time. A constant state of stress can leave individuals vulnerable to stress-related complications like lowered body immunity, high blood pressure, ulcer, cancer, skin rashes and possible malfunctioning of adrenaline gland which can result in tiredness, blurred vision, a crave for sweet starchy food and digestive difficulties (Bloona, 2005; Seaward, 2006; Bupa Health Info, 2011).

While stress is the rate of wear and tear on the body, stressors on the other hand are things or events in the environment that act as triggers. Here, the stressor under study is ICTs, specifically over-identification as well as inability to cope with these technologies.

What is Technostress?

The term technostress was coined in 1984 by a clinical psychologist, Dr. Craig Brod who conceptualized it as:

A modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner. It manifests itself in two distinct but related ways: in the struggle to accept computer technology, and in the more specialized form of over identification with computer technology (Brod, 1984, p. 16)

Shenk (1998) also defined technostress as any negative impact on attitudes, thoughts, behaviour or body physiology that is caused either directly or indirectly by technology. Also, in their definition of technostress, Rosen and Weil, (1998) perceived it as "our reaction to technology and how we are changing due to its influence." More recently, Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan (2007) described technostress as a problem of adaptation as a result of a person's inability to cope with or to get used to information and communication technologies (ICTs). Therefore technostress is a modern disease of adaptation to ICT, largely understudied and understood, that negatively affects our behaviours as normal human beings.

Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan (2007) identified five components of technostress, which are also known as technostress creators. They are as follows:

- *Techno-overload*: One well documented form of technostress is the escalating problem of information overload. Just as fat has replaced starvation as most nations' number one dietary concern, information overload has replaced information scarcity as important new emotional, social, political problems. Until recently, the production, distribution and processing of information remained evenly balanced. People could receive and think about information roughly at the same pace as it was generated. Since the mid 20th-century, computers, television, mobile phones, satellite and the internet have created a condition of hyper-production and hyper-distribution that has surpassed human processing abilities (Shenk, 1998). The impact of information overload is particularly apparent in the workplace as more and more people spend their time at work sorting through e-mails and web-pages while their day is interrupted by ringing phones, and responding to e-mails. Without a doubt, technology has made access to information easier than ever before. Access to all this information is one thing, processing it is quite another.
- *Techno-invasion*: While technology such as e-mail, cell phones, texts, tweets and status updates has made it easier to stay in touch, these communications are often invasive, intrusive and impinge on our ability to concentrate and work uninterrupted. All the

task-switching, additional pieces of information that we are forced to process and extra decisions we have to make only add to the stress we may already be experiencing.

- *Techno-complexity*: All change is stressful to some degree – even positive changes like getting married or starting a new job, because of the need to learn new skills and update our mental map of the world. When one considers the rate at which technological change is occurring and the requirements of learning new operating systems, new software programs, new ways of processing data, new hardware, etc, it is easy to see why rapid changes in technology can be stress-inducing.
- *Techno-insecurity*: This can be of dual perspectives. Insecurity can be as a result of workers feeling threatened that they will lose their jobs, either being replaced by the new ICT or by other people who are better in ICT compared to them. The other dimension is the vulnerability and security threat experienced due to massive personal information available on the internet.
- *Techno-uncertainty*: This is a situation where ICT users feel uncertain and unsettled since ICT is continuously changing and need upgrading.

Other terms that were synonymous with technostress identified by researchers include technophobia, computerphobia, computer anxiety, and computer stress (Chua, Chen, & Wong, 1999; Durndell & Haag, 2002; Mustaffa, Yusof, & Saad, 2007). In addition, the term digital depression has also been used to identify the feeling of an employee when being overwhelmed by technology (Ungku, Shilmaih & Wan Khairuzzaman 2010).

Technostress: An Overview of Health Implications

Over the past forty years or so, computers have gone from being monstrous curiosities taking up the entire space in large rooms, to relatively small boxes on almost every desk. Along with smaller size and lower prices has come an explosion in the number of personal computers, putting them within the reach of the vast majority of people. The speed and efficiency of the computers has made most businesses, institutions and individuals dependent on the technology. As a result, many people now spend a large part of their time working with computer technologies. Also, the relatively recent advent of the widespread availability of the Internet has meant that even those individuals, who do not use computers at work, use them at home to surf the net and engage in numerous social Medias available on the internet. Thus, the associated information overload, invasion, complexity, insecurity and uncertainty pose huge psycho-physiological threats on

individuals. These threats are of public health concern, incidentally, such health complications are not readily acknowledged because they are seen to be at the infancy stage. Although at its infancy stage, it is still very important to acknowledge the early warning signs of excessive and unchecked use of Information Communication Technologies (ICT) devices in order to take precautionary measures for the future. This paper therefore presents an overview of the physiological and psychological complications that are associated with ICT.

Technostress: Physiological Manifestations

One of the earliest phenomenon associated with technostress is *Repetitive Strain Injuries (RSIs)*. Repetitive strain injury (RSI) is also known as repetitive stress injury, repetitive motion injuries, repetitive motion disorder (RMD), cumulative trauma disorder (CT), occupational overuse syndrome, overuse syndrome and regional musculoskeletal disorder (Teixeria, 2009). This is an injury of the musculoskeletal and nervous systems that may be caused by repetitive tasks, forceful exertions, vibrations, mechanical compression (pressing against hard surfaces), or sustained or awkward positions. The following complaints are typical in patients who might receive a diagnosis of RSI:-short bursts of excruciating pain in the arm, back, shoulders, wrists, hands, or thumbs (typically diffuse - i.e. spread over many areas). The pain is worse with computer-related activities (like typing, or clicking the mouse), with associated weakness and lack of endurance (Ring, Kadzielski, Malhotra, Lee & Jupiter, 2005).

Computer Vision Syndrome: This describes a group of eye and vision-related problems that result from prolonged computer use. Many individuals experience eye discomfort and vision problems when viewing a computer screen for extended periods. The level of discomfort appears to increase with the amount of computer use. The most common symptoms associated with Computer Vision Syndrome (CVS) are: eyestrain, headaches, blurred vision, dry eyes, neck and shoulder pain. These symptoms may be caused by poor lighting, glare on the computer screen, improper viewing distances, poor seating posture, uncorrected vision problems and a combination of these factors. The extent to which individuals experience visual symptoms often depend on the level of their visual abilities and the amount of time spent looking at the computer screen. Uncorrected vision problems like farsightedness and astigmatism, inadequate eye focusing or eye coordination abilities, and aging changes of the eyes, such as presbyopia - (a condition where the eye exhibits a progressively diminished ability to focus on near objects with age), can all contribute to the

development of visual symptoms when using a computer (Farlex.com, 2010). Many of the visual symptoms experienced by computer users are only temporary and will decline after stopping computer work. However, some individuals may experience continued reduced visual abilities, such as blurred distance vision, even after stopping work at a computer. If nothing is done to address the cause of the problem, the symptoms will continue to recur and perhaps worsen with future computer use.

E-Thrombosis: The eye strain and repetitive strain injury are two of the more well-known health risks associated with sitting in front of a computer for hours on end. However, it now appears that people are also at risk from blood clots, similar to those experienced by long-haul air travellers. Doctors have warned of the potential burden of this condition in view of the widespread use of computers in all facets of life and this new condition was named: 'e-thrombosis'. E-thrombosis is a newly recognized variant of deep venous thrombosis (DVT) caused by sitting at a computer for long periods of time. Thrombosis is the development of a blood clot (*thrombus*) in the heart or a blood vessel, which then puts the victim at risk for an embolism (obstruction of blood flow). DVT first became associated with long periods of sitting during World War II, when accelerated rates of fatal embolisms were suffered by Londoners sitting in deck chairs in air-raid shelters. Since then, long airplane flights have been cited as a risk factor for DVT (in this case sometimes called economy class syndrome. A research article by Dr. Richard Beasley and colleagues in The European Respiratory Journal described the first reported case of e-thrombosis, which occurred in a New Zealand man who developed DVT after periods of sitting at a computer for up to 12 hours a day. The article points out that the prevalence of computers may pose a threat to people who spend much of their time working at them (Beasley et al, 2003).

Technostress: Psychological Manifestations

While technostress infects society, Brod (1984) is more concerned with what he calls the 'technocentered individual' -- a person who has adapted successfully to the new technology and begins to identify with the computer to the extent that he or she becomes machinelike in behavior, cut off from human interaction or emotion. Signs of (someone who is) technocentered include a high degree of factual thinking, poor access to feelings, an insistence on efficiency and speed, a lack of empathy for others. Thus, their desire to conquer the system becomes greater than the desire for human relationships and pleasures.

Brod (1984), a pioneer in the area of technostress began noticing the affects of technostress on his patients. According to him:

'I remember a systems analyst who was having a troubled marriage. He described his wife as 'inefficient'. When asked what he meant, the patient explained that his wife walked too slow'.

In addition, stress could build up because of the solitary nature of computer work, which cuts off interaction with other employees and even lowers the workers tolerance for interruptions. Brod is not alone on his findings of technostress, other researchers reported intense involvement in the fast-paced computer world and loss of contact with outside reality, a phenomenon that could result in anti-social behavior, early professional burnouts, stress-related problems and broken marriages. Other findings include: negative emotions, irritability, and poor sleep pattern (Weil & Rosen, 1998; Dias, 2005; Beckers, Wicherts & Schmidt, (2007). This is largely due to the fact that computers allow people to work at unusual times of 6pm to 6am, in addition to normal working time of 8am to 5pm, without getting the much needed night rest. Other manifestation include: panicky feeling (especially when technology fails); a state of near constant stimulation, in which one feel perpetually "plugged in", with associated increase in heart rate and blood pressure, irritability' memory disturbances, headaches, stomach and digestive problems as well as tingling or numbness in the fingers (Brod, 1984; Arnets & Berg, 1993; Weil & Rosen, 1998).

Observations further indicate that the modern family nowadays, tend to be isolated, with each person wrapped in his or her own "Techno-Cocoon." Just take a look at what the typical modern family looks at the end of the day. Mom preparing dinner with head glued to the portable phone, while she returns calls. One child is playing games on the computer in his bedroom, another is talking on her own phone, and the youngest is playing Nintendo. Dad comes home later from work and goes immediately to the computer. And the children seem to know so much more about computer technology that their parents are feeling intimidated and inadequate. In many homes we are seeing a loss of communication and a major shift in the power balance in the family.

Also, an interesting and worrisome observation is the fierce competition on free night call packages by many GSM providers, in Nigeria, for example. This package is especially attractive to the youths who spend sleepless nights (usually from 12 midnight to 6am in the morning) chatting away on insignificant issues. This affects their sleep pattern, mental alertness and studies.

Technostress and the Plight of Children

The amount of time and the types of activities that children engage in while using computers are key factors influencing whether computer technology has positive or negative effects on their development. Studies on computer use, on children's development, on learning, and on the effects of other media, suggest that excessive and unmonitored use of computers can be harmful. Packard foundation (2000), reported that obesity in children is linked to excessive time in front of a television screen – defined as five or more hours a day. The sedentary time spent in front of a computer screen could pose a similar risk. Report warn that Repetitive-Strain Injuries (RSIs) may result when children use computers at workstations not designed for them, and that children's vision may be harmed from staring too long at a computer screen. It was also observed that teenagers, who spend more time online, communicating with strangers in multiuser domains and chat rooms, are likely to experience greater decline in social involvement with increased feelings of loneliness and depression. In addition, playing violent computer games—a popular activity, especially among boys could trigger aggressive behaviours (Packard Foundation, 2000).

In an article by Young (1988) entitled: computers causing human technostress, he asked the following questions: Is your child unwittingly altering the human race? Have you noticed any of these behaviors?

- Exhibition of a false sense of power
- Demand that parents respond quickly
- Lose of track of time while working at a computer game
- Loss of interest at most family discussions and anxious to get back to the computer.
- Description of almost everything in computer character

While some futurists optimistically predict a rosy wedding between mankind and the technology that it has created, Brod (1984) paints a disturbing image of a machine-blighted society where human emotions could take a back seat to a dispassionate, computer-driven civilization. Brod posits that no other factor today, is transforming childhood more than technology. Raised on a combination of computers and television, he fears that today's children may grow up lacking social, creative, intuitive, athletic and political skills. They may relate better to machines than people.

Conclusion

The foregoing portrays that in the brief time that ICTs have been an essential tool at work and increasingly at home, several health and psychological problems have emerged. Some identifiable examples presented in this paper include: computer vision syndrome, repetitive strain injuries and e-thrombosis. Presenting insight on some psychological complications that characterises excessive and un-monitored ICT use, it was observed that our children are gradually becoming robotic in their mannerisms and if certain measures are not put in place, they may grow up lacking in social, empathic, creative, intuitive skills and may relate better to machines than people.

That technological innovations is necessary and required to make our lives more qualitative is not in doubt, but quite worrying, as have been seen are the possible negative effects of some technologies for both adult and children. While adults have the choice to make enlightened decisions on the manner some technologies should be used, children do not understand, or do not have the liberty to choose the technologies they have been exposed to. To this extent, it is important, as a matter of public health concern, that society, including government, companies and civil society, should work together to reduce the negative impact of such technologies on the vulnerable society.

Although some may harbour the hope that technology will just go away and leave us in a state of relaxed, primordial backwardness, the reality is that, it will not! Its presence is pervasive, affecting everyone, at home and at work. The ICT revolution is indeed one of the global challenges for Africa in the 21st century. Technostress has been identified as one of the public health concern associated with the ICT revolution. The question is: how prepared is the African continent to face these challenges as well as those that will arise in future? Thus, the public health cost associated with ICT revolution can be managed if the continent recognises the early warning signs and act quickly.

This paper therefore offers the following recommendations:

1. Government must live up to its responsibilities of protecting public health by identifying and addressing issues of technology and public health before they become pandemic.
2. Policies should be put in place to tackle hazardous market strategies by GSM providers (including banning of free night calls for children and youths of certain age level).

3. Public enlightenment on precautionary measures such as performing foot and ankle exercises when sitting for extended periods and taking frequent breaks away from your computer is necessary to reduce incidences of technostress.
4. Organizations that are largely dependent on ICTs should provide periodic eye screening for their staff, with increased sensitization on the consequences of technostress.
5. Buyers of ICT gadgets should take note of health hazards stipulated in the instruction manuals if available, and if not, should report such to appropriate authority.
6. Computer manufacturers should be held to certain standards, which include steps to control lighting and glare on the computer screen, and reducing the penchant for miniaturization of computer accessories, which has led to increase in visual problems.
7. Manufacturers of addictive technologies should be made to indicate such on their products.
8. Public authorities should ensure that more recreation facilities are provided, where children could spend more time, than on their computers and video games.
9. Teachers and parents should work together to protect the children from dangers inherent in excessive and un-monitored use of ICT gadgets.

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