Ethical issues of human enhancement technologies

Cyborg technology as the extension of human biology

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Received 21 October 2013
Revised 7 January 2014
Accepted 8 January 2014

Abstract

Purpose – This paper aims to focus on the modern development of bionics and linking new technologies with the human nervous system or other biological systems that cause changes of the human biological structure.

Design/methodology/approach – The paper is a discursive evaluation of technological progress and new systems where computers and machines integrate, making a single matrix entity – the cyborg. Here fundamental questions arise, such as what it means to be human and what is (descriptive aspect) and what should be (normative aspect) a human being?

Findings – The paper argues for the value of twenty-first century human enhancement techniques and other emerging technologies that promised to "help" humans become "more than human", trying to create human beings with greatly enhanced abilities, to improve human mental and physical characteristics and capacities. Modern man is gradually disappearing as a natural being and increasingly turning into an artificial creature "cyborg" that leads into the question, what will ultimately remain human in a human body?

Originality/value – The paper contributes to the existing debates about further development of cyborgisation and examines boundaries that will strictly divide man from a cyborg in the near future. In order to protect man from the omnipotence of technology and its unethical application is necessary to establish cyborgoethics that would determine the implementation of an artificial boundary in the natural body.

Keywords Computer-mediated communication, Cyberethics, Cyberspace

Paper type Research paper

1. Introduction

The human enhancement technologies of the twenty-first century promise make humans immortal by already giving them enhanced physical and mental abilities and capacities. The usage of bioelectronics enables us to connect new technologies with human nervous system on a higher-functioning level, nanotechnologies and nanomachines coupled with genetic engineering can affect biological changes within the cells, bringing further changes in the human biological structure. There are two dominant courses of improving and reshaping the human body. On one hand, the human body is "dematerialised" in the infinite space-time of the virtual world, using digital information, and on the other hand, the technical implants and artificial additions turn a man into a partially artificial being – cyborg, with a tendency for replacing all organic bodily parts and their functions, and creating a robot.

We are at a crossroads of our decisions. Do we want to fully accept all the possibilities offered by the techno-scientific mind, including the disappearance of man as a self-conscious living being, or do we advocate for a different way of thinking

Journal of Information, Communication and Ethics in Society
Vol. 12 No. 2, 2014
pp. 133-148

1477-996X
DOI 10.1108/JICES-10-2013-0040

and existence. In the inexhaustibility of man's life and the ethos of his self-preservation, we see a chance that, on the possible end of human history, we may find solicitous sources of the true history that are out of sight for the metaphysical mind and its version of being and essence of man. The discussion on the cyborgoethic issues and principles is a small but an inevitable step on this path.

2. Technologic existence and the end of human beings

> Man is an invention of date.
> And one perhaps nearing its end [...]
> One can certainly wager that man would be erased,
> like a face drawn in the sand at the edge of the sea (Foucault, 1966/1971, p. 387).

These are the final thoughts of Foucalt's book *The Order of Things: An Archaeology of the Human Sciences*, in which he prophetically announces the death of mankind:

> If those arrangements were to disappear as they appeared, if some event of which we can at the moment do no more than sense the possibility – without knowing either what its form will be or what it promises – were to cause them to crumble, as the ground of Classical thought did, at the end of the eighteenth century, then one can certainly wager that man would be erased, like a face drawn in sand at the edge of the sea (Foucault, 1966/1971, p. 387).

The techno-scientific progress in the human evolution is dictated by the ubiquitous cybernetics, which organizes the integration of the man and the machine, giving rise to a new ontologic situation in which the homo sapiens is replaced with homo cyborg.

The term cyborg has come into existence by courtesy of scientists Manfred Clynes and Nathan Kline, who in 1960 published an article under the title "Cyborgs and space". The article dealt with the ways of adapting humans to survive in space and the possible future of space flights with human crew, claiming that "altering man's bodily functions to meet the requirements of extraterrestrial environments would be more logical than providing an earthy environment for him in space" (Clynes and Kline, 1995, pp. 29-34). For this particular reason, Clynes and Kline (1995, pp. 30-31) suggested that the term cyborg be used to name any kind of "exogeneously extended organizational complex functioning as an integrated homeostatic system". The development of cyborgs stems from the field of cybernetics, the science dealing with ways of receiving and using the information in organized systems – machines, living organisms, and their relations. The founder of cybernetics, Wiener (1964, pp. 15-19), put forward the basic tenets of cybernetics in 1948, but also pointed out the dangers of selfish exploitations that could lead to dehumanization of human beings.

The connection between the human nature and the machines dates way back to forming mechanic metaphors. Indian national epic "The Mahabharata", written around 300 BC, depicts a machine in the form of a lion. In the "Discourse of the Method", Descartes (1988) states that the animals were machines used to make comparisons between their bodies and the movements of the clock mechanism. In the eighteenth century, De La Mettrie (1748/1912, p. 141) compared the man with a machine, "Human body is a clock". But one thing makes the cyborg of today different from his mechanical ancestor – built-in information system. As Haraway explains:

> [...] cyborgs are information machines. They're embedded with circular causal systems, autonomous control mechanisms, information processing – automatons with built-in autonomy (Kunzru, 1997, Issue 5.02).

Today, many real cyborgs are among us:

> Anyone with an artificial organ, limb or supplement (like a pacemaker), anyone programmed to resist disease (immunized) or drugged to think/behave/feel better (psychopharmacology) is technically a cyborg (Gray *et al.*, 1995, pp. 1-16, 2).

In her essay, "A Cyborg Manifesto", American theorist Donna Haraway uses the image of a cyborg to explain its meaning as a product of science and technology. Haraway (1991, pp. 149-181, 150) defines a cyborg as:

> [...] a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction [...] By the late twentieth century, our time, a mythic time, we are all chimeras, theorized and fabricated hybrids of machine and organism; in short, we are cyborgs.

An overwhelming influence of "informatics of domination" creates and maintains new forms of human being. In such a modern life reality, the relation between humans and technology has become so intimate that it is no longer possible to make a clear distinction between the man and the machine due to their increased merger. For Haraway (2000, pp. 128-129), being a cyborg does not imply only being improved by technology and prosthetics in the human body:

> I am adamant that the cyborg, as i use that therm, does not refer to all kinds of artifactual, machinic relationship with human beings. Both the human and the artifactual have specific histories [...] The cyborg is intimately involved in specific histories of militarization, of specific research projects with ties to psychiatry and communications theory, behavioral research and psychopharmacological research, theories of information and information processing.

Attempts are made to enhance and reshape the human body with various technical gadgets and implants. Most cyborg technologies function without the use of consciousness, with one's own autonomous bodily homeostatic control modern machines are quintessentially microelectronic devices: "they are everywhere and they are invisible" (Haraway, 1991, pp. 149-181, 153). The term cyborg exclusively refers to an implantation of artificial technology into the human body as well as the possible "loss" of physical body in the virtual reality. The extension of human senses through various devices and the usage of pharmacological substances and genetic engineering, enhance natural human abilities and functions, but they are not in the scope of our definition of cyborgisation of the body. The discussion of "natural vs unnatural" could be questioned from a perspective of embodied cognition. Clark (2007, p. 277) developed the idea that we are "natural – born cyborgs" that are "systems continuously renegotiating their own limits, components, data stores, and interfaces".

The scientists are trying to create an artificial man which would simulate man's appearance, activity, behaviour and actions. There are two options of enhancement being developed today. One integrates a man and a machine by making him almost "artificial" by identifying his behaviour and using a computer programme, and on the other side are "artificial" beings almost identical to human, which imitate his features and appearance. A man with built-in technical parts is increasingly becoming

an automatos, a self-moving device which could be programmed according to one's wishes. An attempt will be made in the future to mechanize man's mental activity as well in order to allow machines to think in man's stead and become the subject. Such a vision would mean the end of the man as a subject – the end of the historical man as prophesized by Francis Fukuyama, even Virilio (1997, epigraph) who states: "One day the day will come when the day will not come". Another seemingly Frankensteinian prediction by Čatić (2010):

> The industry of organic and anorganic polymers has decided, through industry of chips, plastic and rubber, to allow the cyborgs to make the decision on banning the existence of the natural men. The deadline is 31.12.2049.

As Shelley (1988, p. 45) states, despite all the technical difficulties:

> [...] learn from me, if not by my precepts, at least by my example, how dangerous is the acquirement of knowledge, and how much happier that man is who believes his native town to be the world, than he who aspires to become greater than his nature will allow.

The technical future of man was prophetically marked by Heidegger's words:

> What if we effectively are thrown into this world, never fully at home in it, always dislocated, out of joint, and what if this dislocation is our constitutive, primordial condition, the very horizon of our being? (Žižek, 2007, p. 36).

Maybe:

> [...] the body must become a cyborg to retain its presence in the world, resituated in technological space and reconfigured in technological terms. Whether this represents a continuation, a sacrifice, a transcendence, or a surrender of the subject is not certain (Bukatman, 1993, p. 247).

3. Prosthetic man – the body as software and interface

The procedures for enhancing man's senses and natural abilities through various extensions are present in the history of man since the ancient history. In the present day, thanks to American mathematician Norbert Wiener, who is regarded as the father of cybernetics, the body itself is treated as a dynamic process, it is in constant evolution and this evolution can be accelerated by technical means, changing the appearance, content and purpose of the body. Such coexistence of the biological man and the technical implants with the "reproduction" of man's body in the computer, is dubbed a cyborg. Thus, we enter the post-human era in which the human body will no longer be necessary to exist. Donna Haraway describes the cyborg as a cybernetic organism that is of fiction of techno-capitalistic as well as a feminist origin. But cyborgs are real humans of the age of information or the "informatics of domination". Haraway (1991, pp. 149-181, 243-248) uses this term to describe "scary new networks" that replace the "old hierarchical dominations" and produce new forms of power and control.

We shall put forward two examples of potential enhancing cyborgization of the human body. Australian performer Stelios Arcadiou, also known as Stelarc, uses medical instruments, prosthetics, robotics, virtual reality and the internet to enhance and extend his human body. In his performance "Suspenzions" (1976-1988), he first attracted the public attention by hanging himself by means of ropes and hooks, testing the endurance of his body and measuring his physical abilities (Scarry, 1985).

The technology connected to his body can be used to display different capabilities of prosthetic enhancement of human abilities:

- technology connected to the body (Third Hand);
- technology input into the body (Stomach Sculpture);
- body-expanding technology (Exoskeleton);
- technology for extending the body into the network (Virtual Arm); and
- technology for connecting the body with the network (Movatar, Ping Body, Parasite).

Stelarc tests and expands the boundaries and capacities of human biological body and sets new post-human strategies in his performances. For instance, "Third Hand" (1976-1994) is an artificial mechanic arm attached to his right arm which represents an addition, and has the ability to move independently. It is activated through contraction of leg and abdomen muscles. After numerous years of usage, Stelarc (2004, p. 4) can move it intuitively without conscious effort.

The focus of Stelarc's project performance "Movatar" is connecting the virtual and biological identity. In the "Movatar" performance, Stelarc reverses the concept of avatar, in which the man controls the virtual body, with an inverse approach – allowing Movatar to have an autonomous virtual entity and having partial control over Stelarc's own body. "Movatar" is a virtual body, or an avatar, imbued with artificial intelligence which makes it partially autonomous and operative. By taking control of the physical body through a device connected to the internet, it can operate in the real world. Whoever wears the device and logs into the avatar becomes the host of an intelligent virtual entity which will be operated by the movements of the avatar (Stelarc, 2004, p. 6). Stelarc's works are done in the light of what Haraway (1991, pp. 164-175) calls "C3I metaphor": command-control-communication-intelligence. His third ear, "Extra Ear" is able to function as an internet station for transmitting and receiving data. It is a flexible prosthesis, made out from soft tissue and flexible cartilage. It represents an extension imitating the natural ear in shape and structure, and was grown in the laboratory from real human cartilage and transplanted by way of an operation in the inside of the left forearm. In the future, the third ear will have in-built microphones which will enable the transmission of sound onto the internet. He intends to grow a real ear lobe from stem cells, although the location of its insertion remains unknown, whether in another arm as a fourth ear or replacing the hard cartilage of an existing ear. By connecting to a modem or a laptop, Stelarc would be able to transmit audio and an additional ear would represent an internet antenna of sorts which both telematically and acoustically proportionally amplifies one of the senses. This project questions the idea of the wholeness of the body and the possibilities of manipulating living systems (Stelarc, 2004, p. 5).

By using robotics, Stelarc has constructed the "Hexapod", a hybrid man-machine architecture consisting of six robotic man-operated legs. The robotic dynamic locomotion and management is controlled by bodily movements and turning of the torso. "Muscle machine", a flexible and stable mechanism is moved by combining electric and pneumatic system. Lifting one of the legs, moves three mechanical legs which move forward when the others stop. The body remains stationary on the ground as a part of the machine chassis, which includes the lower exoskeleton body connected

to the robot. The coder on his lateral joints enables the man to control the movements, run the machine, and change the speed at which he wants to travel. When the machines starts to move it is no longer necessary to ask who is in control, man or the machine, as they become fully integrated and move as one (Stelarc, 2004, p. 5).

In performances such as "Fractal flesh" or "Parasite" Stelarc literally closes himself within the internet. In the "Parasite" project, the electrodes are attached to the ends of his muscles, and the impulses from the electrodes lead to forced movement of his body. When performing the "Fractal flesh", the internet has a role of expansion of his nervous system. In this performance, the audience uses the ISDN lines to log on to the artist's body. Using "touch screen monitors" registered users are allowed to stimulate parts of his body. Stelarc (2004, pp. 2-4) describes this "out-of-body experience" as an electronic stimulation.

Stelarc subjects his body to technical intervention through which it becomes a manipulative object which can be modified, extended and supplemented. He concludes, that it is necessary to continue with further cyborgisation of the body as it is inadequate for today's age of technology, and it must be allowed to become a prosthesis in the technical environment. As a motivation for the cyborgisation of the body, Stelarc (1998, p. 123) states the encounter with the interface of the old and new story of self-realization:

> Images are immortal. Bodies are ephemeral. The body finds it increasingly difficult to match the expectations of its images [. . .] The body now performs best as its image. Virtual Reality technology allows a transgression of boundaries between male/female, human/machine, time/space. The self becomes situated beyond the skin. This is not disconnecting or a splitting but an extruding of awareness. What it means to be human is no longer being immersed in genetic memory but in being reconfigured in the electromagnetic field of the circuit in the realm of the image.

As Stelarc, the French artist Orlan wants to show her body through her experiments as software and interface which can be used in different ways. In 1990 Orlan started the work "The Reincarnation of Saint Orlan", in which she redesigned her face using a series of cosmetic surgeries. Her artistic slogan is: *This Is My Body, This Is My Software* (Orlan, 1996), and her fundamental goal is to design a new identity. She makes a performance from the operations on her body, by recording them and selling the video online. She also demands pre- and post-operation photographs in order to document the gradual makeover of her face, as is the case in "Omnipresence" (1993).

4. Post-human and the (re)production of man in a computer

> The cyborg's dilemma: The more natural the interface the more "human" it is, the more it adapts to the human body and mind. The more the interface adapts to the human body and mind, the more the body and mind adapts to the non-human interface. Therefore, the more natural the interface, the more we become "unnatural" the more we become cyborgs (Biocca, 1997).

In "The cyborg's dilemma: progressive embodiment in virtual environments", Frank Biocca rethinks the relationship of the man and the technology in terms of symbiosis of man, machine, and computer interface. "Cyberspace philosopher" Heim (1993, p. 83) holds that "with its virtual environments and simulated worlds, cyberspace is a metaphysical laboratory, a tool for examining our very sense of reality".

Cyberspace opens up the possibilities of overcoming and disintegrating the physical body, and as Sherry Turkle claims, it leads us across the world of dreams and allows us to consider the mental life existing separately from the body. Computer is "evocative object between the outside world and the inner self" (Turkle, 1984, p. 106). Turkle (1996, p. 21) thinks that:

> [. . .] our new technologically enmeshed relationships oblige us to ask to what extent we ourselves have become cyborgs, transgressive mixtures of biology, technology, and the code. The traditional distance between people and machines has become harder to maintain.

The computer:

> [. . .] is a mind that is not yet a mind. It is inanimate yet interactive. It does not think, yet neither is it external to thought. It is an object, ultimately a mechanism, but it behaves, interacts, and seems in a certain sense to know [. . .] But can it think? Could it have the capacity to feel? Could it ever be said to be alive? (Turkle, 1996, p. 22).

Turkle (2011, p. 287) argues that:

> [. . .] the robotic performance on emotion might exist in its own category implies nothing about the authenticity of the emotions being performed [. . .] We build robots to do things that make us feel as though they have emotions.

Using it increases the overlap between the boundaries of animate vs inanimate categories in the man-machine interaction. The machines were created as mere extensions of human senses of "dissimilar organisms living together." There was only one type of man-organism and the rest were only there to help him (Taylor, 1990, p. 2).

Today, "mechanically extended man" has given way to replacement of men, to automation (North, 1954) The absolute speed and interactivity of the internet have resulted in the "[. . .] invention of a perspective of real time, that will supersede the perspective of real space" (Virilio, 1997). By erasing borders between man/machine, natural/artificial we could enter the post-human world "without control, in which our desires will be subordinate to the system" (Pearce, 1995). "The promise of the cyborg sciences was that the computer would aid and assist in achieving centralized command and control [. . .]" (Mirowski, 2008, p. 284) until very recently, it was very hard to imagine any form of rationality (algorithmic or no) which was not centralized, hierarchical, and deeply fearful of loss of top-down control. "This is the main reason why the plethora of fin-de-siecle effusions about the democratic promise of computers and the Internet is acutely embarrassing and acridly jejune" (Mirowski, 2008, p. 307).

The users of virtual reality have an illusory feeling of bodiless movement through virtual environment (Dagenais, 1991, p. 43). Here we are dealing with incorporeal reality, a transformation of human body into a "body without organs" – corps sans organe (Deleuzo). "Rejection of organs" requires the isolation of the body and the detachment of feeling for virtual reality. The interface becomes the main centre of being, the main connection and breach between the man and technology. Man's Identity on the internet is unstable, and the body is absent. As a place for the "deconstruction of the body", the internet possesses the pseudo-human "life forms", such as Avatars. This way, Biocca (1997) states:

> [. . .] we are designed to be cyborgs, to achieve a tighter and tighter coupling of our minds and bodies with the externalizations of ourselves, that part of the physical world that is mixed with human forms, that part is our technology.

Descartes (1975, p. 204) said in his time:

> I had no doubts about the body itself, but I thought that I know its nature separately, which, If I were to describe according to the present case, I would explain thusly: by body I understand everything that can be delimited by a shape, determined by a place and can fill a space in such a manner so as to exclude every other body from it; that which can be seen, touched, heard, tasted or smelt, and can move in various ways, not by itself, but by a touch of something else; for I have considered that a power to move, feel or think by itself cannot be a part of the physical nature [. . .].

5. Human enhancement technology and the possibility of eternal life

> If you look at the man-made automata or those that already exist in nature,
> you will often find that their structure is mostly determined by
> the ways they can break down, as well as (more or less successful)
> preventive measures used to stop this from happening (Burks, 1970).

Human enhancement, also called human augmentation, is an emerging field within medicine and bioengineering that aims to develop technologies and techniques for overcoming current limitations of human cognitive and physical abilities (Naam, 2005). Technology developed within this area is called human enhancement technology (HET). It refers to every method aimed at increasing the human individual "space of abilities" over the current status quo. An important factor that influences the development of human enhancement technologies is the convergence of four areas of research: nanotechnologies, biotechnologies, information technologies, and cognitive sciences – also known as NBIC, which wants to enhance the human body on an individual level. For instance, it refers to:

(1) Enhancing cognitive and perceptive abilities – achieved through implantation of neurochips and other neurotechnology:
   - improving cognitive abilities – implies, for instance, sensory perception, the infrared spectre of vision, increased memory of thoughts and fantasy, and decision-making; and
   - improving perceptive and affective abilities – implies mood enhancements, social interaction, trust, compassion, etc.

(2) Enhancing physical capabilities – mostly implies increasing strength, endurance, precision, resistance to heat and cold, etc. These modifications are achieved through implantation of prosthetics, bionic technology, pharmacological means and genetic engineering.

(3) Enhancing with the aim of achieving supernatural abilities – implies achieving abilities not characteristic for human beings, including eternal life.

Can the achievement in the field of nanotechnology really bring us eternal life? A part of positive argumentation comes from scientific research. George Smith, the head of the Department of Materials at Oxford University, explains that new different properties can be seen in the nanoscale technologies and materials (RCEP, 2008, pp. 10-26). The newest research in nanotechnology is in the domain of studying human genome, and it is only a matter of time when every man will have his or her "genetic print" through which his possible diseases could be predicted. de Grey (2005), a scientist on the

Interdisciplinary Research Centre for Gerontology at the University of Cambridge, is already working on a plan for extending life expectancy. The testing so far includes only mice, but life extension for humans is scheduled within the following ten years. The scientists' goal is to find the main mechanism which controls the aging of the body, stop it, or at least delay it. de Grey states:

> It is not just an idea; there is a very detailed plan for fixing any kind of damage inside the cells, and each one of these methods either already exists or is based on technologies that only need to be combined together (Metro Portal, 2009).

With the aid of nanotechnology American scientists from Stanford University have developed a treatment for cancer which certainly expands the life of the diseased and gives hope for a longer life.

The future research paths for HET are: nano(bio)technology, (i.e. nanobots, artificial immune systems), tissue engineering (anti-aging/life extension), genetic engineering (i.e. artificial chromosomes), implants/prosthetics (cyborg technologies, brain-computer interface, "supersoldiers" (DARPA).

Many scientists warn that nanotechnology will enable the merger of molecules into larger structures and thus radically change certain branches of science, medicine, electronics and influence society and human identity. Saffo (1989, pp. 219-221) thinks that nanotechnology will bring more good than bad to human kind, but also points out the importance of developing regulations regarding usage of nanotechnology. Nanotechnology promises extremely fast computers (new kinds of computer memory), lighter and stronger materials (space technology), etc. A team of researchers at Northwestern University has produced transparent transistors which can be used to show a transparent image in the air. Researcher T. Marks claims that such material could find numerous applications:

> One can imagine a soldier with goggles on which important information are being shown. Or a surgeon who, while operating, is able to trace what is happening on the other side of patient's body.

Such improved medical technology – small medical robots would be able to erase the diseases from our cells (Drexler *et al.*, 1991, p. 119), stop the aging process, enable the upload of human mind from a computer (achieving human level of artificial intelligence). American futurologist Kurzweil (2000) finds that humans could become immortal in less than 20 years, as a result of perfecting nanotechnologies and deeper understanding of the way the human body functions.

The most interesting aspect of the nanofuture are the interventions into the human body and positioning the molecules according to our desires. From the creation of artificial molecules which are used as a memory and the logic of the machine, we come to a future assumption of implementing the entire computer system into a cell. It is exactly the kind of achievement which would enable us to program the way humans are improved and enhanced on a cellular level. From a positive perspective, it could facilitate keeping track of health and the environment, for instance, detecting cancer at its beginning (NCI, 2004). However, increasingly extreme forms of implementation into the human organism, which not only remains in the segments of organs and functions, but extends even into mollecular interventions in the brain, raises ethical questions regarding the boundaries of human body enhancement.

Only future can tell whether the achievements in nanotechnology and genetic engineering can really create the preconditions for eternal life. What this being will "do" with eternal life, and where shall it spend it; that we do not know. But it is certain that it will not be a self-conscious human being in regard to its metaphysical, techno-scientific designation.

In book *Our Posthuman Future – Consequences of the Biotechnology Revolution* Fukuyama discusses about possibilities and implications of regulation in the field of biotech. He argues that biotechnology has the potential to reshape our human nature in negative ways and fears that human rights and liberal equality is threatened by the spectre of eugenics:

> In the face of the challenges this technology poses, only one response is possible: Countries must regulate the development and use of human biotechnology by political means, setting up institutions that will discriminate between those technological advances that help humans flourish and those that threaten human dignity and well-being [. . .] (Fukuyama, 2002a, p. 57).

Fukuyama (2002b, p. 189) believes that by using the power of the state we can regulate biotechnology, appealing to human nature and dignity:

> Skeptics will argue that none of these efforts to control technology have been successful in the end. Certainly, no regulatory regime is ever fully leakproof. But social regulation does not need to prevent all breaches to be effective. Every country makes murder a crime and attaches severe penalties to homicide, yet murders nonetheless occur. But the prevalence of murder has never been a reason for giving up on the law or on attempts to enforce it. The purpose of a law banning human cloning in the United States would not be undermined if some other countries permitted it or if Americans traveled abroad to have themselves cloned.

Winner (1973, p. 183) have argued that technologies require continuous attention, rebuilding and repair: "eternal vigilance is the price of artificial complexity" and the human is responsible for the "synthesis, regulation, and continued maintenance" since "artificial-rational systems can't be built and left alone". The overview of future technical development and approaches to the procedures of human enhancement and reshaping includes:

- questioning ethical, medical, social and philosophical pro et contra arguments for certain technical progress;
- researching conceptual questions and ethical context of using ubiquitous neuro-, bio- and nano-technologies, as well as other human enhancement technologies;
- analyzing particular cases of human enhancement technologies;
- encouraging the work of multidisciplinary teams researchers and making comparisons between bioethical reactions to the problem of human enhancement; and
- encouraging the broad public to discuss the questions of cyborgoethics.

6. Cyborgoethics – ethics of human enhancement technologies

There are numerous medically and ethically justified examples of cyborgization that involve replacement or restoration of lost or damaged biological functions and organs that, through implementation of artificial technology into the biological organism, enabled the injured to regain their healthy state of organism (e.g. pacemaker, artificial hip, bionic extremities, etc.).

The procedures of enhancing and reshaping the man which aims to expand the existing and adding new functions that the man does not posses, is ethically dubious (e.g. implementation of RFID chips into the human body), which changes the man's natural structure with the final goal of creating supernatural and predominantly artificial body. We should mention the "Project Cyborg" by Kevin Warwick who, owing to the experiments with nervous system implants, RFID sensors and robotic arm, earned the title of the first information cyborg. In 1998 Warwick implanted an RFID silicone chip into himself, which he used to communicate with a computer and used it to operate doors, lights, heaters and other computers without lifting a finger (Warwick, 2002, p. 152). Such implants are being input into people today. The chip contains every kind of information about the person – from credit card information, health insurance information, bloody type, and could be used as a space travel passport (Durn and Eder, 2012, pp. 44-47).

In a later experiment, Warwick used the internet to connect his nervous system with that of his wife. The aim of the experiment was to create a form of online telepathy (transfer of emotions – pain, physical emotions and sexual excitement) that eventually resulted in the first electronic communication of the nervous systems of two people (Warwick, 2002, p. 285). Warwick thinks that:

> Once the human brain is connected to a computer, and linked into a network with other connected individuals there will no longer be isolated individuals, there will be a society of cyborgs (Infonomia TV, 2012).

A steady development of production of human-like robots should be added to this.

6.1 The questions of cyborgoethics

The humanity did not respond in an appropriate and timely manner to the ethical challenges of application of science, technology and medicine for treating humans, and it particularly failed in the questions of enhancing cyborgisation. This is exactly the reason, why we need ethics that is based on the questions of using ubiquitous human enhancement technologies and the necessary setting of boundaries for implementing artificial technology into human beings.

By using previous experiences it is necessary to set clear boundaries of cyborgization of a natural human being, and understand the social consequences that may follow. The cyborgoethic (Čatić and Greguric, 2009, pp. 110-140) questions should motivate the man to think about the boundaries of enhancing and reshaping the natural human body. We shall mention some questions that should be answered through multidisciplinary discussions of doctors, engineers, philosophers and the broad public:

- What is the future of human enhancement?
- What decisions can humanity make to stop the modification of human bodies, genes or brains?
- Can safety in human enhancement be ensured?
- Can a human being enjoy complete freedom of thought if someone else controls his or her brain and everything that constitutes a human being?
- Will enhancements eliminate natural human being and lead to the erasure of ethical values?
- Does the man want to create a thinking and organically artificial humanoid creation and what consequences will that have for humanity?

- Are we allowed to upgrade the human being into a superhuman being?
- What is eternal life and do we really want to "live" it?

The aim of these questions is to encourage an argumentative ethically-theoretical discussion which would result in practical implications on ethical and moral challenges, that are set before the humanity by new technologies and interventions into the human being. Therefore, these are the questions regarding the possible foundations of ethics in the age in which the changes in cognitive, philosophical, technical, medical and social aspects have occurred. The ethical behavioural norms, that should be turned into legal norms, should be postulated based on the answers to these questions.

6.2 The principles of cyborgoethics

In a time of an unstoppable self-establishment of the techno-scientific mind and its metaphysical character into the world setting and the essence of man within it, it is clear that the questions, norms and principles of cyborgoethics are a weak opposition to further enhancement and reshaping of man for the needs of techno-scientific processes. However, we still believe in the vitality of life which is older than any metaphysics of this fateful movement of the techno-scientific mind, as a substance-subject of our epoch.

The vitality of man's life and its hidden (alienated) essence carry within themselves an ethos of self-preservation and this is why we believe that encouraging the discussion on the questions of cyborgoethics can slow down the establishment of the techno-scientific mind and its need for human enhancement. On a "practical level" a new and different thought paradigm is necessary, directed at the manner, boundaries and applications of knowledge if the new technical areas in which the ethical norms and values are brought into the centre stage. In these endeavours it is necessary to first determine the aims and define the norms that would force all those involved into the creation of new procedures and materials, and their implementation into the human organisms, and all those that for various interests and non-medicinal reasons make the decision on the application of science and technology to accept the necessary amount of social responsibility. This refers to:

- Ethicality of implementation – to draw a line between restorative and normalizing procedures and enhancing and reshaping procedures. This should distinguish whether it is equally ethical to substitute bodily organs (i.e. artificial hip) during the replacement, and interfere into the mental functions of the man's central nervous system (the latter leads to a change in personality).
- Usage of implementation – to test biological boundaries of endurance when substituting with technical improvements, and analyze the dangers of implementations of the ubiquitous neuro-, bio and nanotechnologies. There is a vast difference between the need to substitute a deficient organ or organ system function, and upgrading the function of a hitherto normally functioning organism. The biological basis, in the broadest sense, has its boundaries of endurance in terms of various implants, especially when dealing with improving the intelligence by inserting a chip into the human brain. This brings forth numerous bioethical questions around, which a crucial discussion has to be lead and in which the judgement must be based on all standpoints, not only medical and technical.

- Purposefulness of implementation – to determine the purpose that wants to be achieved by inserting the implant into the human body. It is ethically questionable to create a system which uses reshaping of human beings to create more perfect beings with superhuman possibilities and artificially created intelligent beings, lab-constructed androids that would have the ability to think. To prevent transformation of biological into the electronic, artificial basis, it is necessary to determine the purposefulness of implementation as science and technology need an ethical component and a clearly determined goal.
- The borders of implementation – to form a multidisciplinary centre open to public judgement that would decide on the borders of implementation. It is necessary to set a clear centre that will use public debates to make decisions on allowing and forbidding human body implementations, taking into account its purpose and the reason for its necessity, so as not to become a powerful manipulation tool. As long as the decision centre is biological one, the human itself, the question of implementation will remain the human's choice regardless of influence of globalisation interest lobbies. But what if the decision centre becomes technology itself?
- Law regulations for future implementation – should be put under the most scrutinous public control. It is necessary to establish laws that would legally and ethically control the boundaries and further implementation usage, and make decisions which would ensure the safety of the individual as a natural human being, thus eliminating potential danger from other decision centres, such as the military industry, and global corporation interest groups.

7. Conclusion

The possibilities of overall enhancement of human life raises many questions, starts controversies, promises and causes fear. From the beginning of communities, one of the basic fears was the fear of existence of other intelligent forms. Conversely, the basic promise of biotechnological and bioscientifical researches is the promise of an eternal worldly life. However, we cannot enhance a human being and claim that is still essentially human.

Near the end of the twenty-first century mankind might possess bionic bodies with artificial brains and sensory organs. By exploring borderline questions of applied bioethics, genetic researches, nanotechnologies and robotics, we enter the domain of ethical questions on the boundaries of scientific research and applied human enhancement technologies. The advocates of human enhancement promise to cure all bodily ailments, offer the possibility of "improving" performance, allowing us to choose the sex of our child, increase intelligence or certain talent. Without accepting these possibilities with care, we shall end up like engineers and not the mothers and fathers of our children that will no longer be human anyway. Technological progress is accelerating exponentially and we need to urgently bring forth cyborgoethic principles and applicable decisions on borders of technology applicable on man.

This work gives pro et contra arguments. Ultimately, the expected results and aims of cyborgoethics should yield a new view which will, despite all potential benefits of the new technologies, take into account the boundaries of interventions into the human body as well consequences of man's body and mind being located in the virtual space. To conclude, we may say that if the procedures of enhancement and reshaping

of man continue, the natural human being will disappear from the horizon of the techno-scientific epoch. In the first stage the man will become a partially artificial being – a cyborg, and through continuous enhancement and reshaping he will become a completely artificial being – a robot. It will exist only as a being of post-human history.

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