The historical development and context of technology

Direct brain connections to computers By way of IBM technology are already here helping amputees and the paralyzed regain use of their bodies (Deep Implants are already used to reverse deafness and blindness) but with refinement the diffusion of this convergence of technologies will almost certainly be used for non; therapeutic purposes -? and with that comes profound ethical questions and moral considerations. The use of computers to enhance and augment both mental and physical abilities and potential is no longer the exclusive realm of science fiction Ritter.

It is becoming a reality. Brain Computer Interface technology will help re-implants are already working in patients with Parkinson disease restoring to them a degree of freedom and motility, but not without its complications. Spinal implants used to treat pain have now been modified by a physician in North Carolina to bring sensitivity and sexual stimulation to those previously unable to have that as part of their life. There’s a patent and marketing plan already in place to reduce the cost and make it widely available. Though incredible now, these technologies will soon seem undeveloped.

Scientists predict that future implants will be made from engineered tissue and organic endometrial rather than metal, and allow for a literally seamless union of man and machine. Brain-machine interfaces could be used for entertainment or work; the U. S. Military has plans to implant them in soldiers. Military use for BCC is being applied to enhance troop responses to certain orders, situations and words. Recognizable brainwave patterns communicated between soldiers has given rise to what might be best described as technology generated telepathy.

A soldier need only think a command to instantly broadcast it to other roofs. Already command and control is remotely handled by those behind the lines who sees and hears what the soldier experiences. In addition, robotic exoskeleton enhancement suits give superhuman abilities as well as protection. Human movement is amplified so that equipped troops exhibit tremendous strength in the performance of their tasks. IRON-MAN is on the way! Where will the line be drawn between man and machine or will it simply be erased?

Will a divergence in the human family result in the fabrication of a new race of super beings – not Just a group of augmented humans but beyond that. Trans humanism is already embraced by some as the natural progression of human evolution. There are some who believe that humans, as they are now are already in effect cowboys because we are tool users who need only to evolve or enhance our brains. Neuron electronics, molecular biology, robotics and processor technology have all come together for this to be a reality. Annotate, now in its infancy will soon be added to the list of exotic new enhancements to the human reach.

Will deep brain stimulation and the possibility of uploading ones memories onto a hard-drive pose significant ethical issues on society? For now the safety of implanted circuitry and brain system-tinkering may be the easiest question to answer. Risks and benefits can be measured and weighed against each other. Far more complicated questions are posed by the non-therapeutic applications of futuristic IBM technologies. The paper will also examine the immediate and future social implications of this technology

concerning marketing, environmental impact of discard and waste from supporting technologies and legal issues.

With technology in this field increasing exponentially and drawing in more supportive technologies and interests from genetic engineering to robotics e feel it is important to address the far reaching impact of this human endeavor that surely promises to bring its own expanding revolution to so many facets of life. Living every day in a wheelchair or not being able to use one’s arms is the last thing anyone of us wants to experience. Thousands even millions of people around the world experience this on a daily basis. Through science a new way of living is coming, with freedoms beyond our imagination is being offered.

Brain Computer Interfaces cords. On the horizon of Science Fiction and with imagination this is becoming a reality. A brief description of the technology and an explanation of the associated science The historical development and context of BCC “ Definition: Neuropsychiatry is a discipline related to neuroscience and biomedical engineering concerned with developing neural prostheses. Neural prostheses are a series of devices that can substitute a motor, sensory or cognitive modality that might have been damaged as a result of an injury or a disease. “(ACTA. Feel. H/news/ neuropsychiatry-the-mind-is-the-pilot) The idea of Brain Computer Interfaces was brought about at the end of WWW to try and come up with a solution to injured soldiers. In the very early stages of this concept robot arms and legs where trying to allow patients to walk and have the ability to use these new arms and legs, but was unsuccessful due to the lack of control. Different variations of robotic prosthetics were being introduced with little and no success. In 1951

a breakthrough in human and robotic prosthetics took a huge turn with the idea of robotic arms and legs being controlled by implants in the human brain.

Here are several early renditions of the 1st robotic to mechanical prosthetics. After the idea of IBM and BCC in the early stages, the medical field had to start putting hose ideas to action. And out of this action came brain implants to control many different aspects of the human body. The 1st known cochlear implant to the brain was designed and tested in 1957, on lab animals attempting to do basic tasks. A working model was created in 1961 but started off being a needle size computer link that was placed inside the top of the spinal cord.

This was a 1st step for upper and lower brain control of the prosthetics. This 1st step was later named ABA, the Auditory Brainstem implant. Over the years different implants were made to try and adapt the rain to control the functions, steps like Visual, Sensory/Motor, and Cognitive Prostheses. Now leading the way in BCC technology is IEEE Member Miguel Nicole, and John Donahue founder of Brain Gate. Donahue has developed a small chip when inserted into the paraplegics brain sensory area, allows them to move their limbs through thought and brainpower.

Although this is a few years off completion, many steps and tests are ongoing to allow Sic-if to turn the 1st human into half man, half machine. Early steps of controlling the human body were thought to be outside the box and were not possible. However with study of the human brain as Jumped this possibility to not possible to now, Just a matter of time.

Understanding the human brain and how it works was the Chic’s 1st step. Tiny microchips can be placed in the sensory part of the brain and a computer interprets what the brain in thinking to movement of the limbs.

Here is an early photo of this in action. On the left is an early stage IBM control unit with the patient using his mind to only his thoughts? Brain Gate a leader in BCC and IBM designs are set to complete the 1st full usable human upgrades controlled by human thought. This had peaked the interest of several governments and the US Military. Military applications would be mind blowing with mind control applications, and the rehabilitation of military personnel who were injured in the line of duty. Over time Brain Gate has placed several BCC chips into patients for an extended amount of time. 010 Brain gate broke many milestones while having a chip in a patient for over 1000 days. And also moved up several time tables and has completed new versions of the BCC and IBM chips to control motor functions of human and robotic limbs. Moving human limbs that have been cut off due to spinal damage has now been accomplished, a small BCC chip has been installed and a sensory pulse chip has been placed in several muscle areas around the body. When the BCC/IBM sends out the correct signal this pulses the muscle and allows the movement of the limbs.

In the end Brain Gate has risen and accomplished only what many seen as science fiction. Over time many more tests will be conducted with the BCC controllers and applications to patients with soon be coming. Political and Legal Issues Although many of us agree that the BCC technology is a well developed piece of technology that assists those whom are in need of it and the scientists of which rated the device are helping to better technology as a

whole giving people the opportunity to walk again by using the motor skills from the brain.

BCC technology is also used in the political and legal aspects of life. Case in point ” In recent years, the use of brain scanning technology has become commonly used out of the hospitals. Various hi-tech brain imaging techniques, used before in medical diagnosis and treatment only, are now commonly used in marketing and advertising, and even in criminal cases to determine brain deficiencies or whether someone is lying. (Neurosurgeon. Com, 2011) This simply states that the technology has advanced from being Just medical based to a global entity which expanded.

I personally believe that with much reward as the technology gives also comes with great risks. The brain-computer interface devices read electrical activity from specific neurons and translates that activity into a specified action. This alone makes the assessing of a disc risky. Implanting of such devices is a uniquely complex enterprise involving at least engineering, neuroscience, and biochemistry. In addition we currently have emitted understanding of the physiological mechanisms of PC’s and their interaction with neural circuitry.

There are many mechanisms in place to protect the health of the public but it also varies from country to country. Take for instance the U. S. Food & Drug Administration/Center for Devices & Radiological Health and Health Canada Medical Device Bureau, studies show that though the general requirements for applications has little to no difference is not the same case for “ Good Clinical Practice Guidelines”, Interim &/or Final Reporting, and

also the requirement to submit procedures for monitoring device investigations.

The United States offer all three 1-2% of the United States sites go through yearly inspections as well as pop ups. This information can be found on (whom. Docs. Com). If simulated worlds would come true, it may be difficult to ensure the protection of human rights. For example, social science researchers might be tempted to secretly expose simulated minds, or whole isolated societies of simulated minds, to controlled experiments in which many copies of the same minds are exposed (serially or simultaneously) to different test conditions. The only limited physical resource to be expected in a simulated world s the computational capacity, and thus the speed and complexity of the simulation. Wealthy or privileged individuals in a society of uploads might thus experience more subjective time than others in the same real time, or may be able to run multiple copies of themselves or others, and thus produce more service and become even more wealthy. Others may suffer from computational resource starvation and show a slow motion behavior.

The development of reliable whole human brain emulation technology may require extensive and sometimes painful animal experiments. ” (Wisped. Org, Mind Uploading) Enough with all the negatives and skis that follow PC’s let’s move to more legal aspects that shines light on such a wonderful creation. “ BABCOCK can be valuable for laboratories specialized in fields of electro-physiology and psychophysiology, including those investigating aspects of human computer interactions” (Brain-Computer Interfaces: Applying Our Minds to Human-Computer Interaction, peg. 265).

An example of such experiment will be to investigate Fit’s Law model of information transfer rates in human movement (Fits, 1954). The law basically is the measurement of a particular body part’s speed and sickness from one target to the next with a simple back and forth motion. Economic Questions and Considerations IBM Technology is a type of technology that provides paralyzed persons with a way to walk again through a brain-computer interface (BCC). Studies that are done prove that persons who are paralyzed are able to control signals and communicate with others with ease.

This is important to many paralyzed people because their state of mind is normally limited state; meaning they feel they are limited to do Just about anything. Through this type of technology there are different types of products that an aid in providing freedom to those in need, examples include Electroencephalogram (EGG) and Based Brain – Computer Interfaces (BCC) and Neuroses Mindset. This will further describe in detail the different types of products that are available to help aid paralyzed persons along with the economics costs and questions involved in such production.

Future developmental ideas and considerations are explained in detail to help provide a better picture for what’s on involved to continue to make this type of technology even bigger and better for years to come! (Change in brain activity through virtual reality-based brain-machine immunization in a chronic traveling subject with muscular dystrophy, 2010) l) Types of Products and costs BCC technology is a type of technology that is based on a device that enables communication can be done from a computer to the human brain.

Electroencephalography (EGG) system How BCC currently works through a) Electroencephalogram (EGG) is that sensors make contact on specific points of the skull and pick up electrical impulses that occur when neurons in the brain transmit and receive signals. The sensors feed these signals to the computer where algorithms translate them into a number of desired actions. EGG signals that can translate different mental states into appropriate commands happen through the use of consumer electronics or spelling devices.

With this type of device it’s important to keep a natural flow between the human and the machine so this type of approach allows users real- time control of external devices so they are able to understand how the ongoing cortical activity is changing and able to provide feedback when appropriate. There are challenges that are arise with the EGG system such the fact that continual use to the EGG systems has caused some potential long term affects which are yet to e clarified.

Research was conducted to help hinder error rates and after results was recorded and training completed the error rate of EGG decreased from 40% to 28%. In addition, with severe physically challenged individuals it unclear whether long- term BCC use actually changes EGG patterns and classifications enough in paralyzed persons to make a large enough of an impact on them. This is where other products are coming into to play to be more beneficial when it comes to more extreme cases. A typical, highly accurate electroencephalography (EGG) system which requires a technician’s assistance can cost $40, 000 or more.

Since this is one of the more expensive routes when it comes to a type of product it is important to utilize this type of system on the appropriate candidates. (BCC Technology Set To Break Commercial Ground, 2010) b) Neuroses Mindset-based EGG Neuroses is a leader in Brain- Computer Interface technologies for consumer product applications. It was founded in 2004 and is based out of San Jose, CA; their main goal is work with industry partners, developers, and with academic and research institutions to provide innovative products and solutions.

It is with Neuroses Mindset product that brings them into play with BCC technology. Mindset measures the brain fluctuations and uses algorithms to translate various types of mental activity via BCC technology. Mindset – based EGG machine has a calibration time of four seconds and an accuracy rate of 90 to 96%. This type of technology has a background of 60 years of medical research and has actually evolved from a medical EGG technology to an application that is utilized now in games and toys!

It is through Neuroses that discoveries are being made that have help aid in increasing brain wave research and providing an effective gap between academics and consumers by offering an incredibly reliable ND effective EGG machine for 10th of the cost off medical EGG system. The current consumer markets for BCC technology are rapidly growing and strong, with the brain fitness market expected to grow form $265 million in 2008, to an astounding $5 billion in 201 5, and the neuron-stimulation/ drug free market growing from $1. 3 billion in 2009 to $2. 7 billion in 2015.

The cost off typical medical EGG systems, which must be used with gel and assistance from a clinician, can be above $40, 000 accuracy. Neurosis's Mindset has a calibration time of only 4-seconds, an accuracy rate of yet only costs $199. The fact that Neuroses has been able to offer nearly the full value of a real EGG machine for mass-market consumption is one of the factors that have contributed to the company becoming one of the world's largest EGG manufacturers. (Neurosis's Brain Computer Interface – Bridging the Gap Between Research, Academia, and the Consumer, 2010).

II) Future Developments a) Expandable Market It has been found the Universities and medical companies now spend more on BCC research than they receive from patient licenses. As of right now there is a huge gap between BCC research and the end consumer " the medical lied" and the main focus for the upcoming years is to bridge that gap. Continual Research Through research and centralization partnerships with Carnegie Mellon, Stanford, Trinity College, the University of Wallowing and the University of Washington medical research hopes to unlock decades of brainwave research for mass market applications.

The possibilities are infinite for both medical purposes as well as for gaming purposes. (BCC Technology Set To Break Commercial Ground, 2010) Neuroscience at the Duke University Center for Neuron Engineering (DUCK) have in addition developed the IBM into one of the most exciting/ promising areas of basic and applied research in modern neuroscience. This has been done by creating a way to link living brain tissue to a variety of artificial tools. IBM raises the hope that in the not so distant future persons with neurological disorders are able to recover their mobility.

The project that Duke University is working on is entitled the “ Walk Again Project” which has a main goal to develop and implement the first IBM capable of restoring full mobility to patients that deal with severe paralysis. Not only does the university hope to develop this device to make patients walk again UT also to develop a new technology that aims improving the quality of life by creating a complete new paradigm for global scientific collaboration among leading academic institutions worldwide. The Walk Again Project, 2009) Psychological and Social effects/concerns of IBM Technology We live in a rapidly moving world and nowhere else is that more prevalent than with the development of computer and robotic technologies that have occurred in the last twenty years. Never before has computers played such a huge role in our lives. We use computers and the many personal devices from personal smart phones to pad’s, n our daily lives. We use GAPS to get around, smart phones to communicate, and has been a century that has greatly encouraged research on the use for robots in the medical field.

Robots have been used for surgery, diagnosis, rehabilitation, prosthetics and assistance for the disabled and elderly people. Technology has progressed even further in the 21st century. Continual research and development into computer technology has brought about Brain Machine Interface Technology (IBM). So what is IBM? IBM function is “… Primarily motivated by the purpose of recovering lost motor functionalities in subjects affected by spinal lesions, metamorphic lateral sclerosis, and other pathologies which may prevent the patient from executing any voluntary movement…

These systems, which may be connected to robotic manipulators, wheelchairs, and word-processing systems, are able to classify user intentions (e. G. The intention to issue a grasp action, to choose a direction for a wheelchair, to select a key on a keyboard) on the basis of the analysis of neural activity. The system then plans and executes actions based on this analysis, in order to fulfill user goals. ” It is a new field of medicine that allows the possibility for sizable people to have an implant that acts as an interface between brain signals, which then get converted into a machine that performs some function.

In healthy people the primary motor area of the brain sends movement commands to the muscles through the spinal cord. For those who have been paralyzed this pathway has been interrupted due to a spinal cord injury. Research is being done into IBM where electrodes measure activity from the brain, which sends the data to a computer, based decoder that translates this activity into commands for the control of muscles, prosthesis or a computer. In labs, monkeys have learned to move a errors with a robotic arm and people have learned to use a simple prototype to write short texts or to control mechanical devices.

This technology is still new so not much data or research has been accumulated on the effects it has on the psyche of patients. So obviously some major issues are; what kind of psychological and social effects does IBM technology have on people and the way we interact with others and ourselves? Does one using IBM technology have to worry about any drawbacks? On a psychological personal level does IBM technology have the ability to change ones cognitive thinking patterns? Paul R. Wolfe describes a

case study where Matthew Angel, a quadriplegic, talks about some major psychological concerns.

In Matthews case “ the computer that translates his brain waves into signals “ learns”; it does increasingly well in understanding what Angel is trying to do and translating it into action. But this computer is hard-wired into Angel’s brain. As it learns, its relation to Angel’s intentions changes. In other words, this extension of Angel’s brain is itself a developing intelligence of a sort, now integrated into Angel’s own processes” (Wolfe). So in essence a Brain computer interface has the possibility of reading a symbiotic artificial intelligence within the psyche off human.

This brings up an interesting question on to what extent IBM technologies have on changing or creating a psyche. On a positive side though it has some interesting implications for therapy. Cyberspace could be used to “ act out” unresolved conflicts, to play and replay character logical difficulties on a new and exotic stage… It provides an opportunity to “ work through” significant personal issues, to use the new materials of cyber sociality to reach new resolutions” (Whither). E may still retain ourselves but at what point do we become something other than unman if we have more and more mechanical devices in our body? Does a Terminator scenario come to mind? Wolfe has expressed his concern with his case study on Nasal. This real concern becomes more prevalent when more devices are implanted in us. The more machines we have in or body that have artificial intelligence in them the more likely we have the possibility of our “ cognitive thinking patterns” to be influenced or changed drastically. Social issues are also something to be concerned about.

When IBM technology becomes more prevalent how will society respond? If someone can implant a device to make them stronger or faster or marker who would implant a device? People who have the money would pay to become better. There would arise a class of engineered humans. How would this effect society? Classes could arise that would cause conflicts. What kind of laws would arise? How would one label someone who has implants for strength, intelligence, sight, and hearing? Would we still call them human? At what point would we say they are no longer human?

How many engineered machines would we need in us to be labeled something other than human? What are some possible uses for the military? Wars would be fought with super soldiers. The movie Universal Soldier expresses some possible scenarios and problems with this type of technology being abused. Technology has a way of changing the way we live and experience life. IBM technology is still new but the implications it has for a person psychological change and social one has not been researched due to not enough data on the topic.

One thing that technology has always done is to cause us to see and experience our world differently. We need to become aware of the benefits and the problems that can and may arise with biomedical technology that is interfaced with our brains. The technology in its cultural context, media influence Technological Advances in BCC: from its very inception IBM technology was for years the realm of science fiction, comic books and movies like Buck Rogers. But whatever man can imagine or image in his head he has been able to achieve – He dreamed of flying, we’ve been to the moon and back.

And whatever technology man has embraced there have been social and cultural changes that have occurred as a result. Just like Virtual Reality, Brain Computer Interface devices have been the offspring of government supported research and development in fact the nonviolence of both technologies has furthered the reach of man’s abilities in the areas of robotic surgery, mapping the human genome, remote piloting of UN-manned military aircraft and spacecraft sent to distant worlds. What was science fiction in the sass and ass is now part of our culture.

How is it that we have come to expect more and more from science and technology in these areas? What introduces a technology into a culture so successfully that it becomes an integrated part of the culture and fundamental driver of socio/cultural change is how it is perceived before it gets there. Right now in Japan, robots are a part of daily life, they are perceived as back to the sass when the Japanese produced some of the world’s first robots called “ karakul” using Western gun and clock – making technology.

Robots in western culture are seen as threats to human autonomy and those who stand to bring the obsolescence of mankind; that also is because of depictions in novels and movies of alien robot invaders or machinations that could malfunction and suddenly turn on their makers. Illustration by Niobium a) Cultural approval thru medical application of technology: The IBM and robotics hat are now being used in the biomedical industry is changing the cultural bias towards robots, robotics and machine or computer interface with humans.

Along with being accepted through introduction by medical technologies, Western culture is simply inundated with all kinds of digital gadgetry bringing humans closer to one another and closer to the technology that we embrace. Further advances in IBM and Deep Brain Implants with the convergence of other technologies will no doubt bring acceptance of non-therapeutic uses into the cultural mix. B) Transition to non-therapeutic uses of BCC to human potential enhancements: One such non-therapeutic use has already made the transition and is on the market. Quite by accident, Dry.

Stuart Melody, a North Carolina anesthesiologist and pain specialist in Winston-Salem, while treating chronic back pain in women using a spinal cord stimulator, found a treatment for sexual dysfunction as well. Instead of treating chronic pain, the sacral nerve recalculation device (which is already FDA-approved for bladder problems and pain) could cost up to $17, 000, device, implantation and remote. The ethical question is of course where will this all go in the near distant true – what kind of effect will this have on human intimacy and sexuality? As the illustration suggests – maximum pleasure- very little contact....

The military already has made headway in other arenas perhaps more than we may ever know. Magic fighter pilot helmets have made their debut – does anybody remember the movie called “ Brainstorm” (Natalie Wood’s last) featured Just such a device. F-16 Fighting Falcon pilots can now look, lock and launch on an enemy target in the blink of an eye. Because split seconds can mean the difference between life and death for a fighter pilot in aerial combat, (where the standoff range is measured n miles) the Air Force is

adopting an advanced approach to high-tech man-machine interaction with the Joint Helmet-Mounted Cueing System.