Ethical Analysis of the Neuralink Company

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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STS Thesis

Introduction

Elon Musk's company, Neuralink, is a company that is currently developing a device called the "Link", that is essentially a computer that directly is attached to the human brain. This device is currently in development. One of the showcases of this device was the implantation into a pig's brain during a showcase of the technology in 2020, showing signals gained from a pig pressing it's snout on things. More recently, in 2021, the company has shown a monkey playing Pong, using the Neuralink device to control it, which was an interesting demonstration of the technology, showing that it can actually work, instead of showing just signals. Elon Musk has had a track record of working with companies that push the boundaries of technology, such as SpaceX, and the Tesla car. Despite his work with these companies, Elon Musk himself doesn't have a background in neuroscience, but he does have a company behind him that he can work with.

As shown by the experiment with the monkey, the Link device isn't just a hypothetical device; it can actually work. There are plenty of people that are interested in this device, and think it can be beneficial for people, such as people who have paralysis, but there are some concerns for this device. For example, there are safety concerns with regards to if the device is able to be used long-term. There are also worries about Elon Musk's claims to the device, like how it could be used to do various things in a human brain, such as potentially merging a human with an AI. There are some that say that Elon Musk is mainly hyping the device. Despite the previous devices in the category, this specific device has been said to be something that is a step forward compared to other devices in that it is wireless, and has the potential to be commercially viable, like the iPhone compared to other previous devices. Elon Musk himself is also important because of the fact that he is basically showcasing the device, as Brain Computer Interfaces didn't really have an overall 'face' to be the brand of this type of device. Compared to other previous devices, they haven't really had a device that the public would be interested in, as they were mainly experiential. With the Neuralink company, this device was a BCI that was more captivating for the public eye.

The video with the Monkey and the "MindPong" game that it played was a very neat video of a Monkey using two Links, one on each side of his brain, to play Pong without physically using a controller. Most of the commenters on Youtube found it novel, and it captivated the minds of people watching it by showing something that surprisingly worked well, instead of just seeing data on a graph.

This thesis will be about the Link device and its various potential benefits and applications, along with the challenges. The thesis will also look into Brain-Computer Interfaces (BCI) in general, in order to take a look at the overall field of devices that connect signals from a

brain to a computer. To explore the challenges of this device, this paper uses two frameworks, SCOT, and Mediation Theory.

SCOT specifically stands for “Social Construction of Technology”. SCOT is a theory that looks at the interplay between technology and the society that surrounds the device. The parts of society are called Relevant Social Groups, or RSGs. Each social group both influences how the technology is created, and affects the technology when it is used after development.

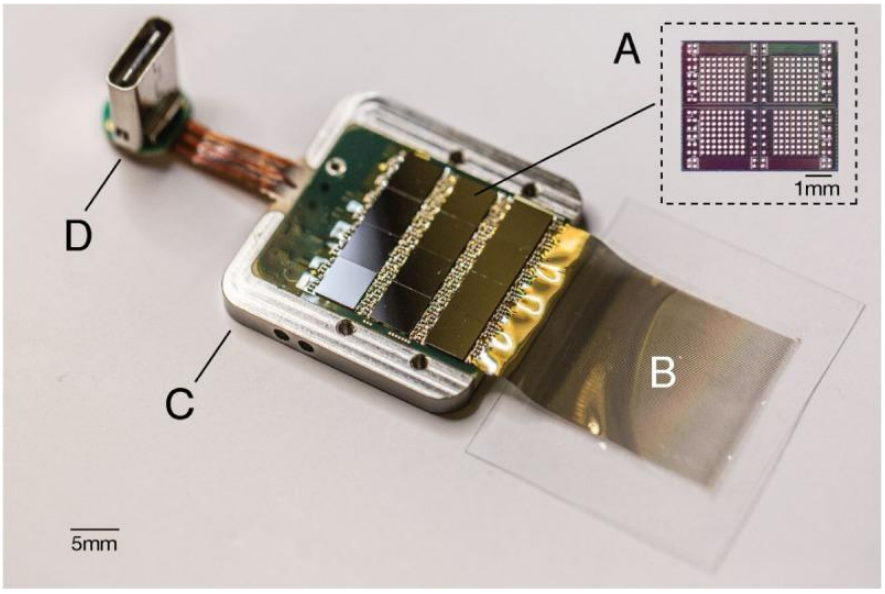
Mediation Theory is a theory that looks at ethics of devices. This theory looks at the ethics of the devices themselves, not only just the usage by people, but the ways that the device changes the way people use and think about using the said technology. This is similar to the SCOT in that both of them look at the interplay between technology and users, but Mediation Theory also looks at the potential ethical issues that would happen when the device is being developed. Mediation theory also looks at the way technology affects how people perceive the world.

Literature Review

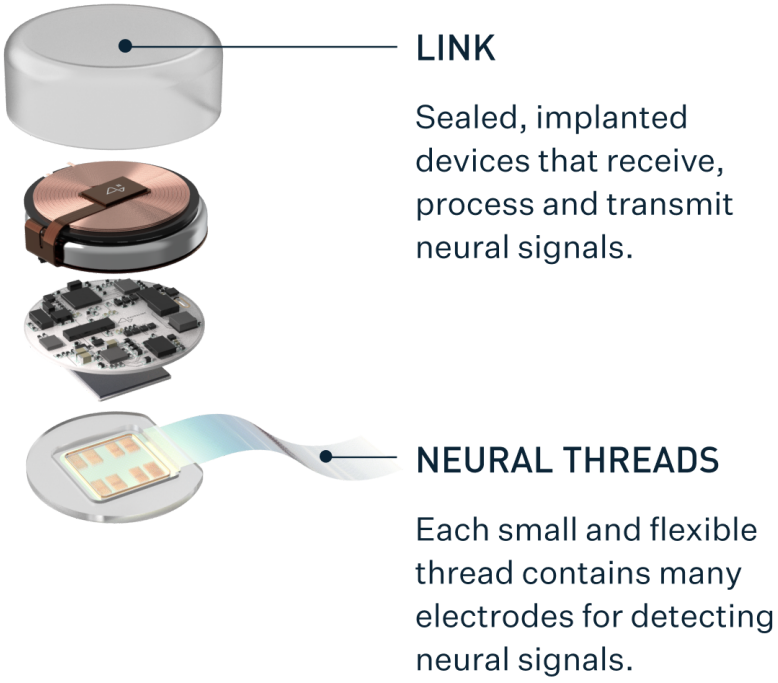
There are a variety of sources and literature that talk about the Neuralink company and it’s device, the Link. This literature review will summarize the various sources.

Lewis (2020) gives an overview of the current design of the device, which is a coin shaped device set flush against the skull, without any physical connectors. The previous device had an external USB port that was supposed to connect to an external battery and radio transmitter. Compared to this, the current device doesn’t have any external parts, which makes it easier to use. The device builds off of previous Brain-Computer Interfaces, but one major difference was the amount of people working on the project, which was more than other groups. The overall presentation that Elon Musk did with the pigs was, as the article said, mainly a tool for recruiting people to work on the project. The article mentions the implantation system for the “threads” that connect the device to the brain are notable compared to other systems. One potential problem is the amount of data that would need to be relayed over Bluetooth. The device also needs to be tested to see if it won’t cause harm to brain tissue. It also needs to work inside the body, as the device might be damaged inside the body.

One of the previous designs is shown below, from a Neuralink paper.



This device, in its current form, is shown below, with the pictures taken from the Neuralink website. The main circuits are in the circular part, with the “threads” which each have many electrodes that detect signals.



Zhao (2020) has an interview with Professor Bin He, the department head of Biomedical Engineering at Carnegie Mellon University, who is a researcher in non-invasive BCI (BCI meaning Brain Computer Interface), which is a form of Brain Computer Interface that doesn't directly connect a brain to a computer physically. One thing he mentioned is that invasive BCI

has more accuracy, and easier application. With regards to invasive BCI, one important topic he mentioned was Bidirectional BCI, which essentially is a feedback loop between the device and the brain. With the Neuralink device specifically, he said that if the reports are accurate, then the device is a great step forward, although he doesn't think that invasive BCIs will be hard for normal people. He also raised some ethical regards to BCI, such as privacy concerns, with the possible harm to a human body being another concern. In the future, he says that BCIs will help medical patients, with normal people possibly using them to control computers.

Pisarchik (2019) talked about the history of Brain Computer Interfaces, mentioning that nowadays Brain-Computer Interfaces are considered to be one of the most exciting aspects of science and technology. This paper was written about a paper written by Elon Musk and Neuralink detailing the wired version of the device. Pisarchik mentions that one important and novel aspect of the device is the threads that are biocompatible, along with the system that implants the device, which can work better than other surgical methods in inserting the threads into the brain. One aspect that Pisarchik mentions was the amount of data needed to be taken from the brain, which the Neuralink company had an approach to, with its large number of threads. The other type of BCI, noninvasive BCI, is limited by the amount of data it can access, so invasive BCI like the Link device are an improvement over it. This paper also mentions the potential impacts of the device, both positive and negative, such as a group like a government controlling people's behavior by directly sending things to the brain.

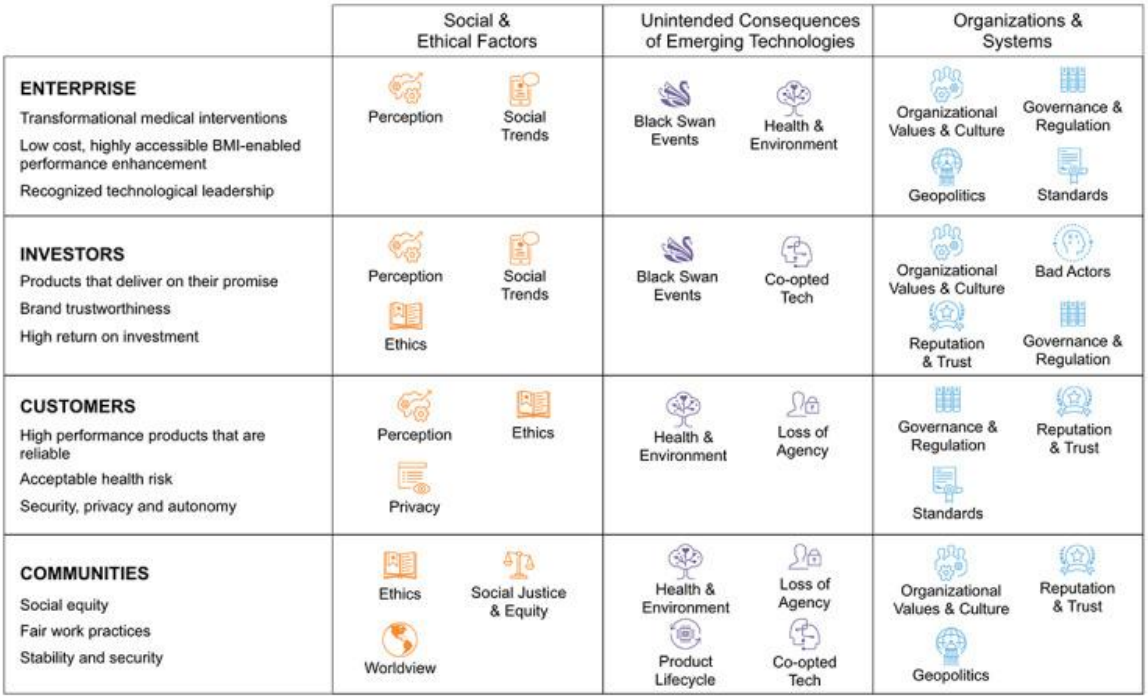
Valle (2019) starts out by mentioning the previous iterations of Brain Computer Interfaces in that they don't have as much control over getting the user of the device to control things. One way to work around this problem is, as the article mentions, is to directly connect the nervous system to the device, which means that the loop of intention to activation becomes smaller, allowing for control to be easier. The Neuralink company has presented a system that includes the device, along with a novel way to insert the threads into the brain with precision. With Musk's idea to connect healthy brains to a computer, this device is a step in that direction. The article also mentions that the Link device has "unprecedented package density", along with extensibility, and "scalability within a clinically relevant package". However, the device needs to be tested to see if the device can work. This device, according to Valle, has gotten nearer to a complete brain-machine connection, but isn't there yet. Devices like this and similar to this will let computers become a part of us, blurring the line between humans and computers, which raises ethical, social, and cultural concerns. Things like "personal identity, physical integrity, and the human dignity" of people using newer BCIs will be something important in the near future.

Fourneret (2020) mentions that one of the goals of Elon Musk with the company would be to connect a human mind to an AI, as mentioned in his presentation in 2019. The overall device, the paper said, was something that might not be feasible to develop, due to the level of design needed to make the device work correctly. It also says that the overall device was more of a marketing strategy due to the interest in transhumanism, where transhumanism is something that allows a human to improve themselves by connecting their body and mind directly to a computer. Another aspect that was mentioned was Elon Musk's idea of merging a human mind

with an AI. This potentially has repercussions for people, but the article itself mentions that it is difficult to see the effects of a technology before it is widely used. At that point, there isn't a way to go back to a time where the technology wasn't used. One example of this was the early computer network ARPANET, which ended up becoming the modern Internet. The people working with ARPANET didn't see the future problems of the Internet like fake news, which is similar to what the Neuralink device might end up being. The article also mentions that while technological devices are being developed, ethical issues should be looked at with ethicists working alongside scientists. They should also look at the purposes of the device, their values, and how it can "change the human condition".

Zhang (2020) details about BCI, specifically Artificial Intelligence alongside BCIs and their uses in various aspects of medicine. These things include cursor control, neuroprosthetics, somatosensation, auditory sensation, speech synthesisers, and vision. One of the oldest uses was in cochlear implants, which are used to help people hear after hearing loss. This is an example of a successful BCI. With the other fields, there needs to be some amount of processing with the brain's data that would make it so the BCI works. This is done by AI manipulating the data and processing it. If there were just a bunch of signals coming from the brain, there wouldn't be a good way to interpret the data without having something work with it in real time. This type of usage is still being developed, but it is an important part of future BCIs that use AI. The article also mentions potential ethical and social challenges. One example is the cost of the device - it would be hard for people with severe disabilities to access the device. There also are problems such as the decision-making aspect of the device - if it autonomously adapts itself to the brain, there raises a question of human autonomy. Brain data can also potentially be used by people to gain information about the person, such as intentions or interests.

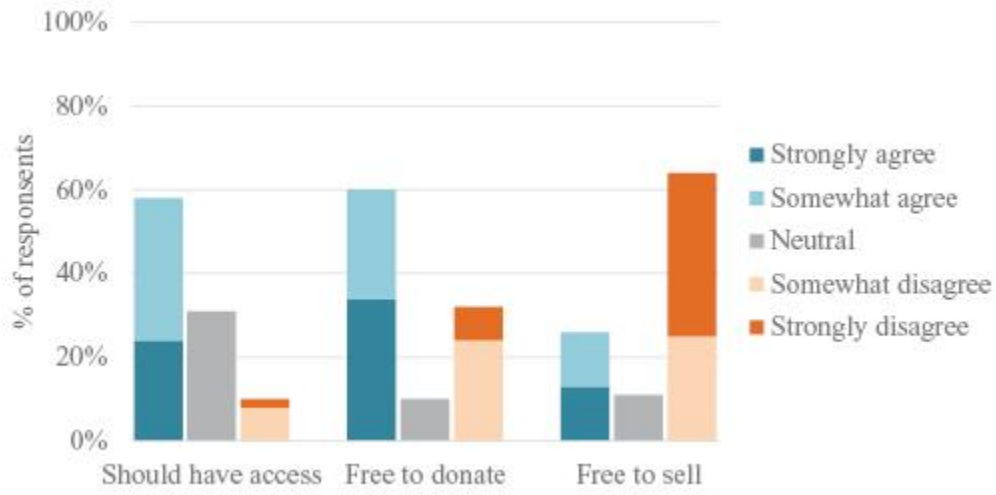
Maynard (2019) uses a framework called "Risk Innovation" to look at the various risks involved with the development of Brain-Computer Interfaces in general. This framework looks at potential benefits and risks with the development of advanced Brain Computer Interfaces. Risk Innovation specifically that looks at risks not based on previous risks, but looks at innovative views and solutions of the risks. This framework treats risks as threats to values, and are looked at as parts of a landscape of new ideas and their journey of becoming a good product. These values are specifically the values such as health, usage, and environmental aspect, as well as others such as privacy. The paper then outlines various risks over the categories of "Organizations and systems", "Unintended consequences of emerging technologies", and "Social and ethical factors". This framework starts with values, and then considers the risks to those. This allows the innovators to develop technologies while also avoiding threats that can hamper progress. The paper then mentions the BCI that Musk was developing, as it is a technology that can potentially be helped with Risk Innovation while the device is being developed. This device had values with medical uses, as well as values with usage for healthy people. These values vary between the various groups such as the usage, investors, customers, and communities. These values are outlined in the figure below.



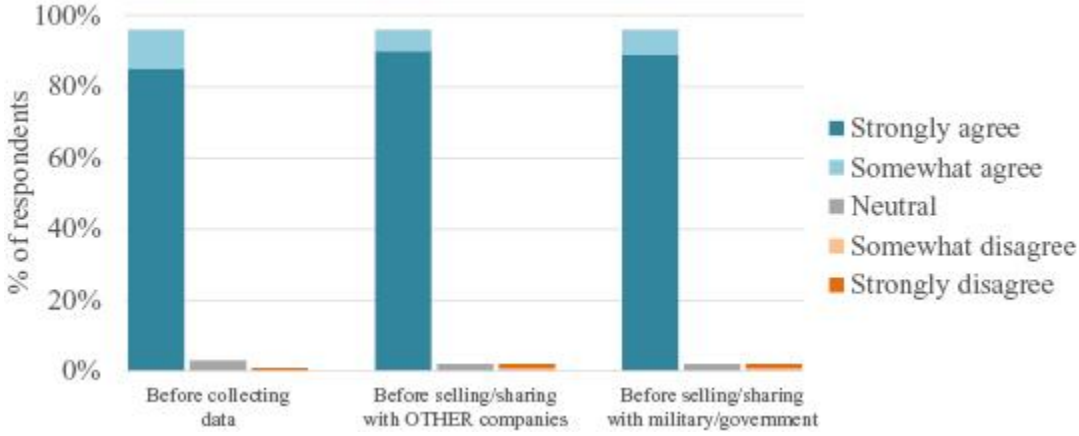
In this diagram, “black swan events” are events that are unpredictable, such as novel health impacts. This diagram illustrates a “risk landscape” that has various risks that need to be worked around for a successful device. The developers of the BCI created by Musk is one that has a lot of risks involved in the development and successful implementation of the device, which would require looking at the risks and updating them as the project develops with new risks that come up. Risk Innovation gives a framework for new risks and how the development of the Neuralink company’s development might be helped with it.

Naufel (2020) talks about a survey of Brain-Computer Interface researchers and their opinions on the nature of data collected using the device, specifically the control the researchers and research participants have over the data that was collected from the device. Below are two graphs showing the overall responses to two questions:

Research participant control of data after study completion:



Consumer consent for collection and sharing of data:



Most of the responders said that research data should be given to participants, but most said that they shouldn't be able to sell the data. If they could, the article said, the participants could enroll in various studies just to get the data to sell. The data might also be misleading if the participant only had raw data. However, most responders said that people should be able to donate the data.

With response to the second question, essentially all of the responders said that third parties need to get informed consent before collecting or sharing data.

Fifty-eight percent of responders felt raw neural data was medical data, although that type of data hasn't been widely used. This is important because designating neural data to be medical data can have regulatory and moral significance. With regards to the data, it could lead to reevaluation of data such as behavioral data, or social data.

Birnbaum (2021) details cybernetics implants, and their data privacy concerns, with the respect that the current legal framework isn't developed enough for the new advances in cybernetics - both the US and Europe are lacking in data privacy protections. This is important because the data from the devices may not belong to the person with the digital implant, even though the person with the implant might think of it as just a part of themselves. The paper also calls cybernetics the Fifth Industrial Revolution, where we currently are in the Fourth. To have a responsible usage of cybernetics, there will have to be more regulation with devices such as these.

The author starts out describing an overview of cybernetics, which includes devices like medical implants, such as artificial limbs, along with Cochlear Implants and pacemakers. One interesting aspect was the potential for hackers to gain access to things and cause harm to the user. The paper then goes into direct neural implants that access the brain. If hackers could access devices such as this, it would allow hackers to access parts of the person's brain that the device is connected to, possibly leading to false memory implantation or hallucinations.

Another aspect that is currently being used is called "Private Body Modifications", which includes things such as implanting chips under the skin that work as digital wallets, key cards, or other things. These types of devices are a part of the rise of the popularity of Transhumanism, which is a movement that believes that merging technology and humans will allow people to "transcend current physical and mental limitations". The article also mentions that it is important for lawmakers to understand the ramifications of devices such as these, as the world goes into the "Fifth Industrial Revolution" and the "world envisioned by transhumanism". In the United States, there aren't as many cybersecurity protections compared to Europe, which is something that the author thinks should be changed.

The article then goes in to talk about the problems of cybersecurity laws in the United States, as they are state based, and have specific based laws, instead of broad, big picture laws. This is an important aspect of cybernetics, as people with cybernetics in various places in the US would have different laws that deal with their data and data breaches. The paper then goes to say that there is a need for a national cybernetic law.

The next section then details potential regulation models for cybernetics. There are three models that the paper looks at: The Computer Network Model, as well as The European Data Privacy Regulatory Model, as well as a Hybrid Cybernetic Model that combines the two of them together. The Computer Network Model has the responsibility of securing data being the responsibility of the network or server owner. This model is one that has been used for protections since the advent of the Internet. With cybernetics, however, if there was one corporate entity to regulate, that would lead to a monopoly. This model would also mean that

there would be a large amount of security holes if the devices wouldn't belong to a single corporate entity, as well as the various networks that the device would be connected to.

With the European Data Privacy Regulatory Model, the responsibility for various aspects of Data Privacy do not necessarily lie with a network owner. Cybernetics in this model would be regulated in sections. With the GDPR, an EU data privacy regulation, there are various aspects that would lead to a set of strong founding principles for data protection in cybernetics, such as the segmented responsibilities as well as the "right to be forgotten", which is the ability to permanently delete their data.

With the hybrid model, the model combines the network security of the Computer Network Model with aspects of the European Data Privacy Regulatory Model, specifically the "Right to be Forgotten". The technology of cybernetics will need to be secure, with strong security, with the responsibility being the network and device manufacturer, an aspect from the Computer Network Model. With the European Data Privacy Regulatory Model, the paper says individuals with cybernetic implants should have the sole responsibility of the data from the device, alongside corporate entities. Data erasure is also an important aspect, as there is an "intensely personal aspect to the data". This type of model works alongside the future risks of cybernetics and is an important aspect for the device's security and data.

STS framework/research method

One framework that I will use is SCOT, to look at the interplay between technology and the social groups that affect how the device is used. SCOT is useful because it shows how technology can affect both the users of the device as well as change how the developers create the device. It also looks at the interplay between the way groups perceive the device and the creators that see the groups and try to work to create a device that people will like and use.

There are around five relevant social groups (RSGs) that were looked at using this framework. The first is the developers of the device, the Neuralink company. This group is important as they are the ones who directly are creating the device. The second is the government regulators, who need to be worked with if the Neuralink company wants their device to be used. The third are the medical patients who will be the first ones to use the device, as Elon Musk wants the device to be used for medical reasons before it is used with healthy people. To make that happen, the health system needs to make sure the device is safe, and they are the ones who will need to be worked with to actually test the device on people, so they are the fourth group. The fifth group are the people who want to use this device while not having medical problems. This group also will need to be worked with as, potentially, people who want devices like this for themselves might want to help the company develop it.

The Neuralink company is currently developing the Brain-Computer Interface device called the “Link”. This device has the potential to help medical patients with communication if they can’t control their body, but Elon Musk, one of the heads of the company, wants the device to be used with healthy people, in order to combine humans, technology, and potentially artificial intelligence. This group is the one that directly affects the technology, as they are the ones developing it.

The government regulators need to be worked with in order for the device to be actually used by people, asif they don’t let it be released, then the device wouldn’t be able to be used to help people or be used with healthy people. Some reasons they wouldn’t release it would be if the device wouldn’t be safe, or if the technology could be hacked somehow.

The medical patients are one group that impacts the device, as they are the ones who can help the Neuralink company test the device, while also being helped by the device as the device can help them communicate, and potentially help them in other ways. This device is still in development, and Elon Musk has mentioned trying to solve other medical problems rather than just communicating, which would help more people.

To work with the patients, healthcare professionals need to be worked with as well, because, similar to the government regulators, they need to be worked with in order to actually test the device, as if they don’t agree with the usage, the device wouldn’t develop further. They will also need to check if the device is going to be safe in both the short term and long term, although the long term safety wouldn’t be able to be checked until the device is actually used.

With healthy individuals, this group affects the device as they are the ones that Elon Musk wants to work with in order to achieve his goal of combining humans and computers. If the device gets to the point where it is shown to be safe and help people, private individuals might help the device develop further when they use the device to control technology and give more data and funding to the company so the company has more money to develop devices so they can help more people with medical problems.

With developing the device, the Neuralink company needs to be worked with each social group in order to successfully create a device that can both help people and also one that can be used for healthy people to create a future where technology is integrated with humans. The Neuralink company needs to work with RSGs in order for the device to develop further and be a device that is useful for people. Both government regulators as well as medical professionals need to be worked with in order for the device to be tested, and also to make sure the device is safe to use. The medical patients also need to be worked with if the company wants to test the device, so the company needs to make medical patients interested in using the device. Healthy individuals would potentially help the company get more funding in order to develop the device, so those individuals would need to be interested in a device that can do more than just control the inputs of a computer, which would lead the company to develop more uses for the device.

SCOT overall shows that the Neuralink company needs to work with various groups in order to have a successful device that people would want to use. This device also has the

potential to help make people more connected to computers, making them into a type of cyborg, which would be part of Elon Musk's goal to combine both computers and humans into one thing.

Another STS framework that I used to work with ethical issues regarding the Neuralink company and its Link device was called Mediation Theory, which is a framework that I will use with the device as it is currently in development, so there will probably be different ethical issues that will come up as the device gets tested on individuals and there are some ethical issues that will come into play when the device becomes relatively commonly used.

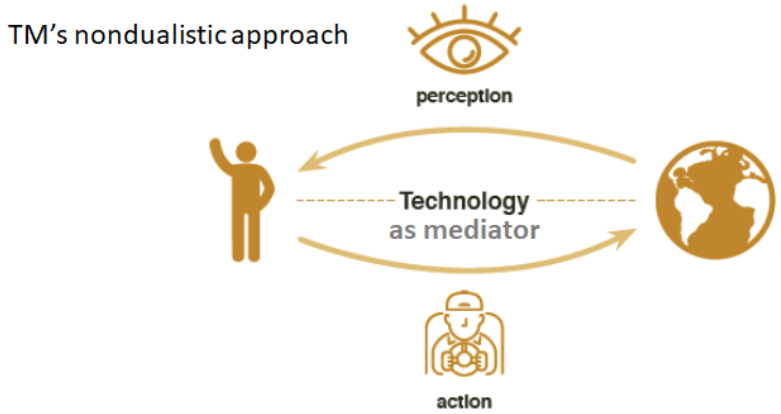
With Mediation Theory, the main parts of moral action are the developers of the device, the device itself, and the future users of the device. Right now, the users of the device are working on medical uses, but one main goal of Elon Musk and the company is for the device to be used with healthy people, in order for them to be able to connect their brain and mind to a computer. For the company, they are going to first work on medical uses, and if that goes well, they will extend their usage of the device to work on non-medical uses for the device, such as augmenting a brain. Elon Musk said that he wants the Link device to be basically a fitbit for your brain, in that he wants it to be a general use device. With regards to a device that connects directly to a brain, there are some privacy concerns, like the data gained from the brain. The company, on its website, said that security and privacy are important aspects of the device and its system.

This device has some aspects that mediate the way people use computers. By that, that means the device itself affects how people will use it. There are benefits to this device, like helping medical patients, but further on, the makers of the device will want to use it on healthy patients, in order to integrate the device with a mind, which can help people control computers, but can also be further used to do things like play music. To start out, the device will be used for controlling computers, in order for medical patients to be able to communicate or access computers when they couldn't easily talk or move their body. The Neuralink website also mentioned that it could further be used for controlling things like a video game controller. One interesting test relating to this was a monkey using its mind to control the paddle, which made people more interested in the device. Overall, in the future, Elon Musk wants the device to be a general purpose device for people to use. In the future, this device will create new values that can be seen by mediation theory, such as using a computer to help medical patients communicate and the benefits of fusing a mind with a computer.

With regards to ethical concerns, there are two main ethical concerns that will be looked at in this paper: concerns over who gets to use the device, and privacy concerns. With regards to who gets to use the device, many medical patients will probably want to use it to help them communicate, but in the beginning the device will be hard to use until the device gets developed further and the price to make and implant the device will become relatively usable for people. This may not be a concern if the device is relatively cheap, but that will be relatively unknowable until the device gets developed. But because the device is supposed to be general use, then it probably will be relatively cheap if the company wants people to be able to use it. The other ethical concern is privacy concerns. As the device connects directly to a brain, the device can access data from the brain, which can be a problem if the device gets further developed to access things, possibly like a person's thoughts. There are a variety of other potential concerns.

With Mediation theory, the developers of the device have to look at the device and try to work on potential problems. There isn't an easy way to see how a device in development will affect society, but the developers will have to keep in mind possible outcomes when developing the Link.

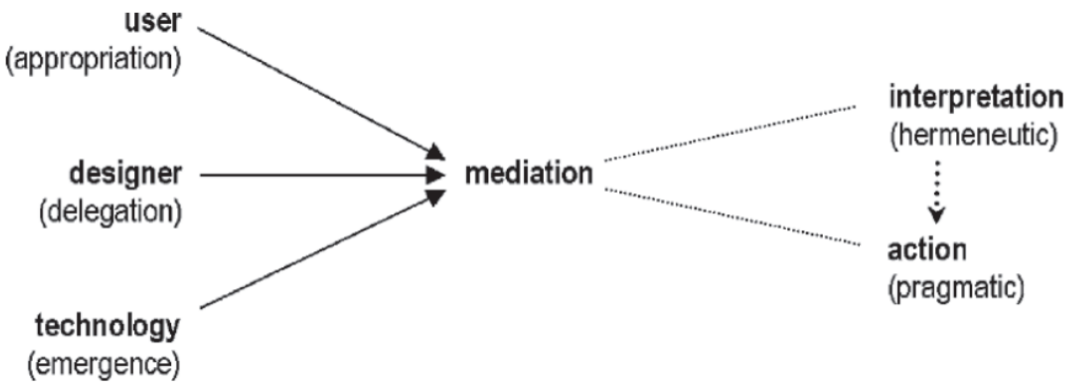
This diagram is an example of Mediation Theory, with technology affecting both humans and reality.



Technology ends up changing both humans and the way the world is. The technology also affects morals that people use to see the world. The diagram shows how the user, designer, and technology interact with each other to end up creating a system that affects the world around them and how they perceive the world.

One aspect of ethics that can be problematic when looking at devices that are being created is the aspect that the impacts of technology can't be seen until the technology is developed and widely used, but at that point in time, there isn't a way to change the fact that the world can't go back to the time where that technology wasn't a part of the world. Mediation theory then examines "morality in the making" by seeing how ethics change and are used with regards to humans and the way technology is used.

This following diagram is one of the main ways of looking at mediation, with technology changing the way people think of and interact within reality, and those changing the technology.



The user would be the person using the device. The designer would be the Neuralink company, and the technology would be the "Link". The mediation section is one that shows the values that are changed by the first three. Some of these include the ways people interact with computers, the health benefits for people who use the device to communicate when they don't have very much control over their bodies. Another aspect is the way people's brains become something more than just normal biological issues - with a device like the "Link", people's minds can integrate technology into themselves, which has implications for people's minds in the sense that with the device people can use technology wirelessly and, down the road, can be used to change the way people perceive themselves, in the case where Elon Musk gets his wish to combine a human mind with an Artificial Intelligence. That could have some implications as to what makes a person "human", in the sense that if their minds are upgraded to combine with an AI, does the AI change what is inherently human in that person? That also can be looked at with regards to what a brain is, as with the Link connected, that person becomes essentially a cyborg, in that they are a fusion of a human and technology. There are some various examples of that in fiction, such as cyberpunk stories, which are series that have a high-tech setting that also looks at ways people use potential future technology, mostly with a dystopian view of things.

With the section on interpretation, the device mediates the ideas of transhumanism, which is a philosophy that advocates technologies to enhance humans, including to the point where there could be humans who have greatly enhanced abilities due to technology. There is also the idea of what it means to be human. There is also a change in meaning of what a "normal" type of device is.

For the action section, this would be the use of this device in, at first, medical problems, but further on, with healthy humans who want to improve their minds by basically fusing with a computer. There is also the idea of the difference between 'enhanced' humans, as well as normal humans, which would basically make it so that if a person doesn't have a BCI type device, they will be at a disadvantage compared to people with one.

Most of the comments on the Neuralink video, and other similar videos about Neuralink, were mainly people interested with the overall benefits of the device, such as helping people, as well as the potential uses for healthy people. One commenter said: "I can definitely see where many people would see major problems with this, but for people that suffer with debilitating

diseases like Stephen Hawking, this could be a new lease on life.”. Another said: "Just imagine someone being able to hack you’re brain…”.

Data Analysis

One of the main aspects that showed authors the Link device is an improvement was the amount of connections the device has to a brain, and the small size of the device. The device is also an improvement as there are no outward connections, this device fits flush on the skull, instead of having a USB port connected to your head.

With the data from the Literature Review about the Neuralink company, there are various authors that had opinions on if the device is going to be successful or not. Overall, most authors mention that the device is a step in the right direction, even though there are things that need to be developed if the device is to be usable in people. In general, it is hard to see what the potential problems would be with a technology that is in development. There were some concerns about the safety of the device, as well as privacy concerns. Other concerns were things such as the potential increase in functionality the brain has, which could create a divide with people with a BCI compared to people without one. Most articles in the Literature Review were ones that looked at most of the benefits for the device, while others mentioned the potential problems and various ethical issues of the device.

There was also the aspect of the various legal problems with devices such as the Link, in the sense that there isn’t a current legal framework for the overall category of Brain-Computer Interfaces. This will be an important aspect of the development of these devices, as when they start to be released, there would be some confusion of who gets to access the data that comes from the device. There are also some potential problems that deal with people hacking devices such as this, to the detriment of the person using the device.

Discussion/Conclusion

The Neuralink company’s device, the Link, has the potential to help people with medical issues, but one aspect that interests people is the potential to connect healthy brains to a computer. This usage would affect how people use computers, and how close human minds can be to electronic devices.

Most authors in the Data Analysis focus more on the idea that the Link is an important innovation in the realm of Brain Computer Interfaces, but they also raise some questions on the topic of if the device is going to be safe physically, and something that is beneficial to people. There are also some problems with potential hacking of devices such as these. However, overall, this device is a step in the right direction.

The entire company is also an important aspect of the potential success of the device, in that it is a relatively large group of people working on the project, instead of having a small number of researchers working on a prototype of a device. The Neuralink company has a good

chance at becoming an actual product people can use, as the device is something that works without having a bunch of machinery around the user's head.

With regards to the actual design, the device is an example of an invasive Brain Computer Interface, with the chip being directly connected to the user's brain. This gives more detailed information than with devices that don't have a similar brain connection.

Devices such as this are an important part of technology in the future, as they can combine the benefits of a human mind and technology. As mentioned in the paper by Birnbaum, these devices will most likely become widespread later in the future. But regulations and data security are important parts to this as well, as the devices need to be safe from being hacked, with a good amount of legal protections for data and the usage of the device.

The Link represents a novel piece of technology that, like the iPhone, can potentially lead the way to more impressive devices, with benefits to people in general, despite the intrusive nature of the device directly connecting to the brain. The developers of such devices need to make sure that they have ethics in mind when dealing with things such as biological safety and data protection.

Overall, the Neuralink company has a good start creating a Brain-Computer Interface that people would find useful. I think that this company has a chance to create a device that people would want to use. There still needs to be some development, specifically with testing the device, but what the company has done so far, showing the monkey playing Pong with its mind, seems to be an interesting showcase of what can be done with the prototype of the device. This device will also spur other groups to make similar devices, which will help the overall field become more developed. The concept of this device is something that will become more relevant and useful in the future, when technology becomes more advanced.

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