STS in Society

As Observed by Section 11H

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Edited by Ryan Matthews, Marilyn Werner and Hannah Guider

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Introduction to The Internet: Co-Construction in Action

Section Editor: Marilyn Werner

The internet was created very recently, but it has already revolutionized how society goes about everyday life. Everything from communication to education to the economy has been changed by the internet, and the influence the web is constantly being expanded to do more things every day. The internet has been shaped by the needs and wants of society, and it has also changed the way that society learns, communicates, and spreads ideas.

The main STS concept that we will use to analyze the internet is co-construction, the interaction of technological and social determinism. Technological determinism (Sismondo, 2010) is the idea that technology shapes the direction of society. Social determinism is the counter theory to this, that societal pressures and social groups determine technological advances (Sismondo, 2010). These concepts and the idea of co-construction shape a large part of science and technology studies, because they are the driving force behind the progression of technology and of society, and they are a central theme in this course. We have worked as a group to analyze specific aspects of the internet as empirical examples of co-construction in action. By comparing and contrasting these two views of social and technological determinism, we will determine how both theories have led to the internet as we know it today.

The internet is constantly changing, but who or what determines the direction of the internet in the future? Using specific aspects of the internet, the group will analyze the internet with the STS concept of co-construction, the idea that technology and society shape each other.

One major aspect of the internet is social networks. They allow people to share portions of their lives with friends, family, and even strangers around the world. Technological determinism (Sismondo, 2010) has played a key role in the popularity and success of social networks. The creation of new websites and tools for social networking has directed society towards an era of less face-to-face communication and easier access to people who live far away, helping everyone to stay in touch, even if they cannot afford to travel.

However, some aspects of the internet are not viewed in a positive light. One area of the internet that is often looked down upon is internet piracy. Pirates illegally download, copy, or share music, videos, and other media from the internet. There are many people that are affected by piracy, including the pirates, the government and groups working to stop piracy, and the agencies or individuals that originally owned the stolen media. The pirates have changed the potential directions of the internet by using it to share media with others, through social determinism (Sismondo, 2010). Social determinism is based on the interactions of different groups of people in society with technology, through the social construction of technology.

Online education, specifically higher education, is another new concept brought about by the internet. Education online is based off of the many groups involved: from the teachers to the online students, to the programmers who create the software that makes instruction through the internet possible. The concept of the social construction of technology (Pinch & Bijker, 1987) explains how these relevant social groups can have an effect on the technology and help to shape its design. Online education allows marginalized groups to have access to education, like those who have disabilities, cannot afford college tuition, or have families or full-time jobs.

The Internet is a powerful technology that has shaped and has been shaped by society through co-construction. Technological and social determinism have both pushed the internet into all corners of society, and this new technology has changed how people communicate, share information, and learn.

- The increased use of social media online has caused a change in the way people act as well as interact with one another. Many users of these sites use them daily and this can lead to decreases in productivity and direct social contact. Users of social media tend to interact online more with the friends they are closest with rather than meet new people.
- Internet piracy and the cultures surrounding it have an impact on how it matures as a technology. At the simplest level, the internet is just a technology that allows users to share information between computers, and copyright law exists only to make the exchange of

certain information illegal. The websites and cultures that emerge from this conflict are all evidence for the impact that social structures have on technology.

- Online education provides easy access to education, but it is not fully taken advantage of by many in society. The social construction of technology determines how much each of the relevant social groups utilizes online education, and how they affect the progression of the technology.

Technological and social determinism work together to shape the internet. These forces of society and technology are also present in other aspects of society, including the environment and the natural world, which will be discussed in the next section.

Technological determinism and the use of the online social network, Facebook

By: Jasdeep Bathla

Explained by Sismondo (1982), technological determinism plays an important role in the changing dynamic of social interaction. This is seen by Joinson's (2008) article on the motives of Facebook use. The increasing use and dependency on online social networks is one aspect of the ways the internet is changing the social atmosphere through the process of co-construction.

Online social networks have been around since the early 2000's and with their emergence, a new social order has been created. About 81% of all online teens, and 67% of adults use some social media/networking site (Madden et al., 2013). Because of these high percentages of users, it is necessary to examine the potential effects these sites have on users. Many people do not understand how online social networks can influence one's social abilities or interactions. Through research done by various studies, it can be seen that online social media does in fact affect one's social interactions and views. Online social media also requires members to be of a certain age thereby marginalizing those under the age limit. However, many underage users still obtain accounts on social media by simply falsifying their information and creating an account. The underage users who create accounts are included in studies however those who do not create accounts therefore will not experience the effects of a social network.

Various research has been done examining the effects of social networks on social interactions as well as individual perceptions. This empirical example will take a look at the specific uses of the most popular online social network, Facebook, which boasts a record 1.35 billion monthly active users (Facebook, 2014). Beginning with research done by Joinson (2008), the leading motives for using Facebook include "keeping in touch" and "social surveillance." Keeping in touch includes browsing content on pages of friends and chatting online, both of which are considered active use. Active Facebook use deals with chatting with friends, posting statuses, or uploading photos. Social

surveillance deals with the passive action of browsing pages or finding new users as it does not require an active response. Once the motives for using Facebook and other social media have been established, the effects of mass use of these sites can be examined. In a study of college students' online and face-to-face interactions, it was found that about 63% of those surveyed reported using social networking sites for at least 30 minutes a day, making it the second most popular usage of the internet, behind general web-browsing (Subrahmanyam, Reich, Waechter & Espinoza, 2008). In fact, more college students reported going online (91%) than those who reported studying. Frequency of social network visits reported that 55% of those surveyed used social networks at least once a day (Subrahmanyam, Reich, Waechter & Espinoza, 2008). After being asked what the most popular usage on social media sites was, 75% of those reported using social media for responding to messages and reading comments or posts on a profile. On average, about 50% reported that their top online friends were also their top offline friends (Subrahmanyam, Reich, Waechter & Espinoza, 2008). This shows that online social networking is used to communicate more between close friends, rather than meeting new people. However, with this rise in the use of Facebook, it is important to understand possible effects this increased use can have. A major effect that comes from online social media is narcissism. A study done on the narcissism levels of social media users found that those with higher levels of narcissism posted more self-promoting information and posts (Buffardi & Campbell, 2008). In this study, it was concluded that those considered narcissistic according to the rating scales, tended to act similar online to how they acted offline. Buffardi and Campbell (2008) also show in their research that higher quantities of Facebook use led to an increased level of perceived narcissism. In another study that collected data on social media users, it was found that users are posting more private information such as cell phone number, email address, and place of location than they were in 2006 (Sterling, 2013). Also, 60% of users have private settings enabled which means that they use the social network more for keeping in contact with current friends rather than meeting new friends.

Applying these examples to the STS concept of technological determinism, it can be seen that

social networks are creating a new way of social interaction. According to the research done, most users keep in touch on Facebook with users they already are good friends with offline as well. Technological determinism applies to this example because an increased use of these social networks leads to a higher perceived narcissism rating as well as more posting of private information online.

Overall, technological determinism in social networks ties into the idea of co-construction and the use of internet because an increased use of social media leads to a change in the social structure and relationships between users. Another aspect of co-construction includes social determinism, where technology is influenced by social forces, and can be seen with the occurrence of internet piracy.

- The increased use of social media online has caused a change in the way people act as well as interact with one another. Many users of these sites use them daily and this can lead to increases in narcissism levels and the posting of private information. Users of social media tend to interact online more with the friends they are closest with rather than meet new people.

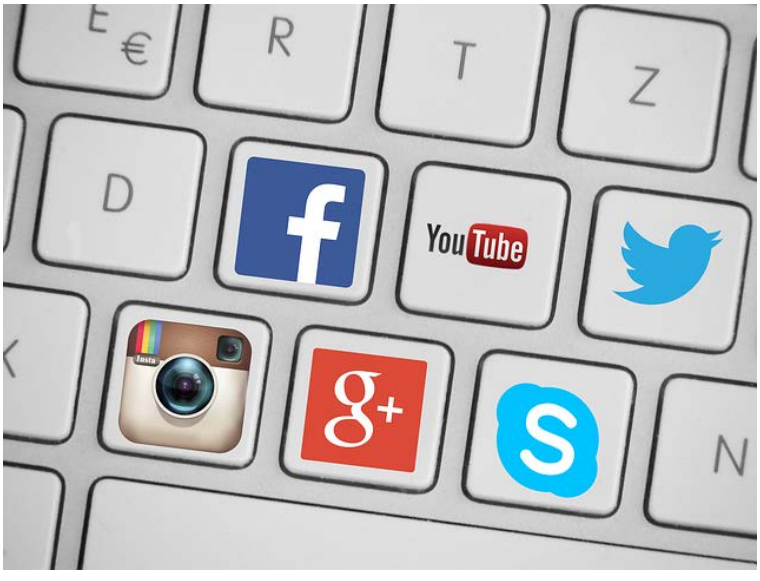


Figure 1 Popular Social Networks. This figure depicts popular social networks as easy-access keyboard shortcuts. (kropekk_pl, 2014).

Social Determinism with Respect to Internet Music Piracy and P2P Distribution Methods

By: Casey Chartier

- Internet piracy and the cultures surrounding it have an impact on how the technology grows as it matures as a technology, as at the simplest level the internet is just a technology that allows users to share information between computers, and copyright law exists only to make the exchange of certain information illegal. The websites and cultures that emerge from this conflict are all evidence for the impact that social structures have on technology.
- Social Determinism is the idea that society and social structures determine the direction that new technology develops, as opposed to the technology itself or related technologies determining the path it takes.

(Notwist, 2009) "Pirate Flag During TPB Trial"

Social Determinism is the idea that society and social structures are the dominant influence on the direction that technology takes as it develops, or the social half of co-construction. This is most evident in areas where two social groups are in direct competition with one another over a

technology, and as such this essay focuses on the back-and-forth struggles between internet pirates and copyright agencies (i.e. record companies) that have been going on for the past two decades or more.

While music piracy has been around since the early 70's in the form of homemade, bootleg cassette tapes, internet piracy has taken the movement to a new extreme due to its ease of use, speed, and nearly negligible cost. Internet piracy first began to gain infamy during the early 2000's when record companies began posting significant financial losses (10s of millions of USD, or about 5% of their profits) and almost unanimously posted blame on IRC (Internet Relay Chat) pirate networks and P2P (Peer-to-peer) sites like Napster or Limewire (Leyshon, Webb, French, Thrift, & Crewe. 2005). Bittorrent, an alternative method to transferring via IRC and the primary vector used by pirates following the rise of "The Pirate Bay", was still obscure and scarcely used at this time.

Music piracy is also a fantastic example of knowledge from marginalized social groups, as pirates are doubtlessly a skillful group of individuals with enough know-how to establish servers and facilitate the exchange of data on massive scales. Despite this, they are viewed and prosecuted as criminals, and their philosophies are largely ignored by companies and governments.

In many ways pirates have been around from the very founding of the internet, as they heavily populated the IRC channels that predate even the World Wide Web format (Cooper, & Harrison. 2001). On the simplest level, this use funds ISPs (Internet Service Providers) and manufacturers of computer parts at a time when computers were not considered average household items, which helped to fund future developments and the proliferation of computers. At the same time, however, these pirates were establishing a social structure and philosophy of content sharing that permeates the internet to this day.

The average music piracy-centered IRC contained three tiers of users; leechers, users who predominantly download content, rarely uploading anything they had found themselves; traders, users

who sought to exchange hard-to-find files with other users in exchange for files the trader himself desired; and citizens, the elite of the chat rooms (Cooper, & Harrison. 2001). Citizens rarely strayed from chat room to chat room and uploaded the vast majority of content to the chat room. The popular video streaming site Youtube has essentially the same social structure as these IRC rooms, with the average user being a “leecher” who only consumes content put on the site, while any famous “Youtuber” can easily be compared to his pirate counterpart, the “citizen” although the former creates content while the latter copies it.

On a more extremist note, following a series of high profile lawsuits on widely used mp3 sharing websites like Napster, Limewire and Kazaa by organizations like the MPAA (Motion Picture Association of America) and RIAA (Recording Industry Association of America), there was a desire among the pirate community for more anonymous and robust service. This was answered by the now infamous website “The Pirate Bay” which has the self-appointed title of “The Galaxy's Most Resilient Bittorrent Site”. Bittorrent allows users to transfer tiny pieces of data to and from one another to make up larger files, meaning that any one individual user never transfers one complete copyrighted file, or even any usable data, and as such they can't be targeted by lawsuits. At the same time, The Pirate Bay itself doesn't host any pirated material, only magnet links which are comparable to blueprints that computers use to build complete files out of the tiny pieces of data they receive. This incredibly intricate system and some border crossing has allowed The Pirate Bay to survive for 12 years, despite a raid in 2006 that took the site offline for a total of three days and all but one of the original founding members of the website being incarcerated in the years since (Thier 2012).

Essentially, the internet owes not only its early history to piracy, but also many aspects of its structure and some of the technologies contained within it. It can be said that internet piracy has led to dramatic changes within the music industry, while providing the foundation for websites like Soundcloud, called “The Youtube of Audio”, to fill the gaps left by these changes (Giannetti. 2014). Piracy's influence is impossible to escape on the web by this point, as most websites are rampant with

anti-piracy design, ranging from copyrighted books that can only be read one page at a time to all manner of DRM present in video games. These things would not exist (or would exist in a considerably different form) if piracy had not been as influential and widespread as it is. Internet piracy and the cultures surrounding it have an impact on how the internet grows as it matures as a technology, as at the simplest level the internet is just a medium that allows users to share information between computers, and copyright law exists only to make the exchange of certain information illegal, so the two are in inherent conflict. The websites and technologies that emerge from this conflict are all evidence for the impact that social structures have on technology.

Relevant Social Groups in Online Education: Looking at Minerva and the Promise of more Quality Education

By: Maya Regalado

- Online education is utilized by certain groups, that determine the progression of the technology
- Online education provides easy access to education, but is not fully taken advantage of.

In recent years, online education has become a vast and large avenue for higher education, whether it is a strictly online college like the University of Phoenix, or the offering of higher level courses to high school students. Minerva is an example of an online college that demonstrates promise of successful distance learning, with more interactive programs that allow for students to be more involved and focused on the subject matter at hand (Wood, 2014). Online education has a number of relevant social groups that all have their own interpretive flexibility over the usage of this technology. Relevant social groups and interpretive flexibility are part of the social construction of technology (SCOT), which concentrates on how social groups shape the development of technology (Sismondo, 2010). In relation to co-construction, this concept leans more to social determinism because of the users influence over technology. Many groups have interests in online education, making it an enormous structure for higher learning.

Today, when the words online education are mentioned many think of MOOCs. MOOC is an acronym that "was coined in 2008 to describe a well-received online course named Connectivism and Connective Knowledge" (Murray, 2013). The acronym stands for massive open online courses and such courses are characterized accordingly. Massive in size, which "can range from hundreds to tens of thousands of students" (Murray, 2013). The open aspect means that the course must be freely available with no registration requirements or cost to register (Murray, 2013). The course must also be "only available online and must be an actual course with a starting and ending time for enrolment"

(Murray, 2013). The term online education is much broader to include for-profit online course and much smaller class sizes. As Figure 1 demonstrates there has been a rise in Internet usage in recent years, as well as a drop in the number of schools being built. These changing dynamics seem to promote an education system based more prominently online. The demographics of US colleges have changed as well because as of January 2013 "2.6 percent of higher education institutions currently have a MOOC another 9.4 percent report MOOCs are in the planning stages" (Online Learning Consortium, 2014). Despite such a vast use of this technology, the individuals that use it are not quite as varied. Online education mainly centers on professors, students, and creators. There is great importance in education because of its influence over the other sectors of one's life such as income level and place of residence. The Internet is widely available, thus it should theoretically be a good avenue for education. For instance, public schools with limited budgets were expected to benefit from mostly free online education (Horn, 2014). These courses can allow students to expand their knowledge in an economically feasible way for schools, and in some cases may aid in their college experience.

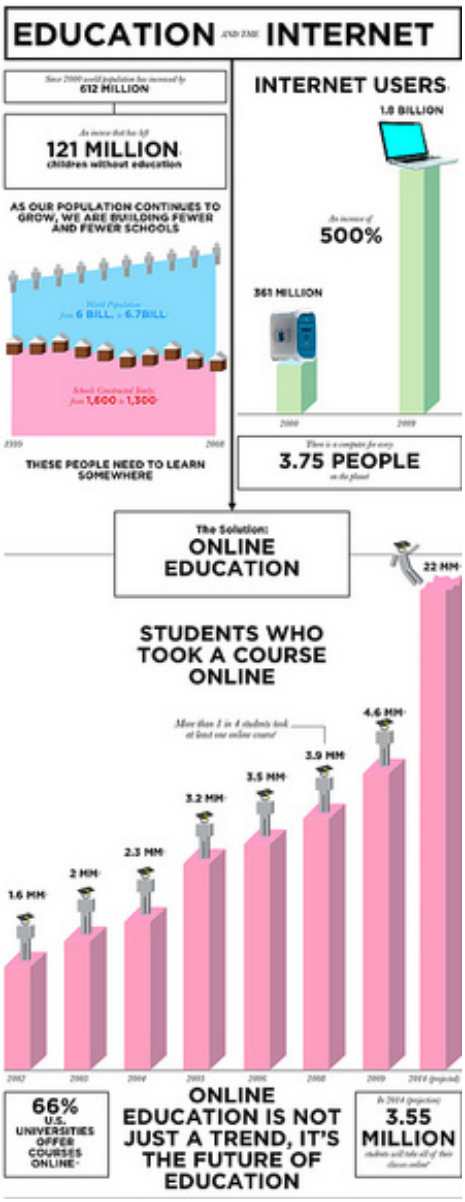


Figure 1. The rise in online education overtime. This figure demonstrates how Internet usage continues to grow along with number of online courses taken. The Internet could be the key to educating the masses. (Sukhbat, B. (2011) Online education. Flickr.com)

Online courses provide knowledge that would take large amounts of money to teach through textbook costs, teachers, and other supplies. Additionally, the high school curriculum

is limited in the amount of time offered to teach students. In a six to seven hour school day, teachers can only cover so much, most of which it general courses such as math and English. Through online education during a student's free time they can pursue other interest like engineering, astronomy, or the arts that are not provided by their school. Arguments have also been made that online courses could be better qualified to grant college credit than AP tests (Horn, 2014). Not all AP scores are accepted for college credit, which in many cases destroys the purpose of taking such a course. The main purpose many students take AP tests are to get out of introductory classes. Also, it makes more sense that higher value be placed on passing an online class created by a prospective college like MIT or Harvard, than simply getting a 4 or 5 on an AP test (Horn, 2014). In many cases online education provides more flexible courses and more qualified knowledge that is widely available to the average student. Although like so many other technologies, online education has its problems.

A study done by the University of Pennsylvania found that "only about half of those who registered for a course ever viewed a lecture, and only about 4 percent completed the courses" (Lewin, 2013). Results such as these are not restricted to universities because completion rates of less than 10 percent are seen for MOOCs (Horn, 2014). Additionally, not all online courses are accredited. The ACCSC (Accrediting Commission of Career Schools and Colleges) along with the Department of Education are in charge of the "accreditation of postsecondary, non-degree-granting institutions and degree-granting institutions … including institutions that offer programs via distance education" (ACCSC, 2014). The ACCSC's accreditation is not limited to observing the how a course is taught, but also "educational outcomes, including the rates of student achievement such as student graduation and graduate employment" (ACCSC, 2014). The first issue is that of limited completion. The courses vary in difficulty and style of teaching, as well as being able to be worked on depending on one's busy schedule, but results such as these persist. If the success of a course is measured in the completion rate, than most of these online courses would be failing. There is an additional problem with online education, which is the limited number of people it reaches. The same study by the

University of Pennsylvania also found that “80 percent of those taking the university’s MOOCs had already earned a degree of some kind” (Lewin, 2013). The knowledge from the course may be benefiting them, but what about those students without a degree? Why are they not using such easily accessible knowledge? These courses help only a few gifted students by providing opportunities not otherwise available (Horn, 2014). The rest are not able to fully utilize such an opportunity are just falling further behind those that do. Fortunately steps have been taken to improve upon these issues.

Minerva is a for-profit online college based in San Francisco that is trying to provide an Ivy level education strictly online (Wood, 2014). Unlike a traditional college, Minerva has limited facilities, mainly dorms and classroom space to work (Wood, 2014). It does not provide extracurricular or other such aspects of a traditional college, but this severely cuts down on the cost of attendance as well as providing an education centered environment. One way it intends to fix these issues is by keeping students more involved in the course. A Minerva class was described as “a continuous period of forced engagement, with no relief in the form of time when my attention could flag or I could doodle in a notebook undetected” (Wood, 2014). With less distractions students should be more focused on their work and better able to complete the course. Additionally students are taught skills as compared to basic knowledge. For instance instead of listening to a lecture on how to use rhetoric students are forced to argue a point and try to convince the rest of the class (Wood, 2014). Minerva demonstrates possibilities for online education to be improved by providing more involved courses. Although, this type of education has many of the acceptance restrictions of a traditional college so the knowledge is not spread those outside of this select group.

Not everyone on benefits from a particular technology, and SCOT demonstrates this. When looking at technology through SCOT “success of an artifact depends upon the strength and size of the group that takes it up and promotes it” (Sismondo, 2010). In the instance of Minerva, the highly educated individuals using the technology allow for a more innovative and interactive environment as compared to that of the large scale, varied education level of MOOC users. Additionally, SCOT is a

socially determined aspect of STS where people's usage of the technology shapes its future. These individuals make up relevant social groups, whose desires are taken into account for the use and design of these products. Some of these relative social groups include professors, students, web designers, and future employers each with their own interpretive flexibility of the use of the technology. The intention of the students is to gain the knowledge and credentials necessary to go on to find a job. Through the addition of education, employment will be of a higher caliber as compared to the positions offered to those who lack it. This will alternately allow the prospective students to live a more comfortable life style. Professors use this technology to teach and as a means to earn money for themselves. For instance some professors in Minerva use a program to divide students into groups depending on GPA, position on a topic, or major to facilitate a better discussion (Wood, 2014). Another relative group is future employers. One of the main reasons people take online courses is to get the qualifications to gain employment. Many online colleges and programs take notice of these desires and adjust their programs accordingly. Web designers and programmers make up another group, they design the website to promote learning. They are also individuals that take note of the previously mentioned groups' desires and adjust the technology to suit the other relevant groups. Minerva is currently a very exclusive group. There are plans for expansion from the relatively small initial class of 33 students to several hundred the following year, and such a move will require the expertise of this group (Wood, 2014). This also demonstrates how users "gain considerable benefits from innovating, tend to make substantial innovations that are picked up by producers of that technology" (Sismondo, 2010). However not everyone benefits from this form of online education. Minerva is trying to compete with Ivy League schools, thus students that are not at that particular level are an example of one such irrelevant group. Irrelevant social groups are individuals that do not utilize a particular technology, and whose desires for a certain technology are not taken into account. Besides students lacking the proper SAT or ACT scores, individuals without decent computer knowledge also make up another irrelevant group. Minerva is an online-based

college without the capability to use a computer this type of learning would be lost on such students, independent of their intelligence. Despite its shortfalls, Minerva demonstrated great promise with their revised programs, the founder was even so bold as to state that other universities will follow his example or be left behind (Wood, 2014).

Online education demonstrates a way in which everyone should be able to access knowledge and learn, but in reality this is not true. There are a limited number of relevant social groups in Minerva, but this college demonstrates capability of online education to be productive. Through interactive programs that force the student to remain attentive and significantly reduced cost through less extensive facilities this college demonstrates promise for the future of online education. Relevant social groups shape online education industry thus making it a socially determined technology of co-construction.

Technological Momentum in Societal Adaptation to Environmentally Damaging Industries

Section Editor: Ryan Mathews

Societal adaptation to environmentally damaging industries will be discussed in this section through the lens of the STS concept of technological momentum. Technological momentum is much like co-construction, which was discussed in the previous section, in that society and technology both affect each other, but with the added element of a time frame. It is the concept that larger, more mature technological systems tend to shape society rather than being shaped by it while smaller, younger technological systems tend to be shaped by society rather than shape it (Hughes, 1994). As many of the environmentally damaging industries are large and mature technological systems, they tend to shape the society that uses them instead of being shaped by that society, despite environmental concerns that may be present.

A technological system that is young and small may be affected by these environmental concerns, but as the damaging industries being discussed are mature and well rooted technological systems in today's society, these concerns of society have only a minimal impact on them. The environmentally damaging industries have enough momentum that it is difficult for society to try to change the industries to fit the concerns regarding the environment. Instead, they are able to withstand these concerns and may even be able to influence a change to these concerns to fit the industry.

Through this section, the reader will first encounter a discussion of the slash and burn culture in the Amazon using the STS concept of the deficit model, which shows how the ignorance of lay people- in this case, farmers- that is presented by the deficit model contributes to the use of damaging technologies involved in the deforestation industry of the Amazon. This is followed by a discussion on the subsidization of fossil fuels in the U.S. with the STS concept of path dependency, which explores how these subsidies contribute to the use of damaging technologies that further allow more damaging technologies to be created and used in the industry of fossil fuel production.

Slash and burn in the Amazon and fossil fuel subsidies in the U.S. are mature technological systems that affect the society around them.

- Deforestation has been an issue since the 1980s and continues to be so. The Amazon is an important ecological community in which heavy destruction could lead to mass extinction of both plant and animal life and irreversible damage to the land (Lindsey, 2007).
- Deforestation in the Amazon is mainly caused by farmers who use technologies to burn and harvest the forest to make way for new crops. In addition they ignore their role in deforestation, believing that there is a lot of land out there and that the use of harmful technologies is okay in the means to help themselves out financially (Camill, 1999).
- Subsidizing fossil fuels locks in the technology making future energy policy path dependent which is harmful due to the nature of fossil fuel use.

As these systems tend to affect society rather than be affected by it, they are mature technological systems that demonstrate the effect of technological momentum. Despite the negatives associated with these industries, as they have benefits for certain people, they can be considered technologically neutral, a concept which will be discussed in the next section.

The Deficit Model Applied to Slash and Burn in the Amazonian Rainforest

By: Kristian Wilks

The overarching idea of societal adaptation to damaging industrial processes on environmental ecology is further analyzed in this section by looking at a specific STS concept in relation to the empirical example to demonstrate the overall STS concept of technological momentum.

The example explored here within the scope of societal adaptation to damaging industrial processes on environmental ecology was slash and burn of the Amazon rainforest, or deforestation by burning and clearing. Technological momentum is the overarching "umbrella" concept, but within this concept that of the deficit model will be examined. The deficit model is a concept that says that the public does not know enough about science and need to be taught more for them to understand and to improve society (Sismondo, 2010).

The slash and burn in the Amazon rainforest can be looked at through the farmers there, who are some of the biggest contributors to the deforestation present there. Deforestation has been present for thousands of years, but since the 1980s the issue of deforestation of the Amazon rainforest in South America has become a major problem (Lindsey, 2007). This has mainly been due to an increase in farming and construction within communities adjacent to or within the Amazon rainforest (Lindsey, 2007). The deforestation of the Amazon has become such a major issue as it the largest community of tropical forests in the world supporting a large diversity of life, accounting for 300 million hectares of land and countless unique species (Camill, 1999). In addition, the Amazon is a large source of oxygen on the planet, and deforestation could then lead to a decline in air quality by preventing the outtake of carbon dioxide by trees as well as the production of oxygen. One of the issues largely at hand is a lack of knowledge about the impact of such deforestation, as well as an adaptation to the damage as a means of economic gain (Camill, 1999).

The empirical example pertains to farming in the Amazon, which accounts for "11% of GDP and 25% of labor force" (Massachusetts Institute of Technology, 2006). Due to struggles of growing economies in the late 1980s in regards to population growth and commonly accessible jobs, governments surrounding the Amazon began to pass laws allowing for more industrial expansion and agricultural expansion using the rainforest as a means of economic growth (Camill, 1999). This led to an increase in farmers burning down large areas of trees in order to make way for their crops and to make land for their cattle to graze, as well as for construction companies to build roads on cleared land (Camill, 1999). An additional contributor to the clearing of the rainforest was a strong desire for resources needed for modern necessary technologies, such as buildings made from rainforest timber or medicines made from extracts from rainforest plants and animals (Camill, 1999). While clearing land for crops, farmers were able to sell the cleared timber for a profit, and due to land being cheaper to clear than to re-fertilize, it was more efficient to clear, sell, plant, and harvest than to reuse the same land (Camill, 1999). This sad truth became a wise investment choice for farmers and reinforced environmentally damaging technologies used for burning and clearing, but ultimately only worsened the ecological damage being done.

The marginalized group in this specific example of slash and burn in the Amazon would be the farmers. This is due to their financial and educational statuses, and as such they are unable to obtain proper education or technology that would help them break from the cycle of using damaging technologies involving the burning and clearing of the rainforest. In this case the farmers would be experiencing a deficit of scientific knowledge regarding the environment, and their relationship with those who are not marginalized, or the elite, is with scientists who act as teachers by providing more scientific knowledge to help mend the situation.

Looking at this example, the deficit model makes perfect sense in both identifying the problem and the solution to deforestation in the Amazon. A farmer responded when asked about the damage of deforestation, "Look at how much land is out here. Whether or not I clear forests will not

make a big difference" (Camill, 1999). This demonstrates the lack of knowledge that farmers tend to have about their own impact on the rainforest. This lack of knowledge has led to an adapted way of living in society in which it seems to be okay to allow harmful processes to occur in the view that only one person doing it will not have much of an impact, as well as that it's okay to do so in the means of gaining additional resources to be used. However when this is magnified by the hundreds of thousands, or even millions of famers out there, it creates a largely detrimental impact on the rainforest and the natural ecology present, potentially resulting in mass extinction. However by teaching the farmers about the large-scale consequences to correct the deficit of knowledge, they could begin to see the issues they present and work towards a unified solution. While the farmers themselves may have lay expertise in the conducting of their occupation, improvement could be made to make the process more efficient and less damaging to the environment with the introduction of scientific evidence and information. In this way the deficit model could take the deficit of knowledge and improve the understanding of the damage caused by deforestation.

The deficit model when applied to slash and burn in the Amazon rainforest helps to understand just how much of an impact a lack of knowledge can have and the damage it creates. In terms of technological momentum, the deficit model here shows how a lack of knowledge can lead to the reinforcement of damaging technological techniques like slashing and burning, which reinforces these technologies and their use. While many aspects appear social, the social drive creates a need for these technologies further strengthening the need for their use. Similarly, the subsidization of fossil fuels also contributes to the reinforcement of damaging fossil fuel technologies through path dependence, as will be discussed in the next section.

This section should help the reader see the pressing issue of deforestation in the Amazon rainforest, and how the deficit model interacts to create a strengthened social adaptation to the damage done through the use of damaging technologies which further strengthens their use in society.

This is shown by two main points:

- Deforestation has been an issue since the 1980s and continues to be so. The Amazon is an important ecological community in which heavy destruction could lead to mass extinction of both plant and animal life and irreversible damage to the land as seen in Figure 1 (Lindsey, 2007).

Figure 1. Deforestation in the Amazon as Seen by Satellite (Wikimedia 2010) http://commons.wikimedia.org/wiki/File:Amazon_deforestation_2010214.jpg

Figure 1 displays the deforestation of the Amazon where the dark areas are forest and the light areas are deforested land. Using the scale to the bottom left of the picture, it can be seen that a large portion of the Amazon just in this photographed region has been destroyed.

- Deforestation in the Amazon is mainly caused by farmers who use technologies to burn and harvest the forest to make way for new crops. In addition they ignore their role in deforestation, believing that there is a lot of land out there and that the use of harmful technologies is okay in the means to help themselves out financially (Camill, 1999).

Path Dependency: Subsidization of Fossil Fuels by the United States

By: Brad Doherty

- Subsidizing fossil fuels economically locks in the technology making future energy policy path dependent on such fuel sources. This is harmful because fossil fuel use contributes to greenhouse gas emissions that damage global ecology.

"Path dependence is the idea that decisions we are faced with depend on past knowledge trajectory and decisions made, and are thus limited by the current competence base" (The Financial Times, 2014). Economic decisions made by the US government concerning national energy policy in the United States, with special interest in fossil fuel policy, are creating the framework for path dependence fulfilling the definition above. Moreover, the harmful effects of man-made greenhouse gas emissions from the use of fossil fuels are exacerbated by the subsidizing of the activity, thus the empirical example demonstrates a harmful societal adaptation to a damaging industrial process on environmental ecology.

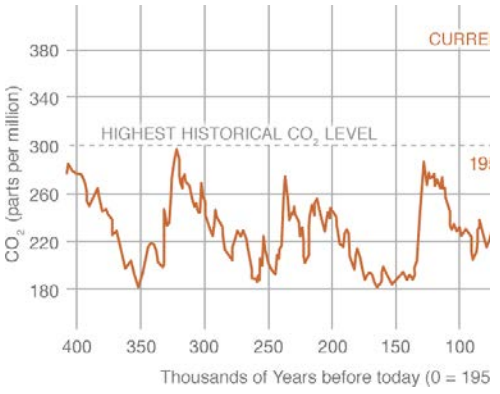
A subsidy can be described as "any measure that keeps prices for consumers below market levels, or for producers above market levels or that reduces costs for consumers and producers" (OECD, 1998), and given this definition, the United States has a well-documented history of subsidizing fossil fuels in one way or another since at least 1789 (Johnson, 2011). The expansion of the energy sector in the late 19th century however, led to steady increases in subsidies ever since. As of 2001, an estimated annual fiscal subsidy of all fossil fuels in the United States is estimated to be between $2.6-121 billion, depending on differing definitions of subsidies (Koplow &Dernbach, 2001). As this is a massive investment on the governments account, simple understanding of economics would lead one to expect a large, long term return on such an investment in the forms of sector growth and more consumption by the population. Thus, the subsidy decisions made by the US limits its decisions regarding energy policy in the future because of the anticipated growth in

consumption, as populations increase and demand is driven up, as well as fossil fuel sector growth, also increased by demand.

According to another study by the Environmental Law Institute, an estimated $72 billion dollars were spent by the US in fossil fuel subsidies between 2002 and 2008, while only $29 billion in subsidies were allocated to renewable energy projects (ELI, 2009). This shortcoming in renewable funding, plus a push to become energy independent as a result of foreign conflict has translated to the US likely becoming the largest producer of Oil by 2020 (IEA, 2013) as well as the largest consumer of oil in the world (EIA, 2013). The important point to understand is that this is the expected effect of a subsidization; it has allowed prices to remain low so as to promote consumption and hence allow the investment in the producers to pay off as described previously.

The problem with fossil fuel subsidization in the US stems from two important factors; the danger of green-house gas emissions from the use of these fuels, and the sheer magnitude of the subsidy and hence its ramifications. According to the National Oceanic and Atmospheric Administration, carbon dioxide in the atmosphere has reached a level of 398.58 ppm, the highest level of the green-house gas in the atmosphere in 650,000 years (Fig. 1) (NASA, 2014). This gas is known to be evolved from the burning of fossil fuels and there is wide agreement, 97% of scientists, that burning fossil fuels is among the main reasons a spike in levels has been observed (NASA, 2014). Put plainly, the rising levels in association with observed climate change indicate that the use of fossil fuels is proving to be a damaging ecological practice. The reversibility of the use however, is not easily done due to the subsidies.

Fig. 1



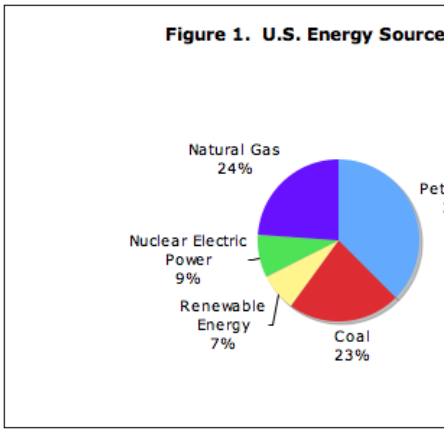
Source: NASA

The problem extends from the very goal of the subsidies; to promote consumption. By subsidizing the production of the fuels, the price is kept relatively low, and people use the lower priced energy source in their day to day economic activities over a more expensive, albeit more environmentally friendly, alternative. Take away the subsidies and people will have to pay more for day to day energy needs leading to an increase in the cost of living. Economic theory tells us that if the cost of living goes up and wages stay the same, debtors will not be able to pay back the debts they have and mass defaults will lead to credit crisis, deflation, and possible stagnation in the economy. Subsidies of such magnitude tend to lock in the good for an economy.

When considering the ramifications of the subsidization's framework, two considerations should be made; the effect of the subsidization with respect to economic and social flexibility, and the need for future flexibility. Subsidies for a good give it an unfair market advantage over a competing good; in this case fossil fuels account for about 87% of energy sources in the US (Figure 2, data from EIA, 2008). That means that the market return for energy expenditure is mostly channeled to the pockets of fossil fuel firms while expansion of renewables cannot financially keep up with the expansion of the carbon based fuel market. This economic phenomena is referred to as lock-in in science and technological studies, and the idea that technologies and technological systems following

specific paths that are difficult and costly to escape is at the core of this principle (Perkins, 2003). This all points towards energy policy in the US as being dependent on former policy decisions that have effectively locked in the technological system (fossil fuels); this is the very principle of path dependence. This is especially problematic when the need for path alteration is considered.

Fig. 2



Source: EIA 2008

Fossil fuel subsidization is an ecologically harmful social adaptation to a damaging industrial process. It makes energy policy path dependent and difficult to reverse even though it may be a detrimental practice, as discussed in the beginning of the section. This is similar to the previous empirical example because economics locks in the technological system as in the case of deforestation in the Amazonian Rainforest. Energy markets display the subsidization responding accordingly with that sectors growth; this sets the norm for the nation by making it difficult for other energy sectors to grow. The specific technological system of fossil fuels is thus locked in, setting the precedent for the social adaptation to the process.

Introduction to the Neutrality of Genetic Engineering

Section Editor: Hannah Guider

Genetic Engineering is still a relatively new concept in the scientific world and has yet to be thoroughly explored. It first started with Boyer and Cohen when they created the first living organism with recombinant DNA in 1973. Since then, research in the genetics field has boomed, resulting in the modification of plant, animal, and human DNA. This entire field is surrounded by controversy, which makes it an excellent umbrella empirical example to discuss the neutrality of technology. Winner (1980) discussed the idea of technology being neutral, explaining that for technology to in fact be neutral, it must possess both good and bad qualities. *[Please see Professor Williams' note in the glossary about Winner's disagreement with the very idea of "technological neutrality"]*.

The analyzation of the positive and negatives of genetic engineering and the process of making this booklet allowed us to complete the course objectives. Arranging the booklet as a class allowed us to show our communication skills to solve problems and finalize a respectable booklet. The separation of work among our team members demonstrated our ability to communicate and critically analyze and summarize the concepts to create a flowing piece of work. In order to adequately examine our umbrella concept of technological neutrality and the umbrella empirical example, two narrower concepts, politics of artifacts and technological optimism, were discussed among the members of our small group.

As mentioned earlier, the concepts of the politics of artifacts and technological optimism were used to fully explain the neutrality of genetic engineering. Winner's politics of artifacts explains how technology can shape economic choices and history. He says some technologies lend themselves to organizations, and are dangerous enough to acquire their own set of politics or be designed for political achievement (Sismondo 2010). We discuss this theory in terms of genetically modified crops (GMOs) and how these crops need regulating in order to remain safe for humans and the environment. The concept of technological optimism will then be used to discuss the general view toward genetic engineering in the medical field. Technological optimism explains how

technological advancements are always viewed as a favorable contribution to society and can do no harm. We will explore how this contrasts the neutrality of technology theory and discuss the possible positive and negative affects genetic engineering will have on humanity.

Throughout our essay, the neutrality of technology is thoroughly explored through genetic engineering. Focusing on Winner's politics of artifacts and technological optimism to discuss the implications on society.

- GMOs are artifacts with politics. They impose a hierarchy and/or settle issues within a community.
- Genetic engineering in humans is a legitimate possibility that could, in fact, reduce environmental impact, but has yet to become a common practice because of the risks and ethical controversy surrounding the field.

Genetic engineering is neutral, with positive and negative effects. It creates issues politically and morally within society.

The Politics of Technology in Genetically Modified Organisms

By: Megan Hughes

The focus of this essay is to discuss the genetic engineering sub-example of genetically modified organisms (or genetic engineering in agriculture). The empirical example discussed, "Can Gene-Altered Rice Rescue the Farm Belt?" will present pros and cons to the production of genetically modified organism (GMO) crops and then be related back to the narrow STS concept of "the politics of technology" (Winner, 1980). The politics of technology is a facet of the umbrella question, "Is Technology Neutral?". The politics of technology can be defined as the idea that technology can create a hierarchal divide and/or settle an issue within a community.

Humans have been altering the genetics of crops since they began to domesticate plants 10,000 years ago (Chassy, 2007). The first GMO patent was issued in 1980 on a bacterium that would eat up spilled crude oil (GMO Timeline, 2013). In 1994, the first GMO was approved by the FDA for sale in grocery stores (GMO Timeline, 2013). Since then, the controversy over whether or not they should be allowed has raged on. The two sides to this are those who believe that GMOs are harmful and should not be grown and consumed, and those, mainly the companies that produce them, who believe they are not only harmless, but necessary in order to feed the growing population. This is an excellent example of the politics of technology because it highlights a controversy as to whether or not GMOs should be produced. This issue is demonstrated in Alexei Barrionuevo's (2005) article, "Can Gene-Altered Rice Rescue the Farm Belt?".

Genetically modified rice plants that would produce proteins found in human milk, saliva, and tears have been developed. If they can grow in northwest Missouri, they could serve to reverse the economic decline in the area's farming community. The GMO rice can be sold for a larger profit than the non-GMO rice, corn, and soybeans that are grown now. This rice project is backed by Ventria Bioscience.

There are arguments against the GMO rice. The specific concerns in Missouri arise because around half of Missouri's rice is sold overseas in areas that are very sensitive about genetically engineered products (Barrionuevo, 2005). In North Carolina, another test plot location, there are concerns about native migratory birds transporting GMO seeds to wild areas.

Ventria scientists address these concerns, stating that rice is one of the safest crops for genetic engineering. Rice stalks-self-pollinate, so it is difficult to transfer to other fields. Farmers working for Ventria are also required to use a "closed system, using dedicated equipment and a production process where the seed is ground into a powder before it leaves the farm" (Barrionuevo, 2005).

Jason Garst, a local farmer in northwest Missouri, is growing 12 varieties of GMO rice in his test plots. He is willing to do whatever he can to make as much money as possible from his farm. He sees the rice as a way to make more money per acre than he can farming soybeans and potatoes (Barrionuevo, 2005).

As I previously stated, the politics of artifacts is the idea that a technology can create a hierarchal divide and/or settle an issue within a community. In this example, the technology, GMO rice, will do both. It will create a hierarchal divide between those who decide to grow the rice and those who do not. The divide will be economic. It also has the potential to create issues regarding the inadvertent transfer of altered genes. If the genes leak into neighboring fields, it could ruin business for the neighboring farmer if they sell to GMO-sensitive countries overseas.

- The main argument of this essay is that GMO crops are artifacts with politics. They impose a hierarchy and issues within a community.

Figure 1: Rice field in Missouri
Image from Wikimedia Commons (n.d.). Retrieved November 25, 2014, from http://commons.wikimedia.org/wiki/File:Rice_Field..JPG

The empirical example "Can Gene-Altered Rice Rescue the Farm Belt?" demonstrates an artifact with politics that will impose a hierarchy and issues within a community. This is a specific example that can represent the GMO debate in all facets of agriculture across America. It is clear that genetic modification is a technology with politics, but does society advance as this technology advances? The next section will discuss the STS subconcept of technological optimism.

Genetic Engineering and its Use in Humans As Analyzed Through Technological Optimism

By: Jimmy Stathakios

Throughout the following essay, the narrow STS concept of technological optimism will be discussed in terms of the specific empirical example of the extension of eugenics into the human species. This empirical example falls under the broader umbrella topic of genetic engineering, while the STS concept of technological optimism (Balbanian, 2006) is a component of the argument regarding the presumed neutrality of technology.

Eugenics is a specific field of genetic engineering in which the genetics of a species are somehow manipulated in order to increase the occurrence of desired heritable traits. This genetic "manipulation" encompasses more than simply "designing" test-tube babies. In fact, the origins of the eugenics movement actually arose in Ancient Greece, where selective breeding took place in order to refine the fitness of the human population (Hopkins, 2014). Recently, advances in technology have made it possible to alter the genetics of an unborn child in order to eradicate genetic disorders and potentially even hand-pick the most desirable traits (Moores, 1998). Considering the history associated with eugenics, the modern question arises as to whether or not the effects of these technologies are a benefit to the well-being of mankind.

Dating back to the early 1990's, the field of molecular biology has been overwhelmingly focused on completing the human genome project, which aims to map the location and function of over 80,000 human genes (Moores, 1998). Twenty years removed from the start of the project, it has been deemed a huge success since the human genome is understood better than ever before. The vast amount of knowledge produced from this research has set the stage for a new age in the eugenics movement. The process of In Vitro Fertilization (IVF) presents the possibility of artificially selecting which genes will appear in an embryo. The uncertainty associated with human trials, along with the legal and ethical controversy surrounding the issue, has prevented this from becoming common

practice, but, nonetheless, it is still possible. One such argument in favor of IVF comes from an environmentalist standpoint. Figure 1 illustrates the concept of a carbon footprint and the idea that each individual can significantly impact the environment over the course of his or her life. It is a proven fact that smaller humans leave less of a carbon footprint than their larger counterparts. If the average size of humans was somehow reduced by even 6 inches, then the body mass of each individual would decrease by up to 25%, and nutrient requirements would decrease by up to 20%, which would be hugely beneficial to the environment (Liao, 2013). Considering the success of the human genome project and the potential to enact widespread IVF, the concept of genetically engineering the height of the human race in order to protect the environment is not far-fetched from reality.

The previous example regarding eugenics and the environment is one such example that supports the concept of technological optimism. Simply put, technological optimism is the idea that the effects of technology are beneficial to the overall well-being of mankind (Balbanian, 2006). If the potential solutions above were ever implemented, the alterations in human phenotypes would reduce ecological consequences and, in turn, benefit the human race. Although the strong ethical and legal arguments surrounding human genetic engineering may make it difficult to believe that its effects are beneficial, consider the issue from this perspective: The technology itself only aims to strengthen the human gene pool and create as fit a race as possible.

Although genetic manipulation that was previously believed to be science fiction is now possible, it does not mean that it is a common practice. Political barriers prevent this sort of technology from universal use. Genetic technologies can be considered political artifacts that discriminate against certain populations. For one, they only exist in highly advanced societies such as the United States and parts of western Europe. Also, their use would be incredibly expensive and could only be afforded by the wealthiest of citizens. The availability of this technology would undoubtedly create a sharp divide between the elite and the marginalized. Many of those who either

are struggling financially and/or live in an underdeveloped country have never even heard of these advances, let alone considered them as an option for their potential children. This idea is important because it argues that the effects of genetic engineering technologies are not necessarily beneficial to the well-being of mankind as a whole since the technologies are exclusive and would separate the marginalized from the genetically privileged elite.

Essentially, the extension of genetic engineering into the human species is an incredibly controversial topic, but when viewed through the lens of technological optimism, it becomes clear that the technology is created with the intent to benefit the human race. As discussed in the previous essay, GMO's can be viewed as political artifacts that establish a hierarchy and create several issues within a community. However, the evidence from this essay points to the conclusion that eugenics technologies themselves do not necessarily possess these implicit politics. Instead, it suggests that their consequences, positive or negative, are a result of how the technology is used. Overall, the advancement of this technology has been followed by the advancement of society, which provides justification to the idea of technological optimism.

Figure 1. Three men attempting to measure a relatively large carbon footprint left behind
Image from Wikimedia Commons
Bitterjug, 22 September, 2009
Retrieved November 8, 2014, from
http://commons.wikimedia.org/wiki/File:Carbon_footprint.jpg

- Modern technology has made it possible to genetically engineer the human race, but the application of this technology has yet to become common practice because of its risks and the ethical controversy that surrounds it.
- Genetically altering humans in order to reduce environmental impact illustrates the idea of technological optimism, which is the idea that technology yields effects that are beneficial to humanity.

Glossary

Co-construction

- The concept that social determinism and technological determinism are both equally important in determining the progression of technology and society (Sismondo, 2010)

Deficit Model

- Concept that says that the public does not know enough about science and need to be taught more for them to understand and to improve society (Sismondo, 2010)

Path Dependency

- The idea that decisions we are faced with depend on past knowledge trajectory and decisions made, and are thus limited by the current competence base (The Financial Times, 2014)

Politics of Technology

- The idea that technology can create a hierarchal divide and/or decide an issue within a community (Winner 1980)

Relevant Social Groups

- Part of the Social Construction of Technology (SCOT) that looks at the types of individuals that use a technology (Sismondo, 2010). The development [of] technology is shaped by of the interpretive flexibility of these individuals' use of technology (Sismondo, 2010)

Social determinism

- Society and social structures determine the direction that new technology develops, as opposed to the technology itself or related technologies determining the path it takes (Zenzen & Restivo, 1982)

Technological determinism

- The social phenomenon that occurs when technological advances shape social interactions and culture. Society is driven by the usage of the new technology and this leads to new orders in social structure and relationships (Sismondo, 2010)

Technological Momentum

- Technological systems, which can shape and be shaped by society, tend as they mature to shape society more and be shaped by it less (Hughes, 1994)

Technological Neutrality

- Technology can be both good and bad, lead to success and cause harm (Winner 1980)

  [Professor Williams' note: Langdon Winner does not agree that there exists such a thing as "technological neutrality". Winner instead espouses the idea of the "Politics of Technology" (see his definition which is correctly written above).]

Technological Optimism

- The idea that the effects of technology are beneficial to the overall well-being of mankind (Balbanian 2006)

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