

Sociotechnical Perspectives and HCI

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A sociotechnical system is a system that takes into consideration the social implications the system will have; it is a perspective that analyzes the effects of the system at large rather than just analyzing the system from a hardware/software perspective for efficiency or a human interaction perspective that analyzes the relation of the system to one person. Dr. Mo, a professor here at Drexel University, once said to me, “It is human nature to become increasingly more complex” so as technology continues to develop and become increasingly integrated in every day aspects of our lives, it is only natural for the systems we already have, or need to create, to become more complex. Therefore the nature of these complex systems will be multifaceted involving many different people and organizations possibly supporting these entities all at once or at different times, it is essential to understand and evaluate the impact that these systems will have – what are the potential benefits, what are the potential downsides?

Before formulating a more concrete definition for sociotechnical systems, it would be best to first define what is considered to be a technology. I would like to define technology as the means used to create the desired finished product or outcome. For example, a sweater isn’t a technology, but the machines that are used to stitch together the fabric are a technology. Originally sweaters were sown by hand, but thanks to the Industrial Revolution better resources emerged, more advanced math and science was available to create these machines and increase the production of sweaters making them more available to people. Applying this then to the sociotechnical system, this is the perspective designers take on to analyze the effects of systems on a society. The sweater machines enabled more sweaters to be made at a faster rate making them more available

to a larger group of people; however, the machines replaced a lot of workers in the factory, causing many people to lose their job.

We all belong to a society and many of us belong to many different types of societies, but how would one define a society? A society can be defined by elements such as geography, income, demographics, institutions, and culture. For example, I currently live in Philadelphia so I can say that I am part of the Philadelphia society because I am united with other people based on my geographic location but I can also say that I share a Philly culture by being an Eagles football fan and participate in similar football traditions. In addition, I am also part of the Drexel University society, it is an institution I am part of and share the similar desire for a college degree along with the students attending the University. Societies come in many different forms, but what makes a good society? According to Philip Brey, author of *Technology in Society*, a good society requires two virtues – well being and justice and is further characterized by instrumental values, values that help to achieve well-being and justice, which include freedom, democracy and sustainability. Brey continues to explain that the role of technology in creating and supporting a good society is that technology should uphold the virtues of well-being and justice also including but not limited to the instrumental values listed above (1). Based on Brey's perspective of a good society, and how technology can contribute to a good society, it is in my interest to understand whether technology influences society or society influences technology.

With the complex nature of technology and systems, it is rare to think of something that simply “just is” without having some greater implication to the people or situation surrounding it. For example, the ability for me to turn on a light switch

whenever I please contributes to my overall well being because I need light at night when it is dark in order to be able to read and write to complete my homework. My ability to complete my homework provides me with a greater chance of getting good grades and having good grades allows me to have more opportunities after I complete my education. On the other hand, let's say I couldn't pay my electricity bill so I no longer had the ability to turn on the light when it got dark so I had to make sure to finish all my homework before nightfall, and if I didn't, then my chances for getting good grades and more opportunities is greatly reduced. I believe that every technology or byproduct of a technology serves some purpose. In the case of the light fixture, the technology emerged from the demand of people wanting to have better light sources, especially at night. The wax candle was among the original technologies, then the kerosene gas lamp, and then the invention of the light bulb powered by electricity. As a result, the electric light bulb allowed for longer work days because the setting sun was no longer a limitation and the artificial light produced by the light bulb was sufficient enough to provide people with the ability to read, write, or take part in various other activities that wouldn't have been possible without a sufficient light source to see.

Interestingly enough, the interplay between technology and society is cyclical. The invention of the light bulb was the result of society's needs to have improved light sources to carry out daily tasks. After the technology was invented, as previously mentioned, it allowed for work days to get longer because no longer did people have to stop their work with the setting of the sun, which is the technology influencing the society because the duration of a work day has shifted. This is no different then the "chicken and the egg" dilemma and because of technology and society's cyclical

interplay, it can be very difficult to see exactly how, when, and where the relationship emerged.

When the light bulb was invented by Thomas Edison, I have a strong feeling his main concern wasn't understanding how the light bulb would impact various societies, but rather was more concerned with using the best materials to create a light bulb that would last a significant duration of time. While focusing on the specifics of the engineering to understand what materials perform best as conductors of electricity is very important and essential to creating technologies, it is just as equally important to understand the social implications of the light bulb.

Yet another example of the sole engineering focus on designing technology was the invention of the atomic bomb, facilitated by Albert Einstein. Not until after the atomic bombing of Hiroshima, Japan did Einstein fully realize the weight and insurmountable devastating effects of this invention. Right before his death, Einstein was quoted saying, "I made one great mistake in my life...when I signed the letter to President Roosevelt recommending that atom bombs be made; but there was some justification – the danger that the Germans would make them" (2).

Even though the country was at war that does not excuse the lack of social analysis in understanding how this would not only affect the current state of the world, but also how it would affect future inter-global relationships. Today, with heavy hearts, we can still feel the weight of the decision to bomb Hiroshima, that's why it is imperative to have both the engineering and social perspectives when designing new technology because catastrophic events like this can't be undone and recovering entire destroyed societies is an extremely difficult challenge that could have very well been entirely

avoided. It is very clear as to why the atomic bomb does not support a good society, but to refer back to Brey's definition of a good society, in this situation, the instrumental value of sustainability was violated by killing thousands of innocent people in Japan.

Because societies are made up of individuals, a good place to start in designing sociotechnical systems is at the individual level and understanding how the affects of these one on one interactions (that can possibly apply to thousands of people) will make for a good society. The field of human computer interaction is closely related to that of sociotechnical systems because the systems that are in place are to be used by humans therefore, they need to be designed and executed with the human perspective in mind. The way that one human individual interacts with a system will be different from how another individual interacts with the system and this collection of individual interactions will hopefully have a positive impact on society, and if so, the sociotechnical team of designers alongside the engineers have properly done their job to create a good system.

In reading Liam Bannon's research paper "Reimagining HCI: Toward a More Human-Centered Perspective", Bannon explained the dynamic between humans and automated systems that struck a chord with me.

"What is important for our purposes here is the realization that building robust complex human-machine or sociotechnical systems requires us to go beyond approaches that aim for full-blown automation, with some residual role for humans added as an afterthought when complete automation is impossible.

Rather, we need to develop our designs from the outset to take advantage of some of the wonderful flexibilities and capabilities of human beings" (3).

Until recently, the common perspective was that if there is an error when the human is interacting with the computer, than it is the fault of the human. However, now if there is an error, it is the fault of the computer because the computer wasn't clear in the actions that needed to be performed in order for the human to be successful in completing their task. This is a major shift of perception and greatly changes the process in which systems are designed, a shift that is both necessary and will do good for all those involved.

With that being said, I cannot account for all the times I have been to a doctor's office and the information systems in place have failed me. I dread going to the see the doctor whether it's for a wellness or sick visit, yet being an educated young adult; I know the importance of going. It seems that every time I go to the doctor's I need to fill out multiple pieces of paper that describe my medical history, and I really despise doing this for multiple reasons. First of all, I understand that it is important for doctors to have past medical history to better treat you for your current illness, but when I'm not feeling well, I really don't feel like reflecting on mine or my family's medical history. Having to write down my past medical surgeries causes a lot of unpleasant memories to surface and having to explain my grandmother's passing from cancer every time makes me irritated to say the least. The ironic thing is that I fill all this information out on a sheet paper and hand it to a receptionist only to have a nurse later come into the examination room and ask me all the same questions again only this time it's inputted into the computer, and I think to myself 'gee, wouldn't it have been great if I started with the computer myself and the nurse read all the information I spent the time inputting before coming into the room'.

Having digital health records is crucial because it can more easily follow you from doctor to doctor and eliminates the paper work for the individual, the nurses,

doctors, and anyone else involved. However, the frustration doesn't end on my part, but also extends to the medical professionals because too often have I been asked my primary health care provider, and that option doesn't appear in the database and then there is no way to manually input it. Or in another instance instead of the doctor writing me paper prescription, they would write it on the computer so it can immediately be sent to my pharmacy, which you would think is a great benefit, yet sometimes the medication the doctor wants to prescribe doesn't appear in the database, so the doctor has to modify it because once again the information can't be manually inputted.

In HCI design practices, it is encouraged to have options for users to recognize what they need, like the medication in this case, rather than having to recall the full medical name for the medication. On the other hand, having to scroll through tens of options and not having the option to manually input information is poor design. In order to improve the design of the system, one could look at the redesign with a sociotechnical perspective and analyze how an improved system could benefit more individuals and society at large. Just speculating, but if there were better systems in place, does that mean that more people will have better health care experiences because their medical history can follow them from place to place? If people have more comprehensive medical histories will the success rates of treatment plans increase? If the success rates of treatment plans increase, does that mean there will be less overcrowding in hospitals and more people can be seen and helped by doctors? I believe these to be the questions that sociotechnologists ask to understand how the operations of a system will ripple and affect many other aspects of the health care industry.

In addition, sociotechnologists may also study the feasibility of proposed systems for different societies. Many of the medical technologies that are produced are made for first world countries that have the existing infrastructure to support these technologies. However, in underdeveloped, where better medical technologies are needed most, the underlying infrastructure isn't there to support these advanced technologies. How do engineers then design for this new society that could greatly benefit from health care and then again how does improved healthcare affect all the other aspects of person's life. If a person has access to better medicine, that means they are less likely to die from illness, and if more people live, is there enough food to support the increase in population?

As can be seen, everything in a person's life is closely related and seemingly unrelated things usually still have some type of connection. When creating sociotechnical systems, it is a big responsibility to understand and evaluate the effects technology will have and hold yourself to a high level of accountability to make sure that these systems are for the betterment and good will of a society as the developmental cycle between society and technology continues to perpetuate.

Works Cited

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