Social construction of technology

ITO 1 Individual Assignment Social Construction and Social Shaping of Technology Course Tutors: Professor Brain Bloomfield & Professor Theo Vurdubakis Submitted by: Amit Tewari Student Id: 30646848 Abstract Theories of social construction of technology provide ways to identify the influence of society in development of technologies. What do we mean when we say that technology is socially constructed? This paper explaining the theory of social construction of technology and providing with some examples cited in existing literature tries to answer this question.

It also briefly explains a related theory i. e. Social shaping of technology and tries to determine differences if any, between the two socially focussed theories. Throwing some lights on the criticism attached with the two theories it tries to provide with a conclusion. Introduction “ Necessity is the mother of invention. ” A famous quote often used, however the question is why a need of something arises? Are the things we have not sufficient enough that we need more.

Human is a social animal, but the insecurity of the word animal being associated with this species of living being forced him to draw a clear line between animals and humans. In his urge to draw this line he perceived his environment differently. His perception made him realize to do things differently and efficiently and in this process his needs raised and changed with time. Technology came as an answer to all human needs. Technology evolved humans and this process it also evolved with humans. Stone age to the age of spacecraft’s.

The world of the made is entirely different from the world of the born (Basalla, 1988). The world in which we are born changes with time. We experience these changes throughout our life and often compare the two worlds. Gergen in his book “ An invitation to social construction” narrates how his social world forced him to use technology over pen and paper and finally agrees to the fact that the technology transformed his life. Technology is considered as a driving force for human evolution, today technology is considered to have an independent existence rather being considered as a human creation.

Technological determinists are of the opinion that technology follows a path which is self-predicted and does not have a social or political influence over it. This ideology defeats the belief that humans are the creators of the so called technology. The existence of human is way before the term existed, everything that comes into existence has a creator, this may lead to an infinite regression problem of who is the creator of this world, but discussing this will be like beating around the bush just to prove the statement incorrect and meaningless.

The question is more about, is technology a self-driving force and in turn forces the society to change with it? Or technology is socially constructed. Historians like T. Huges and researchers like Bijker and Pitch advocates that “ technology is socially constructed” by this they refer that it not the technology that determines the human action rather it is the human action that shapes technology. To say that technology is socially constructed we need to follow an approach towards technology that is fundamentally sociological.

Social approach towards technology Social construction of technology (SCOT) is a theory that attempts to understand how social, political and economic consideration shape technology and its development. Pitch and Bijker presented the SCOT theory as a framework which consists of three related components. The first component is “ Interpretative flexibility”. “ The idea of interpretative flexibility is extracted from empirical program of relativism in the social studies of science. ” (Pitch 1997, 1986; Collin, 1975, cited in Klein et. al, 2002)

The idea considers technology and design as open processes and suggests that outcomes to technologies and designs are different depending on the social circumstances. The second component of the framework is the concept of “ relevant social group”. “ Society is conceptualized and linked to artefacts is via the notion of relevant groups” (Pinch, 1998). Pitch and Bijker categorise this component as groups that share same meaning for a technology or design. The meaning these relevant groups attach to a particular design or technology often plays an important role to determine its existence within the society.

Interpretative flexibility from these relevant groups can be seen as the meaning they give to a particular design or technology. The third component is “ closure and stabilization”. Different meanings are attached to a technology or design by different relevant groups which certainly lead to conflict, the design or technology continues till it possess no problems in other terms the state when every relevant group has the same meaning attached to the design or technology.

Closure can also be achieved when a particular design is considered to be non-functional or unclear to the relevant group resulting to emergence of an alternative. While increase in interpretative flexibility of a particular design leads to stabilization. A better understanding of the components of SCOT is achieved by analysing the case of development of bicycles where a detailed description of the relevant group defines the functioning of the artefacts, a proper understanding of interpretative flexibility and how closure and stabilization of a technology occurs.

Pitch and Bijker (1984) in their research work to understand scientific facts and technological artefacts as a social construct brings out the notion of relevant group. While considering the case of development of bicycle they emphasize on one of the models of bicycle the “ Penny Farthing” model and determine how different relevant group perceived this model and how it led to a construction of a new model. Penny Farthing model of bicycles came in the Victorian era and is often looked as a useless model of the bicycles that we use today.

The users of the penny farthing were young and adventurous people and for them it was more like an adventure sports than just being another mode of transportation. The other group called the non-users considered the model to be dangerous and avoided the use of such adventure sport as for them bicycle was much more a means of transport. The technology had two relevant groups the users (adventurous young men) and the non-users (females and other elderly people who considered it as an unsafe technology).

What was a “ Macho machine” for one group was a non-functional or hopeless technology for other group. In the above case study the three components of SCOT are visible. The relevant groups are identified as “ users” and “ non-users” of the model/technology. The group’s shared same meaning for the model of penny farthing within the group but the meaning was different for the two groups. This difference in the meaning attached with the model can be viewed as interpretative flexibility. “ The macho bicycle was radically different from he unsafe bicycle- it was designed to meet different criteria; it was sold, bought and used for different purposes; it was evaluated to different standards, it was considered a machine that worked whereas the unsafe bicycle was a non-working machine” (Bijker, 1995: 75, cited in lecture hand-out) Technological superiority dies in as the social force begins to strengthen; the function, superiority and power of a device are just not defined by technology but determined the social forces.

This strengthening of social force lead to achieve closure for penny farthing as the society finally perceived it to be a non-sensible technology and hence we saw penny farthing model coming to an end. The end of the penny farthing model lead to the development of “ ordinary bicycle” which we still use today and its dominance helped to achieve stability. Technology can be viewed as a solution to a problem that is defined by a relevant group or entire society. The solution can only be offered when there is a problem.

The need of making things simpler and convenient for human race was the problem that created technology as a solution. The need of light during the night, need to have food that is easily digestible and chewed conveniently and the need to produce heat during the cold weather was seen as a

problem and hence came fire, though it was not invented but was a technology during that era which gave the knowledge of using the technology and further to use them in other possible ways. Technology is often an answer to problem as suggested above but sometime its construction leads to a problem which cannot be answered by technology.

Technology is not limited to manufacturing, Information technology and science and the its construction which is often forced by society does not always turns out as a boon but sometimes the demands of society are is so self-motivated that it can turn out to be a curse. The technology of sex determinism in the field of medical science is one such example. In countries like India where social position of women is still weak is a consequence of such technology. Researchers claim that there have been about 12 million abortions in India since last 30 years (Reuters, 2011). The technology came up as a result social demand.

Male child preference and economic rise were among some factors that influenced the emergence of sex determination technology which ultimately led to a nationwide problem of sex ratio. Analysing the above case from SCOT analysis we have the relevant groups as “ the government”, “ the supporter” and the “ non-supporters”. The interpretative flexibility for these groups can be identified with the meaning each group holds for this technology. “ The government” who believe the technology should be used in a wise way and not in a way which makes the position of the women within society weaker. The supporters” attach the meaning to this technology as a way to predict the sex of their child helping them to make future decisions. “ The non-supporters” attach the meaning to this

technology as a way of making the situation worse for women and such technologies should be banned within society. The struggle to obtain a solution is still on-going, closure and stabilization can only be achieved in a single way by making all the three recognized groups come to an conclusion that such technology in no way is a boon for society and no alternatives to this is required.

A related theory dealing with Technology: Society relationship is “ Social shaping of technology” (SST). Like the SCOT it as alternative to technology determinist approaches. Where SCOT theory focusses on the question of why technology takes a certain form? The key focus of SST is identifying the effects of social relations and institutions on particular technologies. “ SST argues that the relationship between technology, organizations and society is not unidirectional, it suggests that it is a two way process”. Figure 1 depicts the two-way relationship between the three coexisting elements technology, society and organizations.

Technology is not a self-existing entity but it is rather embedded within society and organizations, hence it does not impact the society or the organizations from outside but it is a product of the interaction between social, technical and cultural processes. Social Shaping Society Technology Social Impact Figure: 1 two way relationship (Source: Lecture hand-out) SST deals with shaping of technology which often already exists while SCOT deals with construction of a technology to a particular form that it takes.

The key focus of these theories is different but still SCOT is considered as a variant of SST. SST is said to be available in ’weak/soft’ and ‘ strong/hard’

variants (Figure 2). SCOT is considered to be a strong/hard variant of SST. Social Shaping of Technology Soft/ Weak Hard/ Strong SCOT Figure 2: Variants of social shaping of technology There is always a social choice attached with a new technology. The social choice often makes technologies to compete and the technology that has an edge over others is adopted. It can be compared to the Darwin's theory of " Survival of the fittest".

The technology that makes its users believe that it will be advantageous for them survives over the rest. (Noble, 1999) in his research of automatic controlled machine tools brings out an interesting example of how social choice make technologies to compete and how Darwin's theory is applicable in context with this competition. An era which saw automation of machine tools in the manufacturing units as a boon saw to technologies as a solution to bring automation in manufacturing units. The first was the " record playback" technology and the other was " numerical control (N/C)".

The record play-back was first to arrive and was developed in 1946-1947 by General Electric. The technology used a tape which contained information of a skilled worker, this information was fed to the machine and automation was achieved. The technology did achieve some amount of automation but was considered like a means to achieve repeatability. The other technology providing solution to this automation problem was N/C which was conceived by John Parson while trying to find a way to cut contours of helicopter rotor blade. He presented his idea to Wright Patterson and after onvincing people at Air Material Command he began his research in collaboration with MIT's Servomechanism Laboratory. This technology bought more amount of automation in machine tools as it didn't required any pre-recorded tape of a

worker and only numerical data and calculation made the automation, thus the role of worker nearly coming to an end. N/C came was the winner and was highly used technology by the Aircraft manufacturers and various private organizations. The question is not about which technology survived but more about why one technology over powered the other?

Was it just because of it had an edge over its competitors or were there factors beyond it. The answer to this is complicated. It was not just an edge of the N/C technology that made its usage wide but there were many social choices associated with its winning. The Air material command strongly supported the N/C technology. The Air material command made use of N/C as an essential requirement to become a contractor, thus the private manufacturer heavily used it, forcing the small firms who often acted as a sub-contractor to use the technology.

The profit motive was one of the significant factors to support the N/C over record play-back. But this is not the whole story. Apart from the economic factor was a factor of self-control by management; the play-back technology did not gave all control to the management. To make the tape it still required a skilled worker to do a job at least once. The management wanted a full control over the process which was provided by the N/C technology and hence it was supported by the management.

The other ideology that mirrors the idea of self-control is the distrust in human which also to some extent reflects the capitalist mode of production thus providing an overall view of social relation of capitalist production. The record play-back was not a dysfunctional technology. It bought automation in

the manufacturing firms however did not meet the exact needs of the management and hence was turned down. The introduction of N/C was not just something that came up in a day it was desired long by the management to bring automation after facing labour troubles.

The N/C served the purpose and survived the battle. A different view towards SST and SCOT Both SCOT and SST aim to provide an approach towards technology which is radically different from the technological determinism viewpoint. The theories outbreaks the technological determinists view of technology which is " technological changes are the single and most important source of change within the society" (Winner 1997: 76, cited in hand-out). SST and SCOT do not consider technology as a non-significant entity.

The theories argue that its impact is not form outside but is a result of changes within society and organizations where society and organizations play a significant role shape the technology. SCOT argues that technologies are not self-developing and self-creating. SST and SCOT develop a deeper understanding of technology and play a significant role as a source of inspiration for expressing our meaning towards a particular technology or artefacts. Every theory has critics attached to it and SST and SCOT do not stand out as an exception to this. Different criticisms are attached to SCOT and SST.

Technological determinist critique SST by stating that SST in its research, also believe in the existence of technology and the changes it makes to society and organizations, whether the transformation made are direct or

indirect. SST is not only critiqued by technological determinist but even beyond. SST is considered to be more focused on social and economic interest and consider them to be key factors in shaping a particular technology but in doing so it leaves the reasons behind technological and organizational changes which are accidental and sometime unintended unexplored.

The technology examined by SST does not focus on the technical character of the technology under consideration and hence this factor still remains to be explored. Where SST manages to escape with few criticisms the SCOT theory has far more critics attached to it. Firstly SCOT is “ accused of replacing technological with social determinism”. Technological determinist critique SCOT claiming it to be injurious to researchers aiming to study the technological transform as it is deeply motivated by study of society and has an abstract level of technological study in the theory.

Further to this from a critical viewpoint SCOT is believed to show an unclear picture of the inequalities of power between social groups. To feminist and post-colonial authors SCOT appears to be politically “ disengaged”, “ debilitating” and “ insipid”. They consider SCOT to be of very little use for people aiming to bring transformation to society and organizations. Conclusion Studies suggest that society and organizations play an important factor to shape and make technology in its present form however the critics associated also suggest that it cannot be considered as a universal truth.

The debate that is technology socially shaped and socially constructed or is it the technology that shapes the society and the organizations is never

ending. More research needs to be made before we come to any conclusion. According to pitch the black box is not yet sealed and it is still like an open field to the groups associated making it more interesting. Other alternatives to the study of SCOT and SST have also been developed by researchers who try to provide with the answers which SST and SCOT are unable to. The relevant groups associated in the study will always have a different approach.

This is the era of technology and the developers of technology often consider them to be supreme. The sense of riding the society will always be attached with them. However we are surrounded by technology but the sense of being social is still very much with us. References Gergen, K. J. , 1999. An invitation to social construction. London: Sage Klein, H. , Kleinman, D. , 2002, Social construction of technology: Structural considerations, [e-journal] 27(1) Available at < http://www. prism. gatech. edu/~hk28/Klein02-SciTechHumanVal. pdf> [Accessed January 2012] Noble, D. 1999. " Social choice in machine design: the case of automatically controlled machine tools" in MacKenzie, D. and Wajcman, J. " The social shaping of technology, 2nd edition, Open University press Pinch, T. , 1998, " The social construction of technology: A review" in Fox, R. " Technological change", Amsterdam, Hartwood Reuters, 2011. Up to 12 million girls aborted in India over last 30 years: Study [Article] 24 May 2011, Available at < http://www. reuters. com/article/2011/05/24/us-india-abortions-girlsidUSTRE74N2C020110524> [Accessed January 2012]