

Article

Science Technology and Society Studies in Sociology

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This article explores the general assumptions and conceptual framework of technology from the perspective of sociology. It attempts to discuss the 'technological determinism' and 'social determinism' of technology in the creation of systems, structures, social-cultural and the technological construction of reality. The article also discuss the major themes of sociology of technology studies.

Key Words: *Technological determinism, constructivism, artifacts, Interpretative flexibility*

Introduction

The standard definition of technology may be like that, technology is the technical means people use to improve their surroundings and it is also a knowledge of using tools and machines to do tasks efficiently. We use technology to control the world in which we live. People use technology to improve their ability to do work. Through technology, people communicate better. Technology allows them to make more and better products. But this is a too naive definition for sociology of technology. Studies on technology from the sociological perspectives reveals some of the previously unexplored aspects of technology, which often contradicts our common sense notion on technology. Some of the important perspectives and themes came into being in the last few decades of the past century. The following literatures demonstrates the idea of sociology of technology, along with the major perspectives and example.

Science and Technology Studies or Technology Studies

Until recently, the studies of technology never received serious attention by the renounced sociologists. In fact entire social science paid meager attention to the studies of technology. Early breakthrough was achieved with the formation of Science and Technology Studies (STS) which was an interdisciplinary branch of studies of social science. STS was constituted by – history, philosophy, and sociology of science and technology."An origin story could identify such key moments in the birth process of this field as the first publication of Science Studies (later Social Studies of Science) in Edinburgh in 1971, the founding of the Society for Social Studies of Science in 1975, and the historical first meeting of the society at Cornell University in 1976." (Bauchspies, Croissant, & Restivo, 2006) Few works has been carried out by sociologist like Robert K. Merton, Karl Manheim on sociology of science. During 1970's, 'Science and Technology Studies' has appeared as a specialized discipline to the studies of science and technology by the work of Bruno Latour and Wiebe Bijker. Although there were other contributors played crucial role to the development of the approaches to the studies of science and technology; for example Thomas Kuhn by his famous work "The Structure of Scientific Revolution". (Dusek, 2006) In 1979, Bruno Latour and Steve Woolgar published Laboratory Life, probably the best known book in science studies. The book was an ethnographic study of a scientific laboratory; and its purpose was to document the creation of a scientific fact. "Using a variety of techniques from anthropology, semiotics, and biological fact in the context of lab work. They concentrate on a process they called "deletion of modalities," a progressive stripping away of contextual information about production, with the end result being a fact bare of biographical information. The book was an immediate success and was one of the factors helping spawn a series of laboratory studies and descriptions of fact-making, often ethnomethodological in approach." (Star, 1988) STS mainly focused their attention to the studies of scientific facts, realities; where the

studies of technology received less attention in the absence of perspectives.

Major Paradigms to the Studies of Technology

While the studies of science from the social science perspectives primarily concentrated on the understanding of the productions of scientific facts, technology studies scholars much attention to the studies of the close interplay between technology and society. They were assuming that technologies are like us having enormous impacts on society. Literatures were exploring the nature of the technologies, how technologies are political in nature and many other issues. They were also devising new methodological perspectives to explore the world of technology. The followings are major outcomes of the studies of technology. Early social science enquiry on technology was rested upon the philosophy of technological determinism; which presumes that a society's technology drives the development of its social structure and cultural values. It was essentially a reductionist view of technology where social structure has given priority over the human society. American sociologist, Thorstein Veblen has coined the term. Similar ideas can also be noted among classical thinkers like Karl Marx his idea of means of production or productive technology; where he suggests that the social relations and cultural practices ultimately revolve around the technological and economic base of a given society. Marx's position has become embedded in contemporary society, where the idea that fast-changing technologies alter human lives is all-pervasive. (Marx, Roe, & Leo, 1994). The opposite view of technological determinism can be found in the philosophy of Social construction of technology. Accordingly technology does not determine human action, but that rather, human action shapes technology. Thus a major paradigmatic shift can be observed in the studies of technology. The current article has mainly focused its attention to summarize the idea of social constructivist approach of analysis along with the revival of technological determinist perspective.

The Constructivist Perspective of Technology Studies

The heart of the social constructivists perspective of technology is the arguments that "technology does not determine human action, but that rather, human action shapes technology. Social construction of technology (also referred to as SCOT) is a theory within the field of Science and Technology Studies. Advocates of SCOT—that is, They also argue that the ways a technology is used cannot be understood without understanding how that technology is embedded in its social context." (Dusek, 2006) Its a response to the idea of technological determinism and is sometimes known as technological constructivism. SCOT draws on work done in the constructivist school of the sociology of scientific knowledge, and its subtopics include actor-network theory (a branch of the sociology of science and technology) and historical analysis of socio-technical systems, such as the work of historian Thomas P. Hughes. Major works were done by Wiebe Bijker and Trevor Pinch. SCOT holds that those who seek to understand the reasons for acceptance or rejection of a technology should look to the social world. It is not enough, according to SCOT, to explain a technology's success by saying that it is "the best"—researchers must look at how the criteria of being "the best" is defined and what groups and stakeholders participate in defining it. In particular, they must ask who defines the technical criteria success is measured by, why technical criteria are defined this way, and who is included or excluded. SCOT is not only a theory, but also a methodology: it formalizes the steps and principles to follow when one wants to analyze the causes of technological failures or successes. In their seminal article, Bijker and Pinch brought forward the idea of 'the Principle of Symmetry', which holds that in explaining the origins of scientific beliefs, that is, assessing the success and failure of models, theories, or experiments, the historian/sociologist should deploy the same kind of explanation in the cases of success as in cases of failure. Second most influential idea was 'Interpretative Flexibility' means that each technological artifact has different meanings and interpretations for various groups. Bijker and Pinch show that "the air tire of the

bicycle meant a more convenient mode of transportation for some people, whereas it meant technical nuisances, traction problems and ugly aesthetics to others. Sport cyclists were concerned by the speed reduction caused by the air tire. These alternative interpretations generate different problems to be solved. How should aesthetics, convenience, and speed be prioritized? What is the "best" tradeoff between traction and speed?" (Pinch & Bijker, 1987) Understanding of the role of the relevant social groups are also essential to the study of technology, as Trevor Pinch argued that the most basic relevant groups are the users and the producers of the technological artifact, but most often many subgroups can be delineated - users with different socioeconomic status, competing producers, etc. Sometimes there are relevant groups who are neither users, nor producers of the technology, for example, journalists, politicians, and civil organizations. has argued that the salespeople of technology should also be included in the study of technology. 'Design flexibility' is another key concept to the study of technologies just as technologies have different meanings in different social groups, there are always multiple ways of constructing technologies. A design is only a single point in the large field of technical possibilities, reflecting the interpretations of certain relevant groups.' Problems and Conflicts ' another key social issue which influence the different interpretations often give rise to conflicts between criteria that are hard to resolve technologically. Different groups in different societies construct different problems, leading to different designs. for example , in the case of the bicycle, one such problem was how a woman could ride the bicycle in a skirt while still adhering to standards of decency), or conflicts between the relevant groups (the "Anti-cyclists" lobbied for the banning of the bicycles). (Pinch & Bijker, 1987)

Revival of Technological Determinism: Politics of Technology

The idea of technology cannot be thoroughly rejects to the studies of technology, as Langdon Winner gave certain insights into the field of

studies. Like constructivist perspective ha also rejects the idea of "naïve technological determinism" , but at the same time argued that "certain technologies in themselves have political properties." (Winner, 1986)

"the invention, design, or arrangement of a specific technical device or system becomes a way of settling an issue in the affairs of a particular community" or "Inherently political technologies" which "appear to require or to be strongly compatible with particular kinds of political relationships." Technical Arrangements and Social Order. (Winner, 1986)

The most cited example is the height of the bridges over park ways on Long Island. Robert Moses builds them according to specifications that would discourage the presence of buses. "One consequence was to limit access of racial minorities and low-income groups to Jones Beach, Moses' widely acclaimed Public Park. Moses made doubly sure of this result by vetoing a proposed extension of the Long Island Roach to Jones Beach. This is a demonstration of technological design that enforced a particular political agenda." (Winner, 1986) Winner points out, however, that "to recognize the political dimensions in the shapes of technology does not require that we look for conscious conspiracies or malicious intentions." (Winner, 1986) There are other interesting cases in which "the technological deck has been stacked in advance in favor of certain social interests." (Winner, 1986) Many technologies, Winner argues, are inherently political, since their very creation and operation requires specific social arrangements. Winner's arguments can be important to both creators and consumers of new technology. Winner points out that the political nature of certain technologies has been used by both ends of the political spectrum.

Another important theme of technology studies is the study of infrastructure and experiences. Accordingly our experiences are mediated with the infrastructures of the society. " Technology isn't always something shiny that fits in your pocket: it can be pervasive, networked, institutionalized, and ubiquitous. How do these large technological infrastructures mediate our experience with the world around us, when are they made visible to us,

and what tools can we bring to bear to analyze them?" (Dourish & Bell, 2007) In chapter 2 "The Evolution of Large Technological Systems," Thomas P. Hughes argued that, technological systems are working under groups which continuous interaction with other technological components; quiet similar approach of systems theory of society Parsons theory of social system. Accordingly "An artifact-either physical or nonphysical-functioning as a component in a system interacts with other artifacts, all of which contribute directly or through other components to the common system goal. If a component is removed from a system or if its characteristics change, the other artifacts in the system will alter characteristics accordingly." (Hughes, 1987)

Among the major contemporary theme of technology studies are the studies of Technologies of Control and Digital Studies. "Whether state bureaucratic regimes or DRM on your iPod, technologies can impose existing forms of power, segregation, or legal action upon individuals. This week we look at two examples – apartheid classification infrastructures, and the development of recording protections – as well as an important argument about user resistance". (Wyatt, 2003) The past 15 years have seen the development, implementation and widespread adoption of platforms for virtual engagement digital studies sociologists are exploring and understanding the nature and scope of these virtual spaces. Where and how do the virtual and real worlds intersect? And how do our existing social categories translate to virtual systems?

Conclusion

Today we are confronting new technologies at much faster pace than ever before. We are experiencing new infrastructures, techno-mediated reality, technologies at our home or in other word a completely new social world, where these new social facts playing crucial roles. We are interacting with these actors shaping and customizing them at the same time they are also shaping us and our society. For example, in the age new information and communication technologies

(ICTs), we are witnessing the changes in traditional nature of social networks. We as social scientists have the privilege and perhaps the responsibility of keeping an eye on it. It is important to try to understand how these technologies are being played out vis-à-vis the broader social situation. Sociology of technology has a scope to see under a broader spectrum. Current approaches which explains how technologies arise, are often criticized because ignores the consequences of the technologies after the fact. This results in a sociology that says nothing about how such technologies matter in the broader context. It examines social groups and interests that contribute to the construction of technology, but ignores those who have no voice in the process, yet are affected by it. Likewise, when documenting technological contingencies and choices, it fails to account for those options that never made it to the table. According to Winner, this results in conservative and elitist sociology. It is superficial in that it focuses on how the immediate needs, interests, problems and solutions of chosen social groups influence technological choice, but disregards any possible deeper cultural, intellectual or economic origins of social choices concerning technology. It actively avoids taking any kind of moral stance or passing judgment on the relative merits of the alternative interpretations of a technology. This indifference makes it unhelpful in addressing important debates about the place of technology in human affairs. On summing up, there is a need of subaltern approach of enquiry to the studies of technology, which not only examines the impacts of technology on a particular section of human society; but the people and environment are also affected indirectly at the inception of technological changes.

Works Cited

Bauchspies, W. K., Croissant, J., & Restivo, S. (2006). *Sciences, Technology and Society: A Sociological Approach*. Malden: Blackwell Publishing Ltd.

Dourish, P., & Bell, G. (2007). The Infrastructure of Experience and the Experience of Infrastructure: Meaning and Structure in Everyday Encounters with Space. *Environment and Planning, B* (3), 414-430.

Dusek, V. (2006). *Philosophy of Technology*. Malden, USA: Blackwell Publishing Ltd .

Hughes, T. P. (1987). The Evolution of Large Technological Systems. In Bijker, Hughes, & P. (eds.), *The Social Construction of Technological Systems* (pp. 51-52). Massachusetts: MIT Press,.

Marx, S. &., Roe, M., & Leo. (1994). Does Technology Drive History? The Dilemma of Technological Determinism. New York: The MIT Press.

Pinch, T., & Bijker, W. (1987). The Social Construction of Facts and Artifacts: Or, How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. In W. E. Bijker, T. P. Huges, & T. J. Pinch, *The Social Construction of Technological System: New Direction in the Sociology and History of Technology* (pp. 17-30). Massachusetts: The MIT Press.

Star, S. L. (1988). Introduction: The Sociology of Science and Technology. *Social Problems Vol. 35, No. 3, Jun. Special Issue: The Sociology of Science and Technology*, 197-205.

Winner, L. (1986). Do Artifacts Have Politics? In e. b. Winner, *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (pp. 19-39). Chicago: University of Chicago Pres.

Wyatt, S. (2003). Non-Users Also Matter: The Construction of Users and Non-Users of the Internet. In Pinch, & E. Oudshoorn, *How Users Matter* (pp. 67-80). Massachusetts: MIT Press.