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From technique to networks: Communication, technology and society

The relationship between technology and society has been widely studied by scholars. While this essay is by no means a definitive or exhaustive account of the literature (i.e. little emphasis is placed on the administrative tradition or on interpersonal forms of communication), this exploration attempts to identify some of the most influential texts that address the social, cultural, political and economic contexts and consequences of technology in terms of its uses and design. Borrowing from the terminology of the field, I propose several different frameworks to organize the literature: a *tools/technique* paradigm informed by critical theories of technology, a *process*/*knowledge* paradigm advanced by historians and early information society theorists, a *systems* approach favoured by constructivist and social shaping of technology scholars and a *network* paradigm proposed mainly by internet researchers.

Tools & (la) technique: *Marxist & critical theories of technology*

Theories of technology advanced by Marx (1887) and members of the Frankfurt School marked an important beginning in the history of technology and society scholarship by linking the Industrial Revolution to the advent of modern technology. Heidegger's (1977) assertion that the essence of modern technique is nothing technological is reflective of critical theories of technology that reveal more about society than about technology itself. A critical theory of technology critiques social rationality by contesting the instrumentalist assumption that modern technologies are neutral tools that can be divorced from industrial capitalism. Technology, therefore, is defined as a *tool* or *technique* used to administer a society defined by labour, capital and class relations.

For Marx, the factory machine functions as the symbolic tool of industrial capitalism that replaced the handmill of the feudal society. While Marx understood technology as humanly-controlled, the problem was that it was inextricably linked to systems of domination. Dystopic narratives about technology and society followed. Heidegger (and later, Ellul) favoured a substantivist position that understood *technique* as dangerous, autonomous and containing an essence, fuelling determinist arguments about technology. Benjamin's (1968) critique of mechanical reproduction suggests that he also held the belief that technology contained an essence. Modern *technique* in the form of lithography, photography and film destroyed the aura of traditional art and was linked to society through its *reproduction* of the logic of totalitarianism. By the 1960's, however, this pessimism was tempered by more hopeful perspectives. While Marcuse (1965) critiqued technology as a tool of political rationality (or *one-dimensionality*), he also understood its relationship to society as dialectical, with the possibility that it could be used for contestation and critical refusal. In short, these theories of technology marked an important beginning in the history of technology and society scholarship by challenging the commonsense assumptions of *technique* as socially, culturally, politically and economically-distinterested *tools*, by suggesting that historical and technological changes were linked and by offering up the question of the extent to which society had agency with respect to technology.

Technology as process/knowledge: The history of the (post)industrial society

Subsequent scholarship about technology and society emphasized technology both as a historical *process* and as a form of *knowledge*, opening up debates about technology as being either evolutionary or revolutionary. Although it appears that the history of technology has been neatly divided into *conceptual schemas* (Bell, 1973) such as the preindustrial, industrial and information eras, these categories have been contested by scholars who have proposed alternative "*historical keys* that have (turned) new levers of social change" (7). The origins of the industrial era are one example, as scholars like Lewis Mumford (1934) asserted that the mechanical clock, invented during the Middle Ages, was the first modern technology because it enabled the measurement of labour. Both Mumford and Innis (1961) suggested that the printing press played a pivotal role in the history of industrialism through its introduction of the first standardized product and creation of a mass audience. It appeared, then, that Marx and members of the Frankfurt School provided too narrow of a definition of technology by underestimating the historical importance of communication technologies like the telegraph (McLuhan, 1964: 38) and only acknowledging media like television and film in order to critique mass culture.

By the 1970's, changes in information technologies inspired a host of debates about the *post-industrial* (Bell, 1973) or *information society* with respect to the pace and historical specificity of technical effects and social change, constructing the paradigms of technology as change or continuity. Writing in 1973, Daniel Bell suggested that we were quickly transitioning to post-industrial society that he attributed to the invention of computers in the postwar period of 1945-1950 (346). Post-industrial society, he argued, would knowledge-based, information-led and service-oriented, eclipsing industrial capitalism in the same manner that labour and capital had eclipsed feudalism. James Beniger (1986), who defined technology as an extension of a natural *process* (9) and society as its *processor* (32), proposed an alternative turning moment. The computer was only the latest iteration of a historical process that saw prior communication technologies (e.g. the postal services) used to control information and knowledge. The *information society*, he argued, was a *consequence* of *a control revolution* that took place shortly after the Industrial Revolution (1870-1910) in response to *crises of control* attributed to the speeding up of manufacturing and flows of information (435). In short, these approaches raised important questions regarding technology as a historical *process* or as a historical *moment*.

Technology as system: Social constructivism and the social shaping of technology

While technology scholarship up until this point effectively problematized instrumentality, some felt that technology studies was beginning to take an overtly deterministic turn (MacKenzie & Wajcman, 1999). Technology was not a merely a technical process that had social *effects*; rather, technology was an outcome of a complex social system underdetermined by technique alone. By the 1980's, technology scholars took a *systems*-based approach, defining technologies as artefacts, processes, knowledge and systems (Bijker, Hughes & Pinch, 1987), while society was defined by a system of technology's users and creators. A systems approach also encouraged us to consider the role of technological politics, as Langdon Winner (1986) suggested that artefacts have politics that make them more or less politically *compatible* with other systems.

This turn to the social in studies of technology produced a few distinct, yet related, approaches. The social construction of technology (SCOT) (Bijker, Hughes & Pinch, 1987) attempted to open up the "black box" of technology by emphasizing its *interpretive flexibility*.

As parts of larger sociotechnical systems, SCOT suggests that technologies have been created and stabilized according to the demands of relevant social actors, disrupting the narrative about technological development as linear and external to society.

The social shaping of technology (SST) perspective (Mackenzie & Wajcman, 1999) is in many ways similar to SCOT in that it rejects technological determinism, yet offers two critiques. SST disagrees with SCOT's relativist position regarding causality as always social[1], instead proposing a more dialectical configuration: "Technology is both socially-shaped and society-shaping" (xv). In addition, SCOT's definition of society too narrowly constructs the meaning of a "relevant social group" by focusing only on local actors involved in the R&D process[2]. Therefore, while the SCOT model contributed to the field by expanding the definition of *technology*, the SST model expands the definition of *society*.

One way in which SST opened up the definition of society is through the inclusion of necessary feminist critiques of technology that have been offered up by socialist feminists like Sandra Harding (1986), Judy Wajcman (1991; 2004) and Donna Haraway (1991). From this standpoint, gender and race are also technologies (Harding, 1986: 17) in that they are *systems* that index identity and proscribe ways of organizing life (Nakamura & Chow-White, 2011). Building on Marxism and critical theory, these accounts of technology contributed another necessary corrective to analyses of technology by including the wider gendered and raced contexts in which social relations were taking place. Like their critical predecessors, however, feminist accounts of technology were fraught with debates between utopian determinism and dystopic substantivism that ultimately posed questions about agency: In the case of contraceptive technologies, for example, does technology enhance freedom for women by giving them control over reproduction? Or does it simply substitute one form of medical domination for another? If technology is dominating, is it simply because it is controlled by men or is it inherently patriarchal (Wajcman, 1991: 13)? Ultimately, the position of many feminist approaches to technology recognized an ambivalence that would become a major theme in studies of technology and society by the end of the 20th century.

Technology as networks: Reassembling community and identity in the digital age

While constructivist and social shaping theorists took a *systems-based* approach to technology in order to combat technological determinism, there were several limitations of these approaches: Despite repositioning causality as an outcome of "heterogenous engineering" (Bijker, Hughes & Pinch, 1987; Mackenzie & Wajcman, 1999), SCOT and SST still tended to frame the development of sociotechnical systems in linear terms (Lievrouw, 2002). Technology was also being constructed as complex, dynamic and fluid, while society was incorrectly characterized as homogenous, unchanging and stable (Latour, 2005). Attempting to reassemble the social, Bruno Latour's actor-network theory not only gave agency to objects as non-human actors, but also offered up the metaphor of the *network* to more adequately theorize the

[1] In many ways, this approach is similar to Bruno Latour's Actor-Network-Theory (2005), who critiques the SCOT approaches denial of the materiality of technology and problematizes their definition of what counts as a relevant social group or actor.

[2] This is a necessary corrective that has been noted by Bijker & Pinch in Mackenzie & Wajcman (1999), where they note the tendency for "relevant social groups" to only include men in privileged positions.

dialectical interplay of technology and society. His contribution previewed what would become two major themes in the field: A reconfiguration of traditional theories of technology and a redefinition of technology and society as a *network.*

Over the last 20 years, there had been a transition in the field of science and technology studies, as media and communication technologies were now being distinguished from other types of technology (Boczkowski & Lievrouw, 2008) and integrated into theoretical perspectives. Andrew Feenberg's theory of critical constructivism (2010; 2012) is one example, blending Marxist and critical approaches to technology with the constructivist framework of the 1980's. Inspired by the hacking of the French Minitel system in the 1980's that transformed an information-based technology into a communication-based one, Feenberg's theory emphasizes the ambivalence of modern technologies. Just as they can be used as *tools* of domination and bureaucratic rationality, so can they be readapted by users through grassroots efforts in a form of democratic or subversive rationalization[3]. Another example is the "network society" thesis advanced by scholars such as Manuel Castells (1996; 2001) and Darrin Barney (2004). Readapting Bell's theories about the information society to account for the social and technical changes associated with the internet, the network society thesis ties the information technology revolution to the restructuring of modes of production at the end of the 20th century. Information and communication-based technologies form the basic infrastructure of the society, with networks constituting the predominant form of social logic[4]. Both Castells and Barney contribute to this discussion by investigating the ways in which new media technologies can be used to reinforce the status quo while also promoting a soft technological determinism.

The shift in technology studies to media and communication tools has also generated new questions about society in terms of identity and community in the digital age by focusing on *users* as the unit of the network society. Early scholars of the internet, such as Howard Rheingold (1993) and Sherry Turkle (1996) explored the possibilities for computer-mediated-communication (CMC) to help users reinvent themselves and form virtual communities that had real life "effects". Suggesting that identity, like technology, was malleable, these celebratory accounts of the liberatory potential of the internet overstated the virtual/real divide and reinscribed divisions between human/machine. Later accounts would correct this by emphasizing the materiality of the digital body (see Hayles, 1999) and the examining the ways in which systems of race, class and gender effectively reinscribed themselves online (Wajcman, 2004; Nakamura, 2008; Gandy, 2009; Nakamura & Chow-White, 2011).

The interaction of the digital self with others has also generated questions about community online. Does the absence of physical copresence and social cues undermine the legitimacy and authenticity of digital communities such as message boards and chat forums (and now, social media), or can this help create and revitalize a sense of community when congregation in physical public spaces is difficult or impossible (Rheingold, 1993; Castells, 2001)? In order to answer this question, scholars have redefined the meaning of community and society by characterizing it as *networked individualism* (Wellman *et al.*, 2006), where individual users are connected to others through a variety of different ties and social supports that act as a

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[3] In many ways, this also reflects Foucault's (1978) theories of technologies of power, when he says that "Where there is power, there is resistance and yet this resistance is never in a position of exteriority in relation to power" (95).

[4] This has not been without its critics: Webster (2006) has argued that the network society thesis is underdeveloped, inaccurate, or both, while Wajcman (2004) has critiqued its gender-blindness.

form of community in the digital age. *Personal connection* and *communication* rather than *copresence* becomes an important condition for community, as online communities tend to be interest-based (Baym, 2010) and/or friendship-driven (Ito *et al.*, 2010). While these investigations cannot provide a yes or no answer to the community question, it has at least demonstrated that alternatives configurations of society are enabled through the use of these technologies.

The emphasis on *users* within the network has also had implications for studies of the internet within the context of society. While a critical tradition that investigates the social, political, cultural and economic context of technology worked to discredit instrumentalist and determinist perspectives on technology, the emphasis on the public aspects of development, production and consumption left narratives of personal experience and integration of technology in everyday life undertheorized. In the tradition of adapting social research to explain changes in technology, the emergence of social media like Facebook, Twitter and YouTube have inspired scholars to reassemble their methods of inquiry to accommodate the lived experiences of users by integrating qualitative ethnographic approaches as part of research design (Bakardjeva, 2005; Wellman & Haythornthwaite, 2005; Markham & Baym, 2009; Ito *et al.*, 2010). This need not be an either/or research decision: Critical case studies in the internet (see Feenberg & Friesen, 2012) have demonstrated that macro and micro approaches to understanding technology and society in terms of peoples' social roles and their roles as users is a theoretically-productive endeavour.

Reading List

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