Chapter 2
Analyzing Technology to Uncover Social Values, Attitudes, and Practices

What is called Western or modern civilization by way of contrast with the civilization of the Orient or medieval times is at bottom a civilization that rests upon machinery and science as distinguished from one founded on agricultural or handicraft commerce. It is in reality a technological civilization….If the records of patent offices, the statistics of production, and the reports of laboratories furnish evidence worthy of credence, technological civilization, instead of showing signs of contraction, threatens to overcome and transform the whole globe.

(Beard 1928/1999, p. 97)

The great nineteenth-century positivists…imagined that the statements of science were going to replace opinions and beliefs about all things….Our century has been the graveyard of positivist ideas of progress.

(Badiou 2005, p. 84)

Technologies are products of the societies from which they come. By reading the technologies a culture creates, we can understand the ideologies of a culture. This chapter examines literature drawn primarily from Science, Technology, and Society studies (STS) that supports rhetorical analyses of technology. Based on these STS studies, I make the three following arguments: First, using the work of theorists such as Charles Bazerman, Bruno Latour, and Wiebe E. Bijker, I argue that technologies are created through a complex system of social interactions where groups affix values to new technological advancements. Second, I argue that rhetorical analyses identify the non-physical ways in which technologies are realized or understood. Third, I demonstrate that social values related to progress have often been affixed to new technological advancements in the twentieth century. In the case of my study of Marconi's wireless, the relevant social groups of the early twentieth century saw the invention as *progress*, modernity's most powerful "god term" according to Weaver (1953, p. 212), and considered the invention an important human advancement. Progress or any other value is not physically built into an invention but rhetorically constructed. These STS arguments enable me to demonstrate the importance of rhetorical analyses of technology in general and Guglielmo Marconi's wireless specifically.

The field of STS includes the philosophy of technology, the history of technology, and the sociology of technology, as well as the rhetoric of technology,

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which I consider in a later section of this chapter. Obviously, these theoretical frameworks overlap, but I hope to make clear that all are based on examining the socio-political shaping of technology. This work supports my own analysis of Marconi's wireless as a product that held meaning for an audience in a historical moment and was shaped by social interactions. The following descriptions on the frameworks are not meant to be hermetic categories but general ideas.

The philosophy of technology derives from research analyzing the meaning of technology for a culture. Philosophers of technology argue that technology itself appears to be a major context for industrial cultures (Feenberg 1999; Fuller and Collier 2004; Heath and Luff 2000; Melzer 2004; Nye 1994; Rescher 1999; Winner 1986). Melzer (2004) argued that humans are defined by their tool use: *Homo sapiens* are the "the tool-making animal[s]" with "stages of civilization differentiated in terms of the tools men have actually made" (p. 111). Whether one examines the Bronze Age or our contemporary Information Age, one tendency historians of science and technology have is to define human societies by the major technologies they have at their disposal. Therefore, although technology cannot be said to have caused a prevailing cultural attitude, it exists as a defining principle for individuals. No social structure is "free" of technology's influence; therefore, society is governed in some ways by a techno-socio politic. Basically, the philosophy of technology attempts to answer why humans organize themselves, at least in industrial cultures, around technology and the *meanings* associated with technology.

The history of technology aims to define a historical moment by its technology (determinism) or to discover how a historical moment *shaped* technology (constructivism). Some histories of technology provide lists and brief descriptions of technologies from certain historical periods (Bunch 2004; Burns 2005; Cardwell 1995; Glick Livesey and Wallis 2005; Mitcham 1994; Restivo 2005; Rhodes 1999). Other studies focus on a technology in a historical moment or a type of technology from a time period (Cross and Szostak 1995; Downey 2002; Lewis 2004; Löfgren and Willim 2005; Misa 2004; Reynolds and Cutcliffe 1997; Willmore 2002; Yeang 2004). As with any analysis of technology, defining a time period by a technology can be reductive. Not only do historians risk arguing for technological determinism when claiming technology alone shaped an aspect of society, but they also risk creating a "whig" history if their work "presents history as uninterrupted progress, implying that the present state of affairs follows necessarily from the previous" (Bijker 1995, p. 45). Instead of aiming for a grand narrative of technology's influence on history, other scholars look at smaller "revolutions" involving technological change (Cowan 1997; MacKenzie and Wajcman 1999). This book also studies a single technology. The wireless's overall success, the fact that it became the "radio," means it fit well with the social framework of the early twentieth century. Just as the historical context of the early twentieth century is shaped by society, the society accepting a new tool shapes the technology's meaning through cultural attitudes, practices, and values.

The sociology of technology demonstrates how societies—relevant social groups and wider cultural forces—shape and are shaped by technologies.

As mentioned above, placing too much emphasis on the effects of technology on society can risk arguing from an uncritical technological deterministic position. However, a dialectical relationship between society and technology exists, and this relationship is socially constructed. Many scholars analyze specific groups or specific technologies to demonstrate how society shapes what technologies become created based on wider cultural beliefs and attitudes. Additionally, scholars demonstrate how technologies are created socially but on a smaller scale; for instance, many scholars examine the work of a single invention or inventor to demonstrate the social construction of technology (Bazerman 1999; Bijker 1995; Ceruzzi 1999; Johnsom 1995;[1] Latour 1996; Williams 2000). Inventors and relevant social groups must interact within the social framework in order for a technology to be realized. "The social framework," of course, is a product of the culture's attitudes and values that fits or is made to fit social practice.

1 Technology is/as Social Construction

In Latour's (1987, 1988, 1996) work on the sociology of technology and science, he describes how one can view an engineer or scientist's work in situ in order to understand the forces behind technological and scientific "discovery." By visiting laboratories and examining engineering and scientific discourse, Latour and other scholars have uncovered the non-material forces and attitudes that shape what technologies and sciences become realized.[2] Latour's theory of the sociology of technology stems from Michel Foucault's critiques of power in society.[3] Latour (1996) argued that one must consider more than the technological object when analyzing why a technology succeeds or fails; instead, a researcher has to "grab the actors" (p. 89). He wanted "to show technicians that they cannot even conceive of a technological object without taking into account the mass of human beings with all their passions and politics and pitiful calculations"; by doing so "they can become better engineers and better-informed decisionmakers" (p. viii). By applying such a perspective, Latour's methodology lets the individuals' interactions with the technology supply meaning(s) to why a technology fails or succeeds: His "sociology prefers a local history whose framework is defined by the actors and not the investigator" or by grand narratives such as capitalism or transportation theories (p. 19).

Similarly, Bijker's (1995) analysis used a "snowballing" technique to follow actors or "relevant social groups," as he defines them, who interact with a technology in its early stages before it becomes realized (p. 46). Because "[t]echnological development should be viewed as a social process [and] not an autonomous occurrence," Bijker observed "relevant social groups will be carriers of that process" (p. 48). Latour and Bijker's argument that technologies and scientific discoveries[4] are products of social interactions is a foundational principle in STS. This approach assumes technology is not created in a vacuum but constructed through values and practices mediated by the culture in which the technology is created. Because the actors themselves are products of their culture, Marconi would act in ways congruent to the values of industrialized cultures in the early twentieth century. The assumption that socially constructed attitudes may shape technology allows me to view the wireless historically as a product of modernity and larger prevailing attitudes. As (Hiskes and Hiskes 1986) also argue, "social forces and practical goals always determine the current state and direction of technological research" (p. 16).[5] In the case of the wireless, social forces desiring progressive technology and practical goals pushing for communication at sea and to places not accessible by wires drove the wireless's construction. To make the wireless fit larger social values, Marconi and other wireless supporters reconstructed the images of electromagnetic science and technology in relation to the new invention for various audiences.

Such reconstructions are "public statements" that have been carefully crafted and do not immediately count as "the pure world of truth" without an audience's validation (Bazerman 1988, p. 23). Furthermore, as Bazerman argued, "[t]o recognize the rhetorical character of visually transmitted symbolic activity is only to recognize that we live and use our texts in a human world" (p. 23). The rhetoric of the wireless and the actual physical invention are nothing without social interaction. The ideas Marconi and others affixed to the wireless exist within the context of socially maintained ideology. Åkesson (2005) argued that realizing a technology meant more than just being able to produce a working model because technological realization "go[es] beyond the product and depend[s] on relations, feelings, emotions and culturally constructed beliefs about whether something is worth investing in or not" (p. 44). Åkesson's overall argument is that all technologies must be marketed well before they become recognized. Because technologies must fit within a culture's values and attitudes, the "marketing" or PR involved will most likely adhere to or be made to seem to adhere to prevailing cultural beliefs.

I argue the wireless of the early twentieth century was more of a rhetorical reality than a physical one: Pro-wireless discourse portrayed the wireless as "real," but a viable commercial product was not immediately available. Before any technology becomes a black box, the relevant social groups must use, communicate, evaluate, and, ultimately, produce a viable technology. I do not claim technologies solely shape themselves or the practices of relevant social groups; to say that would risk technological determinism. Instead, my study focuses on the wireless's rhetoric as "created" by favorable discourse, rather than on how users physically interacted with the invention. However, I do include the perceptions and, subsequently, the reinterpretations of Marconi and journalists who recount their own experiences witnessing the early wireless's capabilities. The "social interaction" I refer to throughout the book is *discourse*.

Because society ultimately accepts or rejects a technology, how a technology fits or is made to fit into social life depends partly on audience perception. Although I will not analyze early twentieth century audiences' specific responses to technological discourse, I focus on favorable discourse about the wireless because I assume that an ultimately successful technology's positive discourse reveals attributes that help an audience realize its significance. I believe my study on Marconi's wireless helps demonstrate the common rhetorical aspects that "build" a technology to be acceptable to audiences. But before I discuss features of rhetorical analyses, I will briefly describe the dialectical relationship between society and technology from the point of view of relevant social groups. Technologies might not alter the ways people perceive the world or usher in new social conditions, but technologies have altered human practices on small and large scales. For example, the introduction of the automobile helped create a "market" for American suburban life because workers no longer had to live on a "mass transit" line or within walking distance of work. However, would Americans have wanted to live in single-family homes out in the suburbs away from their jobs if they were not members of an individualistic culture with a tendency to expand their living spaces? Likewise, the introduction of mobile phones changed the practice of calling: Now people can talk almost anywhere. Therefore, because suburban life and mobile phones were perceived as valuable, important relevant social groups within the culture approved the new technologies and changed living and telephoning practices to some degree.

2 Relevant Social Groups Affix Meaning to Technologies

As socially constructed artifacts, technologies represent the values of the culture from which they came. For instance, a culture that advocates the "free sharing of ideas" and technical collaboration among its universities and other publicly funded research institutions would most likely pursue technologies to help facilitate such communication.[6] Likewise, a culture at war or simply a military-industrial-intelligence complex perpetually preparing for war will create technologies to improve its defensive or "pre-emptive" capabilities. A culture's needs are often based on the values its people or, more importantly, its institutions hold (Noble 1999; Nye 1994; Rhodes 1999; MacKenzie and Wacjman 1999). Such groups ultimately determine what technologies are created and how they are modified for particular tasks. As Bijker (1995) argued,

> Technology is created by engineers working alone or in groups, marketing people who make the world aware of new products and processes, and consumers who decide to buy or not to buy and who modify what they have bought in directions no engineer has imagined. (pp. 3–4).

No technologies would ever be realized if they were not perceived as conforming to social values and practices.

After Marconi's wireless became a black box—a commercially viable product—the electrical engineering community no longer debated the reality of radio waves, and the radio became a solution to communication problems. Being able to transmit and receive signals, a practice allowed by radio, became the basis for research into radar and navigational technologies (Tarrant 2001, p. 233) and technologies related to broadcasting. But, no matter how well an invention works, a black box technology must also adhere to larger cultural values. Relevant social groups immersed in a particular culture affix meaning to inventions, thus, building technological frames. Bijker (1995) explained that "[a] technological frame is built up when interaction 'around' an artifact begins"; if a frame is not built up in order to "move members of an emerging relevant social group in the same direction," a technology will fail (p. 123). Before users will accept a technology, they must believe the product adheres to social values. These values give meaning to a technological frame. Bijker observed that "[a] technological frame comprises all elements that influence the interactions within relevant social groups and lead to the attribution of meanings to technical artifacts—and thus to constituting technology" (p. 123). Therefore, these frames can be understood as sets of meaning(s) groups affix to technology. From a cultural studies point of view, a frame is a deterministic screen or cultural lens that defines a technology for an individual or a group. In other words, people define a technology's values and uses by the socially constructed heuristic or frame between themselves and the technology that, in turn, helps define a technology.

Although that argument may appear circular—*a technology is defined by a frame that defines the technology*—it actually suggests the dialectical relationships between technology and society. Other scholars define these relationships as "technological regimes" (Nelson and Winter 1982; Rip and Kemp 1998) or "paradigms" (Dosi 1982). According to Rip and Kemp, "[a] *technological regime* is the technology-specific context of a technology which prestructures the kind of problem-solving activities that engineers are likely to do, *a structure that both enables and constrains certain changes*" (p. 340, emphasis added). Although Rip and Kemp focus on engineers, the argument easily transfers to other relevant social groups who are constrained by their own cultural/personal lenses based on how they perceive a technology should be used. Therefore, participatory actions both constrain and construct technological meanings.

Engineers and scientists work under larger social frameworks for producing knowledge. Latour and Woolgar's (1979) study of biologists at the Salk Institute shows the interconnectedness of ideology, science, technology, and history, allowing us the chance to understand broad patterns of cultural beliefs. Salk (1979), in his introduction to Latour and Woolgar's *Laboratory Life*, claimed that "[Latour's] own style of thought was transformed by our [biologists'] concepts and ways of thinking" (p. 13). Salk further commented on the centrifugal and centripetal knowledge diffusion between science and sociology, noting that "[sociologists at the Salk Institute] are coming to recognize that their work is only a subset of our [biologists'] own kind of scientific activity, which in turn is only a subset of life in the process of organization" (p. 13). Latour and Woolgar's goal at the Salk Institute was to uncover "the *social* construction of scientific knowledge in so far as this draws attention to the *process* by which scientists make sense of their observations" (p. 32). Such a process is important to Latour and Woolgar because they argued that sociological studies often examine the scientist without examining the scientific aspects (pp. 23–24). They also argued that researchers ought to pay attention to "'technical' and 'intellectual' terminology," which "is clearly an important feature of [scientists'] activity" (p. 27). This activity comes with a warning against "the uncritical acceptance of the concepts and terminology used by some scientists" because that "has had the effect of enhancing rather than reducing the mystery which surrounds the doing of science" (Latour and Woolgar 1979, p. 29). This process often comes in the form of discourse, such as technical papers or presentations.

No science stands solely on its own merits or the merit of one or a few scientists; instead, science is peer reviewed. Latour and Woolgar used Marvin Harris's terms "*emic* validation" and "*etic* validation" to describe which types of audiences have the final say on scientific representations. According to Harris, *etic* validation derives from "a community of fellow observers"; this group is "the audience who will ultimately assess the validity of a description"; *emic* validation holds that "the ultimate decision about the adequacy of description rests with participants themselves"—the scientists (as cited in Latour and Woolgar 1979, p. 38). The two types of validation help define *when* but not *why* a science or technology exists.[7]

Once validated, a science or technology can be said to exist. However, the existence may only be among a select relevant social group before the "facts" diffuse to other groups. In order to diffuse the facts adequately, a group must persuade others about the value of the science or technology. Such persuasion is rhetorical as Latour and Woolgar (1979) observed. When the scientists at the Salk Institute attempted to make order out of (relative) chaos, they aimed for "the successful persuasion of readers" by stabilizing facts through discourse; the readers, however, "are only convinced when all sources of persuasion seem to have disappeared" (p. 76). According to Latour and Woolgar, observers believed "a systematic, ordered account is attainable" from any observation "no matter how confused or absurd the circumstances and activities of his tribe might appear" (p. 43). Once a fact is stabilized, it appears to have always been there waiting to be discovered (Latour and Woolgar 1979, p. 177). The science seems inevitable in hindsight:

> Once the controversy has settled, reality is taken to be the cause of this settlement; but while controversy is still raging, reality is the consequence of debate, following each twist and turn in the controversy as if it were the shadow of scientific endeavour. (Latour and Woolgar 1979, p. 182)

Audiences accept the science as a reality because "[f]acts are constructed in such a way that, once the controversy settles, they are taken for granted" (Latour and Woolgar 1979, p. 183).

The various mechanisms that bring science and technology to life are not salient features of technical or scientific discourse. One mechanism is granting credit, and scientific credit often goes to whomever "gets there first." According to Latour (1988), "[w]hen we are dealing with scientists, we still admire the great genius and virtue of one man and too rarely suspect the importance of forces that made him great" (p. 14). These "forces" of which Latour speaks are many: economics, philosophy, epistemology, ideology, society, etc. They can also be the groups or teams supporting the "lone" scientist or inventor. The ingenuity and perseverance of a successful scientist cannot be overlooked, but we cannot lose sight of the fact that science and technology are built upon past "discoveries" that engage multiple actors. Also, if one believes a "fact" was just waiting to be found, he or she ignores the construction of scientific ideas. Latour (1988) claimed "[a]n idea… never moves of its own accord. It requires a force to fetch it, seize upon it for its own motives, move it, and often transform it" (p. 16). Scientists often make discoveries based on their fields' histories: "The social context of a science is rarely made up of a context; it is most of the time made up of a *previous science*" (Latour 1988, p. 19). Pasteur and others discovered new science by building on past science, which appeared as part of the social context of a science. Although in popular imagination, lone scientists are seen as revolutionaries, Latour argued that science has to be communicated before the "revolution" can take place (p. 72). Science and engineering need rhetoric to help communicate new discoveries or inventions. Relevant groups use rhetoric to create an image of a technology that reifies the invention through discourse. Relevant groups not only use rhetoric but are persuaded by rhetoric to create meaning for a technology. These groups work to define meaning under the social forces that allow products to take shape within a culture.

3 The Rhetoric of Technology

The study of how technologies are described and realized discursively is known as the *rhetoric of technology*. Bazerman (1998) defined the rhetoric of technology in a rather useful way: "The rhetoric of technology shows how the objects of the built environment become part of our systems of goals, values, and meanings, part of our articulated interests, struggles, and activities" (p. 386). When new technologies become accepted by a population—an acceptance that does not need to be universal—society may change certain behaviors; however, the social forces that propel technologies to be created or simply accepted exist a priori to those technologies. Claiming that a direct causal link exists between technology and social change may be reductive, but we cannot dismiss the power new technologies have on behavior (Feenberg 1999; White 1978; Williams 1990). After all, some people might be persuaded to weave technology into their social practices because they perceive the technology as useful. How a technology is made to seem useful can be understood through a rhetorical analysis of a particular technology's discourse.

Defining the "rhetoric of technology" requires defining *technology*. What makes something a technology? Popularly, *technology* is associated with computers and other "hi-tech" consumer items. Although those items are technologies, they are not the only types of technologies that exist. MacKenzie and Wajcman (1999) claimed

> [t]echnology' is derived from the Greek *techne*, meaning art, craft, or skill, and *logos*, meaning word or knowledge. The modern usage of 'technology' to include artifacts as well as knowledge of those artifacts is thus etymologically incorrect but so entrenched that we have chosen not to resist it. (p. 26)

Technologies are thus closely related to new knowledge based on science, techniques, and industry. This knowledge is socially constructed through discourse based on relevant social groups' values and practices. The groups accept and consequently stabilize technologies based in part on the value they perceive in particular tools.

Whether a technology be a physical tool (wrench, hammer, or keyboard) or a mental tool (democracy, management science, or the scientific method), it is often defined as the available knowledge of a civilization closely connected in contemporary times to industry and commerce. The *industrialized* world's economy depends on creating new technologies for growth and "prosperity." These technologies can be managerial or engineering ideas to increase or make production more efficient (management science from Fordism/Taylorism), or they can be actually mass produced products (cars, mobile phones, burgers, etc.) from highly rationalized, efficient systems.[8] Regardless of the type of technology, the idea that technology is some kind of tool related to work or profit predominates. After all, the term "modernization" suggests an entity (such as a nation) acquires or develops technologies that will theoretically improve its economic position.[9] As an important profitable technology for industrial nations of the early twentieth century, the wireless fits the above "scientific/industrial" definition. In fact, many contemporaries claimed the wireless was an important scientific discovery, and Marconi's application furthered national and international industrial goals. These goals were also implicit and explicit demands. For instance, as I demonstrate in Chaps. 3 and 4, British and American imperial goals *demanded* that these nations be in contact with their colonies, and supporters of the wireless discuss this agenda. This is not just an implied need but a military demand, which Marconi and others were willing to fill.

Because society shapes technology, we can locate some social values implicit in representations of the wireless or any technology. Even though values may be affixed to technologies, the rhetoric of a technology often adheres to prevailing cultural values. For instance, many contemporary analyses of technologies often examine how "democracy," a major framework for Western industrial cultures, is affixed to technologies or threatened by new technologies (Feenberg 1999; Montagu and Matson 1983; Selfe 1999; Sikorski 1993; Winner 1986). However, rarely can a technology be said to embody democratic principles of egalitarianism or equal representation. Because the "democracy" label is important to Western industrial culture, relevant social groups often discuss technologies as furthering or not furthering democratic values. Those relevant social groups affix values through socially mediated rhetoric.

The next four subsections discuss how rhetoric helps realize or (re)construct a technology. Specifically, I discuss how Charles Bazerman's study of Edison's light offers a theoretical framework for rhetorically analyzing technology, how technologies are products of systemic forces (i.e., the desire for technologies to be seen as democratic), how technologies become stabilized through rhetoric, and how technologies do not become stabilized.

3.1 Bazerman's Example of Edison's Incandescent Light Bulb

Bazerman's (1999) analysis of inventor Thomas A. Edison's incandescent light bulb studied patents, laboratory notebooks, personal letters, specifications, scientific reports, and popular press articles in order to explain how the light bulb and the Edison System (power stations) were both physically and rhetorically created. Bazerman analyzed discourse(s) surrounding the invention in order to demonstrate the rhetorical acts that led to the technology's creation and acceptance. Edison was a technologist in search of profit and fame, and he, as would Marconi, succeeded in garnering an international celebrity status. Because Edison was a successful (and prolific) inventor, we can assume he invented products that appealed to audiences—potential users. Although all of Edison's inventions were not successful, many were accepted through careful marketing/PR strategies. In other words, Edison and his supporters made his inventions fit the attitudes and values of consumers, causing them to desire his inventions.

Bazerman (1999) traced Edison's growth as a young telegrapher turned industrialist whose legacy continues to this day in the company General Electric. Edison physically and rhetorically "invented" the light bulb, and he kept the public anticipating his invention for economic not technical reasons (Bazerman 1999, p. 181).This marketing strategy suggests that a technology needs more than a physical nature to be realized; a technology's viability is tied closely to its profitability. In fact, Edison had to argue for his invention's future value in order to secure investment (Bazerman 1999, p. 200). He had to show this *value* through fairs, advertisements, demonstrations, letters to stockholders, and interviews with popular press writers, or else the light bulb could have failed commercially as his phonograph did in the 1880s (Bazerman 1999, p. 198). Edison marketed his electric system in places like New York City and Louisville, KY before the light bulb was fully functioning, but the public accepted the "reality" of the technology while the light bulb was mainly a rhetorical construction (Bazerman 1999, p. 219). That is, the public accepted the light bulb before incandescent lighting actually illuminated cityscapes.

Potential users may thus accept the existence of new technical and scientific "discoveries" based on rhetoric. An important rhetorical strategy for technological acceptance is proving value. In fact, most of Bazerman's (1999) work covers the economic strategies Edison used to have the public and investors *realize* that the light bulb existed. Bazerman, arguing from Adam Smith's economic theories, claimed: "[A]ll economic transactions are rhetorical… they are exchanges of value and value is a human discursive construct" (p. 141). New technology does not spring from the earth or from a lab without being conditioned or molded by social forces, and economics is one major force. New technology must work within the current technological system and carve out a niche for itself; it must also "create a dissatisfaction with a current technology" to induce consumers rhetorically to buy new products (Bazerman 1999, p. 142). After all, marketing is "the rhetorical economic work of locating unmet desire and matching potential products to desire" (Bazerman 1999, p. 143). In our postmodern world, desire can be manufactured in order to make consumers want certain products (c.f. Herman and Chomsky 2002). For instance, commercials can portray homeowners as at the mercy of invaders (rhetoric of fear) who are only thwarted by security systems; therefore, security system companies manufacture fear and offer their products as solutions.

Before consumers demand new tools, technology needs to succeed materially and "symbolically (that is adopt significant and stable meanings within germane discourse systems)" (Bazerman 1999, p. 335). Bazerman borrowed the concept of "heterogeneous engineering" from Bijker (1995) to argue that technologies are products of "the coordination and application of many kinds of knowledge and practice, all of which are united and instantiated in the final product" (p. 335). The concept of "heterogeneous symbolic engineering" is imperative for inventors who wish to "[build] enduring meaning and values for the technology they wish to *implant* in our daily lives" (Bazerman 1999, p. 335, emphasis added). Bazerman argued that incandescent light had to "take a place within the discourse and the representational meaning systems of [Edison's] time before it could transform them"; therefore, "the new technology… had first to be built on historical continuities of meaning and value" (p. 350). In the absence of historical continuity and cultural values, technologies do not become realized simply for their own sake. Instead, technologies are often products of systemic forces and rhetorically constructed to be in accordance with prevailing cultural values.

3.2 Technology as a Product of Systemic Forces

Although "technology for the sake of technology" may seem to be the goal of industrial societies, changes in technology "will always be only one factor among others: political, economic, cultural, and so on" (MacKenzie and Wajcman 1999, p. 4). STS scholars and other technology critics engage in broader analyses of technologies by examining how socio-political systems in particular produce new technologies. Technology is a product of systemic forces within and across societies. American citizens, influenced by capitalist ideology, associate technologies with highly profitable companies, but profit is only one factor that causes companies to develop new technologies. This "free market" force helps fuel technological development. Consumers are offered many products, and they often have to replace products as new ones come out. However, consumers are not really free to choose outside of products from dominant companies because those companies together have such a huge market share that consumers would risk being not compatible with the majority of other users. For example, consumers looking to buy computers will most likely gravitate towards Microsoft or Apple operating systems. There is virtually no other competition. Consumers or "the public" are not the only relevant social groups, but technologies do not become realized without them. Often consumers are the recipients to whom more powerful, more invested relevant social groups direct their rhetoric. As with any economic system, the means of production and the means of marketing products are controlled by an oligarchy of *invested* agents working within the techno-structure.

This techno-structure values certain technologies over others. Although large organizations have more influence over technological creation, consumers are not helpless in the face of technological creation; see, for example, human input into such technical designs as "ergonomic" keyboards or "value sensitive design" (Radetsky 2003). However, perception of a technology's value also "conditions" the technologies produced. Winner (1986) argued that, specifically in the United States (but across much of the industrialized world), "[a] fascination with efficiency is a venerable tradition in American life" (p. 46). Americans, Winner went on to argue, have "[a]n eagerness to define important public issues as questions of efficiency" (p. 46). This, in turn, creates a condition where "[d]emonstrating the efficiency of a course of action conveys an aura of scientific truth, social consensus, and compelling moral urgency" (Winner, pp. 46–47). That condition informs Winner's 'Technical Constitution of Society,' which has five "distinctive institutional patterns" excerpted below:

1. "[T]echnologies of transportation and communication… [that] facilitate control over events from a single center….";
2. "[A] tendency for new devices and techniques to increase the most efficient or effective size of organized human associations….";
3. "[R]ational arrangement of sociotechnical systems [that] has tended to produce its own distinctive forms of hierarchal authority….";
4. "[T]he tendency of large, centralized, hierarchically arranged sociotechnical entities to crowd out and eliminate other varieties of human activity….";
5. "[T]he various ways that large sociotechnical organizations exercise power to control the social and political influences that ostensibly control them" (pp. 47–48).

The above five areas constitute some of the systemic forces that perpetuate technological creation. These forces also control users' preferences and organizational behavior.

Because of technology's socially constructed nature and larger institutional control over "hierarchically arranged sociotechnical entities" (Winner 1986, p. 48), a dialectical relationship exists between technology and society. Consumers are not completely helpless users *forced* to buy difficult-to-use technologies or to live under techno-surveilance (as in Orwell's [1949] 1984): A republican-democratic society like the United States can maintain some autonomy. Giddens (1984) explained this phenomenon as *the dialectic of control*: "[A]ll forms of dependence offer some resources whereby those who are subordinate can influence the activities of their superiors" (p. 16). Although Giddens was not specifically describing technology as a "superior," his theory applies because technology must be validated by users or potential users. Unfortunately, this relationship can be skewed in favor of dominant invested parties because an illusion of power to influence actions also exists. According to Giddens, those within the social system are confronted with two "faces" of power: "[T]he capability of actors to enact decisions which they favour" and "the 'mobilization of bias' that is built into institutions" (p. 15). An example of this power situation is bias towards the dominant two-party system in American politics. Citizens can effect change within the government by voting, but the two-party system maintains its dominance, making third parties either nuisances because they often can only take enough votes away from one of the dominant parties or irrelevant because their small size does not allow them to advance their message. Third parties cannot actually expect to win a majority or plurality in presidential elections, but third party candidates have won seats in state and local elections in America as well as seats in Congress. Third parties have tried to win Presidential elections, but no modern ones have come close because the two-party dominance of Democrats and Republicans is overwhelming; therefore, voters carry out their civic duty in accordance to this political bias.

The above analogy of America's two-party system can also be extended to the illusion of "real" democratic choices. Just as voting for Candidate A or B (or sometimes C) constitutes limited choice in American politics,[10] relevant social groups may also position technologies to feign democratic ideals or democratic potential if not viewed critically enough. Democracy, a value (in fact, a technology itself) touted by Western industrial cultures, is often affixed to new technologies. However, "democracy" in the next section is often used synonymously to mean *egalitarian participation*, a reality to which the technologies discussed often do not adhere. Capitalist forces or, simply, the marketplace often decide what technologies become realized because users have already "bought into" the technological system that has conditioned them to continue to buy the latest and greatest products—built-in obsolescence.

What I hope to make clear is that some scholars and critics often *want* new technologies to adhere to democratic principles. They validate a technology's potential by claiming a technology, such as the Internet, supports democratic principles. My purpose is not to debunk the scholars I discuss in the next section but to demonstrate how important the notion of democracy and participation are to rhetorical constructions of technology regardless of whether these terms are accurate descriptions for technologies. Although I could discuss the many popular commercials that advertise the "freedom" of high-speed Internet, I focus on the attitudes of technology critics who promote the Internet as a democratic tool or a potential democratic tool because that analysis relates to rhetoric and the values affixed to hopes for technologies; commercials relate more to consumerist rhetoric.

3.3 Rhetorically Constructing Technology Through Democracy

Technologies are products of "social interaction," but that phrase is misleading if one assumes techno-creation follows an egalitarian inventor-consumer relationship. Although some argue for techno-liberation as a political goal, our current late capitalist, post-industrial information age influences the technologies created. Understanding why "democracy" may help stabilize technologies requires understanding how scholars argue that certain technologies have the potential for increasing democracy. For instance, Feenberg (1999) argued that the Internet is representative of democratization across all technologies. He claimed "computer users in France and the US who introduced human communication on networks originally designed for the distribution of data accomplished a liberating technical innovation" (p. xv).[11] He went on to argue that "[i]n all such democratic interventions, experts end up collaborating with a lay public in transforming technology" (p. xv). Therefore, the onus placed on the "lay public" requires them to converse with the established experts to create a democratic technology. Feenberg's use of "collaborating" is misleading because Internet users are not conversing with those who maintain and promote Internet use.

The Internet's liberation is not congruent to the technological liberation of computer users. Feenberg's (1999) argument that the Internet is a liberating technology does not account for the ways consumers are conditioned to access the Internet through a cycle of dependence on large computer manufacturers. Consumers are conditioned to take part in built-in-obsolescence, and the increasing "user friendliness" of computers further removes users from understanding the structure and programming of complex twenty-first-century networking technology.[12] Users are continually at the mercy of help desks and IT departments when things go wrong or when "important" upgrades must be made. Also, with the exception of virus updates, upgrades done by manufacturers are hardly in the interest of the consumer; for instance, eventually programs bought for one operating system will no longer be supported by future upgrades of the operating system. In the early 1990s and before, when most home computer users had non-networked systems, having an operating system for five or more years was not a serious problem for compatibility. But our current highly networked infrastructure now burdens the consumer to buy new expensive software to harness the capabilities of new hardware. The new software requires new hardware to get online, which further complicates the idea that the Internet is a "democratizing" technology. If true collaboration existed, users would be able to have older systems be more compatible with newer technologies in order to extend a product's use.[13]

Within the field of computers and composition, scholars (most notably, Gail Hawisher and Cynthia Selfe) have embraced a call to techno-democratization. Technology as a democratizing force is reified in "computer lab apparatus": the tools and networks that comprise the totality of computer-assisted instruction—the Internet being the most important tool within the last two decades. Selfe (1999) warned of the "perils of not paying attention" to the increasing knowledge gap between skilled and unskilled students entering college—a gap affecting individuals' future prosperity (p. 4). Selfe's work largely focuses on economic class, but she also covers aspects of the digital divide (the gulf between whites and African Americans online) and the educational backsliding caused by political rhetoric espousing the need to improve children's technical-scientific skills without the necessary public finding. Because these new computer technologies enable students to gain important literacy skills, Selfe argued that the very futures of our students are at stake if they are denied access. Similarly, Henry Louis Gates, Jr. (Gates 1999) argued that African Americans "are failing to gain access to the new tools of literacy," meaning the Internet, and that the Internet is "the most diverse and decentralized electronic medium yet invented" (p. 15). Both Selfe and Gates—reflecting on the Internet circa 1999—underscore the idea that access to contemporary literacy *tools* is a democratic imperative.[14]

On a broader democratic level, Winner (1986) argued that technology, if created in accordance with democratic goals, will support democracy. Winner analyzed undemocratic and horrendously authoritarian technological systems. The often cited example from Winner is that of the architect Robert Moses and his technological Jim Crowism: As "the master builder of roads, parks, bridges, and other public works of the 1920s to the 1970s in New York," Moses "built his overpasses according to specifications that would discourage the presence of buses on his parkways" (p. 23). Such an undemocratic system "limit[ed] access of racial minorities and low-income groups to Jones Beach, Moses' widely acclaimed public park" (Winner 1986, p. 23). Winner argued that Moses' architecture reifies the systemic effects of a racist, classist society; certain groups' access to *public* areas is denied by physical barriers, which "embody a systematic social inequality, a way of *engineering* relationships among people that, after a time, became just another part of the landscape" (p. 23, emphasis added). A similar situation exists in low-income, inner-city dwellings where property values dropped as a result of "urban planning" that sent highways, railways, and other eye sores through predominantly African-American communities.[15]

Racism, a systemic force, helped bring about the technological segregation of Moses's "architecture." Such a situation is representative of how white America treated African Americans throughout history. Moses's setup was simply a microcosm of larger cultural oppression—legally upheld until 1954 but in practice through today.[16] As American history proves, "all men are created equal" is relative to who is in charge. Therefore, "democratic" societies stabilize technology from non-egalitarian social values, attitudes, and practices. Ironically, these undemocratic practices are still in accordance with social values as Winner's example of Robert Moses shows. Also, some technologies "make it" through illegal back channels; for instance, Edison had to deal heavily in the graft of the Gilded Age to see his New York system to fruition; after all, Tammany Hall had to be "convinced" (Bazerman 1999, p. 227). The electric works Edison proposed had to fit certain political agendas. Because electricity is a public works issue, politicians had to support the endeavor, which, in turn, boosts their prestige. Therefore, a working technology is simply one aspect of technological realization. To be successful Edison had "to speak the language of politics… involving patronage, jobs, political support, factional infighting, and perhaps *payoffs*" (Bazerman 1999, p. 228, emphasis added). Such a practice of paying off *civil* servants is hardly an official tenet of democracy.

Besides civilian projects being political in nature, military projects require governmental support, and, as was the case with the U.S. Navy's long-range wireless experiments around 1910, some projects are only possible with state funding. C.-P. Yeang (2004) analyzed how the U.S. Navy "decided to build the world's most powerful radio transmitter in Arlington, Virginia, one that would exemplify American's [*sic*] military and economic potential" (p. 1). Here is politics of a different sort. Instead of dealing in bribes to carry out radio experiments, the military, which was "in a better position than scientists in university laboratories to conduct long-range radio experiments, for only the state could afford such large-scale projects," had a *de facto* monopoly on large-scale technological creations (Yeang 2004, p. 3). By 1910, the navy had financial resources because of an internal push towards modernization.[17] They needed a company to outfit ships with wireless technology and construct land-based stations, which meant awarding a contract to the company with the "proper" equipment and contract bid. Politics had a hand in the award. Despite the fact that the National Electric Signaling Company's (NESCO) wireless device "was not in fact able to match the contract's long-distance specification," the navy seems to have wanted "an American over a British or German company"—the British company bidding on the contract was Marconi's (Yeang 2004, p. 9). Because the foreign companies were upset, the navy provided an opportunity for other companies to carry out some experiments (Yeang 2004, p. 9). After all, upsetting possible future companies from helping carry out scientific or technical research would be disadvantageous. The navy was planning more fleet improvements and may have needed commercial support.

The navy did not just decide to outfit ships with wireless because the technology was available; the desire to modernize the navy—a political attitudinal change—occurred because "a number of top-rank officers" believed "[the wireless] could be incorporated into the 'New Navy'" (Yeang 2004, p. 5).[18] The U.S. Navy dealt in favoritism on a micro level but did so because of the appeal to modernization on a macro level. Radios were the high-tech items in the early twentieth century, and they fit the government's idea of what progress meant—modernizing by acquiring new technologies. Having wireless technology onboard meant the navy was being progressive about selecting one of the time period's most important products. What the navy's favoritism and Edison's graft dealings show is that "behind the scenes" forces in which relevant social groups engage also stabilize technologies. Values such as democracy, progress, and modernization are affixed to technologies by relevant social groups, but the reality of such labels does not have to exist. The meanings simply help a technology's favorable perception within a culture.

Relevant social groups affix meaning to technologies that help stabilize them and not stabilize them. Labeling technologies with positive meanings such as progress, democracy, and freedom help technologies; negative meanings such as dangerous, expensive, and inefficient do not help. Many unsuccessful technologies were feasible, but they were not represented to *appear* practical. Technology studies often focus on the successful products that make it to the market, and the field rarely discusses failed technologies. In fact, Staudenmaier (1985) recognized that the STS journal *Technology and Culture* mainly studied successful technologies (p. 718–719). Since then, two important cases where relevant social groups were not able to affix positive meaning(s) to technologies are Rosalind Williams' study of MIT's *reengineering* (1994–1999) and Bruno Latour's widely popular account of ARAMIS, the failed Parisian rail car system.

3.4 Not Stabilizing Technologies

In one of the few studies on a failed technology, Williams (2000) examines how MIT's reengineering was not accepted by *enough* relevant social groups. These relevant social groups were faculty, staff, administrators, students, and various consultants. The concept of "reengineering was defined as 'the fundamental rethinking and radical redesign of support processes to bring about dramatic improvements in performance" (Williams 2000, p. 643). In order to implement these changes, "a core team analyzed key administrative processes and eventually recommended that eight of them be redesigned" (Williams 2000, p. 643). The biggest, most expensive change "went into installing a new financial system, SAP R/3, which replaced MIT's" accounting system (Williams 2000, p. 634). Williams argued that it was the business side of MIT that forced these changes, and not enough users were happy with the proposed changes. She noted that one colleague "describe[d] staff resistance to reengineering" by stating "'[n]othing is more real than feelings'" (p. 667). Faculty and staff feelings were not "factored in" by the administrators or consultants implementing the changes.

Reengineering failed because relevant social groups did not affix positive meaning to the new technology.[19] MIT's administration apparently was convinced that the new business model of "reengineering," which was popular in the 1990s for increasing productivity (Williams 2000, p. 643), would be embraced by all parties. Unfortunately, the technology, or rather technologies comprising *reengineering*, did not fit within the values and practices of important relevant social groups. Williams explained reengineering's failure as follows:

> While the MIT administration was heavily invested in reengineering, the rank-and-file staff had mixed reactions….Others resented the intrusion of consultants and teams that they considered inexperienced or even incompetent, while feeling that underneath it all reengineering was just about eliminating jobs. The view of the MIT faculty was even more negative….they regarded the whole effort with considerable skepticism and often with outright disdain. (p. 644)

The faculty did not consider reengineering a valuable technology in theory or practice; instead, they "considered reengineering at best a distraction from, and at worst an assault upon, 'real' engineering" (Williams 2000, p. 644).

Williams went deeper into the issue of reengineering's failure by linking it to a greater "problem" of modern technology not being "true" technology. According to Williams (2000), over "the last two centuries… 'technology' has become strongly identified with engineering" (p. 644). However, past engineering was devoted to constructing physical products "cover[ing] a wide range of endeavors" such as "sailing, hunting, weaving, plowing, fighting, cooking, traveling, mining" and so on (Williams 2000, p. 644). She also claimed that "The Massachusetts Institute of Technology trains engineers," and "[f]or conventionally defined engineers at MIT…reengineering is not 'technology' at all but a 'business' or management' application of technology" (p. 644). Because reengineering fit neither the idea of "technology" nor "engineering," it failed to be realized as a technology by enough potential users—most importantly, the MIT faculty. Williams made it quite clear that as a business decision reengineering insulted the "feelings" of those who were supposed to embrace it as a solution for greater productivity. Reengineering simply did not fit the values and practices of the community.

Another technology that did not fit the values and practices of relevant social groups was the almost-completed Parisian commuter rail project, Aramis. The project began in the early 1970s and came to an end in late 1987. Millions of francs were spent on the project, but Matra Transport could not get the system successfully in place. Latour (1996) created situations for a young engineer and a veteran sociologist to investigate what "killed" Aramis. Latour analyzed this failed technology by researching history, economics, behaviors, attitudes, and politics surrounding Aramis. Prototypes were developed, budgets were calculated, and the public was informed, but Aramis failed to become realized. To determine why Aramis did not "work," Latour had the two fictional characters interview Matra employees and members of the Parisian transportation authority and examine press releases, correspondences, specifications, and newspaper articles to construct Aramis rhetorically. These fictional characters "grab actors" in order to produce a sociological account superior to an historical narrative (Latour 1996, p. 89). Latour argued that "[t]he time frame for innovations depends on the geometry of the actors, not on the calendar" (p. 88). Engineers worked on Aramis; time did not. Also, other actors—managers, politicians, accountants—had a part in creating Aramis or, more accurately, not having it realized in Paris. Latour claimed research ought to look to the actors for a more fruitful understanding of the time in which a technology was created: "Grab the actors, and you'll get periodization and temporalization as a bonus" (p. 89). Looking to the actors (or *relevant social groups*) allows researchers to understand when a technology exists. An inventor securing a patent has no more created a "working" technology than a group of engineers with a finished prototype that is not feasible (Latour 1996, pp. 66–67). The fictional characters in *Aramis* travel and interview the key actors in constructing the railcar, asking what factors contributed to any successes or failures at a given moment in Aramis's history.

What Aramis failed to do was become a black box. Aramis did not have an effective support system, and it could not mold human behavior through successful marketing or adapt to behavior through engineers' efforts. One crucial engineering fault was the design that allowed too many individuals the opportunity to choose the direction in which they wanted the cars to go; as M. Gueguen, the Parisian transportation authority director of infrastructures, pointed out to Latour's (1996) fictional sociologist:

> People all go in one direction, then the other. If you let people direct their own cars to their destinations, at the end of the day all the cars would be at the end of the line; how would they get back? (p. 90)

On face, this looks to be solely an engineering feasibility issue; however, by considering the fact that the system did not fit the culture's practice, specifically its rush hour practice, this concern is a socially constructed hurdle the ARAMIS system could not address. Gueguen also added that if you tried to fix the above issue "you'd have so many cars, the system would have to be so enormous, that it would cost a fortune" (Latour 1996, p. 90). Also, Aramis's small-car design went against the values of equal access to public transportation: One psychological study on Aramis noted that with the system as proposed "[t]here's no access for the handicapped, or for the blind, or for very tall people, or for luggage" (Latour 1996, p. 187). Additionally, users "expressed fear of being closed in" or "trapped" in a railcar whereas the Metro allowed for greater mobility (pp. 185–186). Again, the potential users' value of security was not a technical but social/personal meaning affixed to what they saw as "confining" transportation technology.

Aramis had a few engineering problems, but not conforming to social values and practices meant it was not realized by the relevant social groups. The Aramis system was a local issue. Although one can say rush hours are similar in many industrial areas, Aramis was specific to Paris. The safety concerns, political "games," and culture cannot be said to be universal. However, industrial cultures do share an almost universal value associating *progress* with technological advancement (Feenberg 1999; Stent 1978; Weaver 1953; Winner 1986). The wireless's stabilization meant progress, and tropes of progress were part of a broader modernist consciousness that encapsulated the "cult of efficiency" promoted not only in technical and scientific discourse but also in avant-garde art.

4 Modernism and Technology

Modernist audiences in the early twentieth century were more likely to be persuaded to accept a technology promoted as a marker of progress. Technologies marked human progress (ion) from the past to the assumed more efficient present and, thus, calling forward to the future. Speed, efficiency, profitability, and movement were all attributes of progress and of modernism. Audiences held the idea of progress in such high esteem that Weaver (1953) argued the term was the industrialized world's quintessential "god term" (p. 212). Weaver defined a god term as "that expression about which all other expressions are ranked as subordinate and serving dominations and powers" (p. 212). Although Weaver analyzed attitudes surrounding progress from a predominantly American point of view, his analysis is not limited to one industrialized nation: Any nation in the twentieth century wanting to increase its industrial power would celebrate progress and the values associated with it. Any rhetorical construction of a technology would be aided by being seen as progressive. The value of *progress* is not in its etymological meaning but in the meaning the modern audience associates with it.

Why would a word that basically means "to move forward" be rhetorically charged to be the god term of the day? That question is easily answered when we see that the era and the mindset of the era affect which words will be god terms. Weaver (1953) argued that a collective stance particular to a time period constructs the god term. Humans define themselves by "[revolving] around some concept of value" or else they "[suffer] an almost intolerable sense of being lost" (Weaver 1953, p. 213). "Progress" was such an entrenched and universal Western goal that anything associated with it made people "socially impelled to accept and even to sacrifice for" the values given to the object (Weaver 1953, p. 214). One would sacrifice "for the 'progress' of the community," and "progress" was "the coordinator of all socially respectable effort" (Weaver 1953 p. 214). Therefore, technologies that espoused progress could arouse nationalist sentiments because the society could point to an object embodying human advancement. New technologies marked a civilization's perceived greatness.

Attitudes towards progress support the "efficiency" practices of Frederick Taylor and Henry Ford, which revolutionized management science and factory production. Although Henry Ford claims not to have had "any Taylor influence over the assembly line," it is impossible not to see Taylor's influence (Beatty 2001, p. 207). John Dos Passos claimed Taylor, who was consumed by efficiency, had "[p]roduction [go] to his head and thrilled his sleepless nerves like liquor or women on a Saturday night" (as cited in Beatty 2001, p. 207). Passos, writing in the 1930s, may be foisting an unwarranted fetishization of Taylor's, but such an attitude would be in accordance with a particular technophile contemporary, Marinetti. Of course, Henry Ford recognized Taylor's ideas or, at least, the importance of efficiency for production.[20] Ford applied Taylor's scientific management to his assembly line and created a new technology indicative of hyper-industrialization at the beginning of the twentieth century.

Because Ford is often credited as *the* inventor of mass production, many audiences uncritically assume he alone is the supreme agent. For instance, Tedlow (2001) claimed Ford alone was responsible for the assembly line (p. 227), but industrial culture already valued efficiency as a goal for technologies. Tedlow ignored the social context by arguing that Ford's investment and not "the market" or "[p]ublic opinion" was solely responsible for the assembly line (p. 227); however, this argument relies too heavily on "a vacuum theory" of technological creation. Social forces must have been "ready" to accept such a streamlined, dehumanizing workplace environment. Tedlow believed Ford "along with Einstein, Freud, Lenin, and a very few others" were "in that class of people who exercised a decisive impact on the history of the twentieth century" (p. 227). What he does not recognize is that these men were products of industrial (izing) cultures. Their genius or impact was congruent to cultural values.

As for Western societies, promoting industrial applications of science was very important. Savvy industrialists and other interested parties founded the Royal Society of Arts and the Royal Institution to advance commercial applications of science. Noble (1999) briefly traced the Royal Society's impact on scientific and industrial promotion, explaining that "[t]here was also a strong connection between the scientific pioneers and early capitalist enterprise" (p. 58). Although Noble's main argument is that these societies' religious convictions extended medieval millenarian beliefs into modernity, he also found the early work of the Royal Society to be "researches focused upon the practical problems of" mechanical and commercial industries (p. 59). These societies promoted technology as humanity's conquest over nature—advancement through techno-evolution. Therefore, technology became a force to be worshipped. It had dominion over the natural world.

Adams (1900/1974) explored the power of machines to become the new spiritual force for humanity in "The Dynamo and the Virgin":

> [T]o Adams the dynamo became a symbol of infinity. As he grew accustomed to the great gallery of machines, he began to feel the forty-foot dynamos as a moral force, much as the early Christians felt the Cross. The planet itself seemed less impressive, in its old-fashioned, deliberate, annual or daily revolution, than this huge wheel, revolving within arm's-length at some vertiginous speed, and barely murmuring—scarcely humming an audible warning to stand a hair's breadth further for respect of power….Before the end, one began to pray to it; inherited instinct taught the natural expression of man before silent infinite force. Among the thousand symbols of ultimate energy, the dynamo was not so human as some, but it was the most expressive. (p. 380)

Interestingly, Adams went on to show his reverence not just for technology, but also for the inventors of new, impressive machines when he claimed, "[h]e wrapped himself in vibrations and rays which were new, and he would have hugged Marconi and Branly had he met them, as he hugged the dynamo" (p. 381). Adams was in complete awe of these new machines, and his account is an apotheosis of their creators. Other modernists glorified technologies as "vehicles" of progress. Marinetti, the founder and leader of Italian Futurism, established speed, efficiency, and ahistoricity as goals for human advancement. Marinetti's manifestos advocate that humans should emulate mechanical characteristics. Although an exaggeration of a social love of progress, Marinetti's works and Adams's enamored state embody the cultural value of progress supported by industrial society.

Because technology was a factor in rapidly changing cultural practices and values, artists echoed or reinterpreted the *meaning* of technology in society. As a contemporary technology, the wireless inspired Marinetti's artistic work. Specifically, he claimed that the wireless influenced his telegraphic style for poetry.[21] However, many artists at the time were experimenting with telegraphic styles; White (1990) suggested "that 'telegraphic' writing was generally 'in the air' in European avant-garde circles" (p. 160). Regardless of how Marinetti was inspired, he reconstructed the wireless through language influenced by this historical modernist moment. Marinetti and the popular press, therefore, reconstructed the wireless for audiences using tropes of progress. Of course, Marinetti's work exaggerates the wireless's possibilities, but those exaggerations show how *progress* shapes his artistic experiments and theories of modernism in general. Part of the Futurist aesthetic was to make bombastic claims about the value of technology and promote its presence as a force of human advancement: According to Marinetti and the popular press, humans advanced or "evolved" through new technologies.

Technology as a marker of human evolution relates to Social Darwinian misreadings of evolution. Evolution is commonly thought to be a progression toward a better species, a higher life form. But Darwin's (1859/2010) theory on evolution does not imply that humans or other creatures become better; instead, they become better *adapted* to their environments. Natural selection is the theory that adaptations enhancing survival cause certain traits to become prominent in a species.[22] Evolution became an important narrative for late nineteenth and early twentieth century Western societies that often feared the opposite—degeneration. As Childs (2000) observed,

> The theory of degeneration threatened Europe with the possibility of a reversion to a less complex and more barbaric form of society. Notions of 'evolution', '*progress*' and 'reform' led to an urgent fascination for their apparent opposites: 'regression', 'atavism' and 'decline'. (p. 39, emphasis added)

Industrial societies had to be seen as advancing through technology; Childs argued, "If a country had not independently achieved an advanced stage of industrialisation, it signified a social and cultural backwardness, an inferiority on behalf of the country's people" (p. 40). Marconi's texts do not speak as narratives against degeneracy, but they do fit the techno-evolutionary narrative that Childs argued came from Darwinian science (p. 36). Marconi and other inventors use *evolution* to mark civilization's progress when they introduce new inventions. The idea that technology signals or is affixed with values of evolution relates to how "democracy" is often affixed *to* or perceived *in* the Internet: Relevant social groups promote evolution and democracy in spite of the reality of such labels. Regardless of the accuracy of certain affixed values, technology still appears to fascinate audiences.

During the Industrial Revolution, new inventions were showcased for popular audiences in World's Fairs. Nye (1994) argued that the World's Fairs embodied the cultural need to move forward because they "served as a site within the transitory present from which the visitor could glimpse the future" (p. 205). World's Fairs showcased progress by showing the public the marvels of civilization; the displays were statements about the importance of technology in society: "They marketed the idea of progress itself, providing an overall impression of coherent historical development" (Nye 1994, p. 205). These popular venues also showcased a nation's technological power—they were expressions of industrial might. And in the political sphere, new movements of the early twentieth century, such as Italian and German fascism, readily embraced hyper-industrialization and the militarization expressed in new technologies. Such inventions as the machine gun, torpedo, dirigible, and even the wireless (which Marconi and the popular press promoted as a necessary wartime tool), as Marinetti shows in his manifestos, would lead Italy into becoming an industrial powerhouse and world military leader. Nationalist sentiments were high in Europe at the time, and technophiles like Marinetti argued a nation's technology established a nation's status.

The desire for modernization led Marinetti to his artistic project: "The liberation of the human body, the liberation of Italian democracy, and the efficient re-working of the machine are one project for Marinetti" (Hewitt 1993, p. 144). Andrew Hewitt argued the systemic reason for Marinetti's *technophilia* "reflects nothing more than the economic underdevelopment of Italy and an understandable fascination with industrialization on the part of the Italian modernists" (p. 146). Marinetti's early Futurist work embodies this fascination and violent patriarchal characteristics of the machine-man.[23] Hewitt observed Marinetti's works as proto-fascist or indicative of fascist aesthetics, identifying "the figure of the machine" in Futurist art as "the symbol of a specific social and political organization" (p. 146). However, machine- or efficiency-inspired political/social organization is not limited to twentieth-century fascism. The needs of industrialized nations appear to require societies to embrace technological advancement. After all, democratic and socialist nations promoted technology as advancement throughout the twentieth century and through today. From Henry Adams' glorification of dynamos to the contemporary drive in the U. S. for more math and science skills to maintain a world leadership role, technologies and sciences appear to be progress reified.

And the wireless's rhetorical reconstructions show that it embodied the value of progress in the early twentieth century. In order to demonstrate tropes of progress surrounding the wireless, this book shows how Marconi's wireless fit societal values and attitudes supportive of technology by examining a select body of texts espousing *progress* rhetoric. These reconstructions of the wireless through discourse are the first places the wireless exists. Before it becomes a black box, Marconi and others present the wireless as a viable technology in accordance with prevailing cultural attitudes.

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