A Historical Perspective of Technology and Planning

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Introduction: technology in society and planning today

Technology is our savior. We see, hear and experience this message constantly in popular culture, from advertisements that demonstrate how technological gadgets make us smarter and perhaps even more likable to forecasts by financial analysts that the information economy will continue to increase wealth for savvy investors. The hype produced by this common message implies that unless we jump on the information age bandwagon, we risk missing out on its vast benefits. Futuristic writers such as Alvin Toffler, Bill Gates, and Nicholas Negroponte proclaim the arrival of a digital age, in which the conditions of home, work and play are greatly enhanced through the omnipresence of information processing chips in all facets of life. As Christine Boyer puts it, computer technology has become such an important part of life for some people, a way of life that "has bred its own form of transcendental utopianism" (1996, 5).

This general optimism toward the impact of technology on society has infiltrated many disciplines, including the field of urban planning. For example, William Mitchell, Dean of the School of Architecture and Planning at MIT, interprets the impact of new information technologies on urban areas, following in the futurist vein of his MIT colleague Negroponte. In his most recent book, *E-topia* (1999), Mitchell envisions "lean, green cities that work smarter, not harder" as a result of the digital revolution:

> In the twenty-first century, then, we can ground the condition of civilized urbanity less upon the accumulation of things and more upon the flow of information, less upon geographic centrality and more upon electronic connectivity, less upon expanding consumption of scarce resources and more upon intelligent management. (155)

Mitchell argues that by employing information age design principles, planners and architects can deal with the problems of the industrial-era city and create more livable cities. Government can work more efficiently by using these new technologies, and planning support systems that take advantage of the Web and multimedia tools can help planners to develop plans and increase community partici-

pation in planning (Krouk et al. 2000, Lenk, 1999, Schön et al. 1999). These emerging examples of how planners can benefit from information technology have given hope that this latest technology will be the answer to our urban problems.

Because these changes are relatively recent, much of the writing about impacts of technology on cities and urban planning tends to be futuristic and speculative, based on the experience of nascent cases. Within the field of Regional Studies, however, academics from a political economy approach have used scarce empirical evidence to analyze how information technology is or is not impacting cities, and their initial findings are much more mixed than simplistically optimistic. For example, Peter Hall's 1988 book, *Cities of Tomorrow*, was recently updated to include a new chapter on the impact of the information economy on cities. Hall argues that while common wisdom might proclaim that digitalization will lead to a decrease in the importance of cities, as people can shop and work electronically, preliminary evidence demonstrates that cities continue to maintain their locational advantage. He also points out, however, that digitalization might lead to increasing social and economic disparities, a theme echoed by Manuel Castells. Hailed as a sage of the information age, Castells' "Space of Flows" theory strikes a chord with academics, Silicon Valley executives, and the popular press. He argues simultaneously that there are fundamental shifts occurring in the global capitalist system as part of the information technology revolution, but that the impacts of these shifts are not as drastic as some would have us believe. While the increasing automation of production via information technology might lead one to conclude that these new systems are moving us toward a "jobless society," Castells concludes that "there is no systematic structural relationship between the diffusion of information technologies and the evolution of employment levels in the economy as a whole" (1996, 263).

If preliminary indications are that cities are not changing as dramatically as predicted by futurists and popular culture, why is there such a tendency within planning to succumb to information age hype? I contend that this tendency is due primarily to what I call a dominant "technocratic ideology" that stunts the historical memory of planners and forces them to place unfounded faith in technological fixes. In this essay, I first provide background on technocratic culture in the United States, both in society in general and in planning in particu-

lar. I briefly trace the development of this technocratic ideology, including how people have challenged its dominance, albeit rather unsuccessfully. As Paul David (1990) has shown in investigating the "productivity paradox" – the fact that modern technological innovations have not led to substantial increases in industrial productivity – historical analysis is very useful for uncovering the assumptions and power relations present in the adaptation of technological innovation. Therefore, I next present three historical case studies of how planners have viewed technological innovation. Specifically, I look at planners' perspectives regarding energy technologies, the automobile, and computer and information technology. I believe that these case studies provide a rich context for reflecting on lessons for how planners should approach technology today.

Historical Perspectives on Technology

The Dominance of Technocratic Ideology in U.S. Society

Technological determinism tied to ideas of social progress has permeated American culture throughout its history and led to the development of what I call a technocratic ideology. An inevitable component of any discussion of the role of technology in society is the perpetual debate over technological determinism. The fundamental tenet of technological determinism is, as Langdon Winner (1986, 9-10) succinctly describes, that "technological innovation is the basic cause of changes in society and that human beings have little choice other than to sit back and watch this ineluctable process unfold." Technological determinism allows little or no room for human agency in explaining why certain technologies are adapted and what their impacts are. This determinist outlook has been the dominant perspective in the U.S. since at least the early stages of the Industrial Revolution and has intellectual roots in the ideas of social progress from Enlightenment thinkers (Smith 1996). This link to social progress is precisely why technological determinism came to permeate American culture, as technology has generally been thought to lead directly to social benefits.

This marriage between technological determinism and social progress was evident during the time of the Industrial Revolution, when there were many books that celebrated the role of new tech-

nologies in bringing about social progress. The following excerpt from James P. Boyd's book, *Triumphs and Wonders of the 19th Century*, published at the end of the 1800s, is indicative of the unbridled optimism of the day:

> It may be said that along many of the lines of invention and progress which have most intimately affected the life and civilization of the world, the nineteenth century has achieved triumphs and accomplished wonders equal, if not superior, to all other centuries combined. (p. i)

Advertising agencies during this period capitalized on growing affluence by portraying the vast benefits of technological innovations to consumers, thus bringing the dominant message of social progress through technology to popular culture (Smith 1994). This set the foundation for a dominant bias toward looking to technological solutions to social problems, as Americans saw the continual improvement in society as a direct result of technological innovation.

According to Leo Marx (1994), with the advent of industrial technological systems there was a shift in the late 19th century in the ideology of progress associated with technology. The Enlightenment idea of social progress was a linear process based on republican political theory. A technocratic version of progress, in which progress was seen as more politically neutral, became dominant near the end of the 1800s as large technological systems came to transform industry and the economy. This, in turn, produced what Marx (1994) calls a "technocratic spirit" in industry, arts and architecture, exemplified in modernist design principles such as efficiency, rationality, order, and control. For David Noble (1979, xxv), this outlook was fundamental in securing the economic ascendancy of American firms, as technology became "the racing heart of corporate capitalism." Technology was viewed as a positive and necessary component of American society and economy, as technocratic ideology secured power in the hands of industry in general and technical professionals in particular.

Coupled with the rise of professionalism, this culture of technocratic thinking provided the context for the idea that technical expertise, rather than political will or mere tradition, should determine policies and courses of action. Andrew Feenberg characterizes the political implications of technocratic culture in the following way: "public debates will be replaced by technical expertise; research rather than the uninformed opinion of the voters will identify the most effi-

cient course of action" (1999, 2). I argue that this is really the core of technocratic ideology: when people are persuaded to put their faith in technology, rather than in people. Ironically, perhaps, because technology is assumed to necessarily bring about social progress, technocratic ideology elevates the professional expert to a privileged position. This persuasion leads to technocratic thinking as an ideological construct, masking the power relations which make this perspective dominant in society. Groups that benefit from technocratic ideology seek to convince society that their power is based merely on the power of objective technology. As history has shown, of course, these processes are not so simple, as they represent conflict between various social, economic and political groups. Technocratic ideology, however, has been largely successful at hiding the role of power relations in how technology interacts with society, thereby allowing for its continued dominance.

Technocratic Ideology in Planning

This technocratic way of thinking has had a major impact in the history of planning, beginning with early utopian movements of the 19th century, which served as a precursor to the formal development of urban planning. Early socialist utopians, such as Robert Owen and Charles Fourier, sought to create a new society, largely in reaction to the social problems created by industrialization. This might lead one to conclude that these thinkers were anti-technology. However, they retained a faith in technology while providing a critique of industrialization. For example, utopians argued that technology could help deal with the negative impact of industrialization on labor by helping return workers to rural agriculture (Segal 1985, Winner 1986). Later utopians more directly tied to the history of planning – such as Ebenezer Howard, Frank Lloyd Wright and Le Corbusier – were likewise fascinated with the power and order of technology, which they hoped would lead industrial society to a just, ideal form (Fishman 1977).

These utopians looked to, at least partially, employ technological innovations to engender social progress, and this way of thinking has continued throughout the history of planning. In linking technocratic theory with traditional forms of planning, Fainstein and Fainstein (1997) place the origin of this outlook in modernist epistemology and ideals of social progress:

> Technocratic thinking is a product of the industrial era. It represents an effort to come to grips with the central social problems created by the Industrial Revolution – the miserable condition of the lower classes and the breakdown in the old structure of authority that previously maintained order…But rather than intending a return to the days before industrialization – an impossibility – they wish to harness the power of technology to create a new society and thereby to ameliorate the condition of the lower classes, as well as the threat they pose to the social order. (1997, 273)

Probably the most obvious example of this technocratic culture within planning is the ideal of the "rational planner," who serves as a technical expert outside the political sphere so that issues are "settled on their own merit" (Meyerson and Banfield 1955). Planning, then, is goal-oriented, similar to the related discipline of Policy Analysis, in which there is purported to be a "rational decision maker who lays out goals and uses logical processes to explore the best way to reach those goals" (Stokey and Zeckhauser 1978, 3). Logan and Molotch (1987), in their widely influential work on the political economy of cities, equate the planning profession to a "technocracy of urban expertise" that has largely served the interests of the "growth machines" that have dominated urban politics and development in the U.S. With a clear foundation in positivist epistemology, the ideal of rational planning fits neatly with ideas of social progress based on technology, as technocratic planners help advance the progress of society through rational plans.

As I argue later in this essay, the use of computers by planners has perpetuated this technocratic culture. Systems planners, for example, have tried to "optimize" planning through computer modeling and simulation (Harris 1966, Harris 1996). This has reinforced the legacy of the expert planner, especially in the area of transportation planning, where the influence of engineering methods has been greatest. With regard to how new information technologies might affect cities, some have presented these innovations as having direct, drastic impacts on urban form. Anthony Pascal (1987), for example, has argued that because the traditional advantages of the city – such as proximity – are erased through new communications technologies, cities are becoming less important and will continue to dissolve. Contending that "technology, then, shapes destiny," Pascal presents a popularly deterministic outlook on the impact of information technology

on cities. Another example of this rather deterministic, progressive perspective comes from a current fad in transportation planning. So-called "intelligent transportation systems" it is argued, will lead to safer, cheaper transportation by providing better information for travelers, thus lowering consumer and environmental costs. It appears, therefore, that the view that technology directly brings about social good, first developed in the 19th century, is still with us today.

Societal Challenges to Technocratic Ideology

Though technocratic culture remains dominant today, as evidenced in the information age euphoria outlined in the introduction to this paper, its dominance has been severely threatened. Even early on in the development of technocratic culture, 19th Century literary figures such as Ralph Waldo Emerson, Nathaniel Hawthorne, and Henry Thoreau raised objections to the corrupting nature of technology, appealing to romantic notions of life before the Industrial Revolution (Smith 1994). In the 20th century, critics such as Martin Heidegger and Jaques Ellul represent "a grand tradition of romantic protest against mechanization" which argues that "technology is not neutral but embodies specific values," a position that Feenberg (1999) calls "essentialist" because they object to the very essence of technology. Disciples of this perspective have had an important role in popular critiques of technocratic ideology, helping set the stage for social movements of the 1960s and 1970s that challenged technocratic views of progress.

More recently, intellectual critiques of technocratic thinking have come from three major camps of scholars. First of all, writers in the postmodernist vein have reacted to the modernist characteristics of technocratic culture. Jean-Francois Lyotard, for example, calls technology "a game pertaining not to the true, the just, or the beautiful, etc., but to efficiency" (1984, 44), arguing that profit will continue to be the driving force for technological evolution. This is characteristic of what Leo Marx (1994) refers to as the "technological pessimism" of postmodernism, the roots of which he traces to social upheaval after World War II and, especially, the Vietnam War. Modernist conceptions of knowledge and social progress were immediately suspect, thus destabilizing the tenets of technocratic culture. A second camp of thinkers that has questioned the technocratic spirit is that of Political Economy. Stephen Hill (1988), for example, de-

scribes technology as a "dramatic tragedy," given the oppressive nature of technological systems in society. Rather than objecting to technology on substantive or epistemological grounds, political economists tend to look empirically at the role of technological innovations in the political, economic and social relations of capitalism, rejecting the simple determinism of technocratic culture. As Castells explains, "technology does not determine society: it embodies it. But neither does society determine technological innovation: it uses it." (1996, 5:f2). A final camp of scholars that have challenged the assumptions of technocratic culture is that of social constructivism. Also opposed to technocratic thinking, constructivists argue that:

> **the choice between alternatives ultimately depends neither on technical nor economic efficiency, but on the 'fit' between devices and the interests and beliefs of the various social groups that influence the design process.** What singles out an artifact is its relationships to the social environment, not some intrinsic property. (Feenberg 1999, 79; emphasis in original)

Similar to political economists, scholars in the social constructivist camp dispute the autonomous nature of technology by pointing to empirical evidence that technological innovation is a matter of social processes and adaptation, rather than something that is determined by the power of the technology itself. In other words, people shape technology, not the other way around, as technological determinists would have it. The social constructivists, however, differ with political economists by focusing on micro-scale impacts, rather than larger political and economic forces (Graham and Marvin 1996).

In identifying technological innovation as part of social processes, both the political economists and social constructivists present an important challenge to technocratic ideology. They reject the technocratic assumption that technological innovation leads directly to social progress, arguing that the development and adaptation of technologies is "socially constructed." Technological innovation does not happen in a vacuum; rather it is always part of a social, economic and political context. Technology on its own does not lead to social progress, but as part of a larger social process it can have a role in bringing improvements to society. As Noble explains, this viewpoint "restores people once again to their proper role as subjects of the story, rather than as mere pawns of technology"(1984, 324). While this perspec-

tive presents a freeing role for human agency, Noble goes on to explain, it is not without its own limitations:

> If the move beyond technological determinism is liberating, however, it is also replete with false promises. Exhilarated by newfound freedom and vision, and enthusiastic about technical alternatives, the optimists easily lose perspective, exaggerate the possibilities, and underestimate the realities of social power that continue to shape the technological future. Those who await the imminent collapse of domination will be disappointed, for with power come numerous options and the power to deceive. (325)

Even those who reject strict technocratic ideology in favor of a social constructivist view are in danger of forgetting an important fact, according to Noble: technological innovation is part of social processes in which power relations determine the winners and losers. Just because technology is constructed by social relations does not mean it will somehow be less exploited by those in power. This will be important to keep in mind in looking more specifically at the history of technology in planning.

Challenges to Technocratic Ideology within Planning

Despite the vast heritage of technocratic culture in planning, there have also been challenges to these assumptions throughout the history of planning. One of the earliest examples of this discontent with the dominant embrace of technology comes from the Southern Regionalists of the 1930s and 1940s. Reacting to what they perceived as the elitist views of the Regional Planning Association of America (RPAA), regionalists from the southern part of the U.S. sought to counteract the urbanizing effect of technology and industrialization (Friedmann and Weaver 1979). One of the leaders of the southern regionalists was sociologist Howard Odum from the University of North Carolina, who looked for the social development of regions, rather than their technological development:

> The region is smaller than society yet is definitive of society. It is characterized by the joint indices of geography and culture and derives its definitive traits through action and behaviour processes and social patterns rather than through technological functions or areas. (Odum 1931, 167)

The Southern Regionalists take what Feenberg might call an essen-

tialist perspective, objecting to technology on substantive grounds.

Another example of skepticism toward technological fixes to planning problems ironically comes from a member of RPAA, Lewis Mumford. Early in his career, Mumford exemplified aspects of the technocratic way of thinking, arguing that social problems such as urban congestion could be resolved through technological innovation. By the 1950s and 1960s, however, this optimism was greatly tempered, as he argued against dominant "authoritarian" types of technologies that focus on large systems in favor of "democratic" technologies that are focused on their utility for humans (Mumford 1964). Mumford, in fact, played a crucial role in disputing the technocratic ideology of his day, something acknowledged by many historians of technology.

Perhaps the most important challenge to technocratic planning, however, came during the social upheaval of the 1960s and 1970s, as Paul Davidoff's (1965) Advocacy Planning model rejected technical fixes to social problems. Instead, advocate planners looked to political lobbying and community organizing as tools for effecting social change, thus reflecting larger social movements of the era. Both Mumford and Davidoff took what today might be called constructivist approaches to viewing the impact of technology, as they saw technological innovation as the result of social processes rather than a predetermined outcome. These examples demonstrate that planners have not been uniform in whether to embrace or reject technology, something that becomes even more apparent by looking more specifically at the history of technological innovations in planning.

Planners' Attitudes toward Technology

As I argued in the previous section, there has been a dominant technocratic culture in American society that has largely infiltrated planning, with scattered examples of challenges to this ideology. Reflecting popular perceptions that technology is the engine for social progress, I contend that planners have largely exemplified technocratic ways of thinking by looking to technological innovation to solve urban problems without considering its possible limitations and unintended consequences. In order to better understand how this attitude played itself out in the history of planning, I now turn to three case studies, looking at three technological innovations and how plan-

ners perceived them. I am interested in how planners viewed the innovations in relation to cities, as well in relation to their own work. In each case, I want to assess the presence of, and challenges to, technocratic ideology and glean lessons for how planners today should view technological change.

Energy Technologies

New sources of energy, such as electricity, coal and natural gas had a vast impact on American society, beginning in the last third of the nineteenth century. These energy technologies played an important role in the development of cities, both in creating an idealized image of urban life, and in aiding trends toward the decentralization of population. For example, electricity was an important component of the neoclassical design of City Beautiful planners, who sought to improve urban life through physical planning of public and commercial space. A prime example of this was Daniel Burnham's *1909 Plan of Chicago*, perhaps the monumental example of the City Beautiful doctrine. As explained by Bouman (1993), Burnham's plan "formalized one of the great conventions of American urban form: that the American downtown is as much 'central illuminating district' as Central Business District." This way of thinking was still apparent in 1926, when merchants and city officials formed the State Street Lighting Association to fill Chicago's retail center street with streetlights in an attempt to attract consumers (Bouman 1993). Operating under the assumption that the city center should serve as a monument to the city, both symbolically and commercially, City Beautiful planners promoted street lighting for retail areas and floodlights for civic ornaments. This became part of the "booster package" in western cities with City Beautiful designs, such as Kansas City and Denver (Rose and Clark 1979), as civic leaders tried to attract investment and development through an improved image of the city.

As mentioned above, another important group of planners who promoted the development of the new energy sources was the Regional Planning Association of America (RPAA). Grounding their regionalism in that of Patrick Geddes, the RPAA planners sought to decentralize population and conserve resources through technological improvements (Friedmann and Weaver 1979). Peter Kropotkin, a radical geographer who greatly influenced Geddes, had developed a theory of 'technological imperative', arguing that new sources of elec-

tric power made centralized power obsolete. Geddes, and subsequently the RPAA, used this argument to promote industrial decentralization with the purpose of providing alternatives to congested urban life (Hall 1996). A perfect example of this argument comes from Stuart Chase's 1933 book, *The Promise of Power*, in which he posited that electricity would transform rural life by providing the possibility of industrial employment to the farm and small rural communities. The influence of the RPAA was felt as their ideas were adopted by President Roosevelt with the New Deal planning program (Hall 1996).

The primary impact of these new energy sources on cities was that, as RPAA planners had hoped, they facilitated the possibility of population decentralization. As electric companies and their engineers grew in influence, new housing developments sprouted up on the periphery of urban areas. Wealthy residents could thus escape the horrors of the industrial city, taking advantage of the improved infrastructure for heat and electricity, as well as a number of consumer appliances coming out on the market. These new energy technologies were seen as greatly improving the quality of urban life:

> Urban residents who used the new energy sources operated in a cultural milieu in which increased inputs of energy promised clean homes, homogenous neighborhoods, improved schools, and wider opportunities for exercising professional skills and tastes. (Rose and Clark 1979, 341)

In general, then, planners reflected the dominant technocratic ideology of the day, arguing that energy technologies themselves would lead directly to social progress.

As will be obvious in the next section, with hindsight we see that the causes for - and impacts of - urban deconcentration were much more complex than merely the liberating nature of new energy technologies. It seems clear, however, that planners in the first half of the 20th century tended to assign a rather deterministic function to these innovations, perceiving that the new energy technologies would directly lead to social progress. Ironically, the trend toward suburbanization that these new energy sources helped put into motion ended up degrading the goals of the City Beautiful movement. By 1958, suburbanization had eroded State Street's prominence in Chicago. Attempts were made in the 1960s and 1970s to revitalize the area, partly through new lighting technologies that would make

the area more attractive to shoppers, but these were largely unsuccessful (Bouman 1993). Planners' narrowly technocratic views of how energy technologies would positively impact urban areas did not allow them to consider possible unintended consequences of these innovations. New energy technologies had helped generate suburbanization, which improved the quality of life for many but also ended up decreasing the prominence of many urban centers.

Automobile Transportation

Another technology that caught the attention of planners is an obvious one, the automobile. When cars were first introduced into American society, the electric trolley was the dominant source of urban transportation, and planners had little reason to doubt that it would continue to meet society's transportation needs. There were a growing number of planners near the beginning of the 20th century, however, who thoroughly embraced automobiles:

> Most early discussions of the automobile emphasized its potential for solving urban problems, not creating them. This positive theme permeated both popular and professional journals. Prior to World War I, a frequently voiced belief was that the automobile would improve public health and lower street maintenance costs by removing horse-drawn vehicles from downtown streets. (Foster 1979, 368)

Planners conjectured that health risks from horse manure would decrease, and costs of street cleaning would go down. Nelson Lewis, Chief Engineer for New York's Board of Estimate, proclaimed at a 1915 planning conference that cars would bring many benefits to urban life, such as stabilizing the real estate market through deconcentration, increasing the independence and mobility of residents, and forcing cities to improve streets (citied in Foster 1979, 371). Technology, again, would be the source of improvement in the quality of urban life.

By the 1920s and 1930s, there was wide recognition among planners that automobiles were helping promote the deconcentration of urban population, which was largely seen as a positive thing. The following passage from a 1935 planning journal article is indicative:

> The private passenger automobile is the best form of transportation now available. The result of suburban development will be the largest amount of land per person for which we can find effective use. The

> result will be economy in development and operation, and conditions which will be wholesome from both the medical and social points of view. (Ihlder 1935, 5)

This positive view of the automobile and resulting suburbanization were reinforced by planners and policy makers through the 1950s and 1960s. In a classic article on the role of transportation in urban development, Colin Clark (1952) foresaw a never-ending process of urban sprawl, arguing that the automobile had liberated both individuals and industry from the confines of slower, fixed types of transportation. A decade later, Melvin Webber (1963) likewise praised the liberating, pluralistic effect of transportation systems that helped create what he called "community without propinquity," thus freeing residents from the traditional confines of urban space. Automobiles would lead directly to improved quality of life for urban residents. This technocratic perspective among planners was rewarded by the provision of federal funding for the development of a national highway system to increase the mobility of residents, commuters, and commerce.

Over the past several decades, many transportation planners have tempered their enthusiasm for the automobile, instead focusing their efforts on strategies to decrease Americans' collective dependence on the car. This shift in thinking began to take shape during the 1950s and 1960s, primarily as a response to material conditions, namely traffic congestion, air pollution, and recurring social inequities (Altshuler 1979). Planners came to recognize a fundamental contradiction between the private benefits and societal costs of automobiles and began to develop strategies such as traffic restraint and road pricing to decrease demand for auto travel and thus mitigate the negative impacts of the car (Hall 1994). In parallel with this response to material conditions - and in line with the resistance to technocratic ideology outlined previously - there was a change in theoretical understanding of how transportation impacts cities and urban planning during the 1960s and 1970s.

Planners began to recognize that transportation technologies were socially constructed, thus dissolving the hard technological determinism en vogue previously. Even Melvin Webber, who ten years earlier had celebrated the liberating effect of the car, could proclaim:

> viewed from this perspective, the vernacular conceptions appear to have

> been far too simplistic, perceiving technological developments and transport facilities as hardware systems somehow tacked onto the body politic, when they've really been social systems buried deep under the political skin. (1973, 8)

This acknowledgement that decisions regarding transportation have been part of a complex social environment has bred a generation of planning research on the political nature of transportation planning (e.g. Mann 1997, Pucher et al. 1981, Pucher et al. 1998). Technocratic ideology has a long history in transportation planning and certainly persists today. Many planners, however, have learned from the past and recognize that changing people's behavior, rather than just providing technological fixes, is a key part of their task.

Computer and Information Technology

The recent history of computers and information technology within the planning profession provides the clearest example of the technocratic ideology in planning. Mainframe computers were first introduced into local governments in the 1950s and were initially used for financial and payroll functions, meaning that municipal finance departments became the home of data processing in cities. During the 1960s, this data processing function was distributed to other city departments, such as planning (Dutton and Kraemer 1982). According to early studies on the use of computers in local government during the 1960s and 1970s, adoption was slower than expected, as mainframe computers were found to improve efficiency in certain tasks but had little impact in larger policy arenas (Brail 1987). An important development during the 1970s was the introduction of the microcomputer, as desktop computers with increased power and memory allowed many more people to take advantage of computing. For the author of a book on the role of computers in urban planning, "the development of the microcomputer represents the democratization of computer power in society" and "societal observers may have understated the rate of technological change" (Brail 1987, 1, 3).

The advantages of computing were quickly seen in the industrial sector, where computers increased efficiency and facilitated trends toward "flexible specialization" and craft forms of production, breaking down the dominant Fordist assembly-line model of production (Piore and Sabel 1984). The service sector, such as local government, was slower to recognize the computer's value. As keepers of data and

technical information - in line with the technocratic heritage of planning - planners eventually recognized the advantages of computers for increasing their own efficiency and productivity. For example, the computer could serve as a valuable time-saving tool for analysis. In a publication geared toward practicing planners, Devon Schneider (1979) highlighted how early Geographic Information System (GIS) applications helped make land-use decisions in a time-efficient manner. Moreover, planners realized that they were able to reduce costs in the areas of administrative support, service planning, and information processing by using the microcomputer, thus taking advantage of "the most promising of all modern technologies for improving local government productivity" (Kraemer and King 1980, 3).

As with the other two case studies, the initial euphoria surrounding computers eventually subsided as it became apparent that there were limitations to what the technology could do for planning and cities. First of all, there were pragmatic issues. Staff had problems learning new software applications, there were unanticipated costs, and this supposedly efficient new technology was often unable to answer the simplest questions for policy makers (Dutton and Kraemer 1982, 123). Planners quickly realized that computers were mere tools and could not "substitute for intelligence" (Wildman 1979). Even enthusiasts of computing in planning had to acknowledge its limitations.

> Two key words have defined the distinction between the past and the future - power and ubiquity. Hardware and software are much more powerful today and microcomputers are everywhere. This does not mean that society will necessarily be affected in a significant way, that cities will be more beautiful, or that poverty will diminish. However, to compete in this increasingly technological world, the planner or public manager will need to know what a microcomputer is and how to use it. (Brail 1987, 10)

Thus, many planners came to view the computer with a much more pragmatic lens as they learned what it could and could not do for them, realizing that computers on their own would not solve any problem. Reflecting a social constructivist outlook on technology, planners began to appreciate that computers would be useful in their work only in as far as they were part of a social process that used the computer for what it was, a tool.

While the limitations of computer technology were becoming

apparent to planners, planning itself was undergoing some fundamental changes. As mentioned earlier, the social movements—Advocacy Planning in particular—of the 1960s and 1970s had challenged the very assumptions of technocratic ideology. Planners began to recognize the political nature of their profession. The following retelling of this history traces the implications of this transition in relation to computer technology:

> Urban and regional planners could have become such an information elite – they were a highly trained group of specialists, with a deep philosophical commitment to achieving greater rationality in government decision making, and a voracious appetite for information as the key to achieving that rationality; they felt that if enough information could be collected and analyzed, objective choices would be clear. Their professional emphasis on rationality was, in part, a response to the highly political environment in which planners operate, and to their weakness as a political group. In their naïve belief in the power of information per se, and in their enthusiasm for models, analysis, and exotic computing, the planners frequently took on overly ambitious projects, many of which failed to produce the results promised, produced only partial results, or produced them too late – after decision and action had been taken by managers or policy makers. Thus the planners discredited their efforts, their analyses, and themselves. (Dutton and Kraemer 1982, 123-4)

Instead of reinforcing the technocratic power of planners, reliance on computers actually weakened the position of planners because they tended to depend on the tool for solutions without recognizing a political context. Peter Hall observes that "by 1975 Britton Harris, perhaps the most celebrated of all the systems planners, could write that he no longer believed that the more difficult problems of planning could be solved by optimizing methods" (1996, 331). As Christine Boyer (1996) points out, the use of computers tends to reinforce binary ways of thinking, in which there are only yes/no, right/wrong, +/- relationships, as evidenced in the simplistic notions of the "vanishing city" due to electronic communication. These naïve theories do not acknowledge the complexity of social production of space, instead reinforcing the idea that only quantified, digitized data can be used to explain urban processes. In this case, planners subsumed in the information age hype have not learned from the failures of the past and continue to hold on to their technocratic ways of thinking.

Conclusion: Lessons for Today

So, is technology the savior of our cities? How about of planning? I believe that this historical analysis has shown that, despite serious challenges, technocratic ideology has been dominant in U.S. society since the time of the Industrial Revolution and persists today, as exemplified in the technological optimism inherent in the information revolution. This ideology infiltrated planning early on in its history. The three innovations discussed herein show that planners were quick to embrace energy technologies, the automobile, and computers as technologies destined to improve the quality of urban life. After initial enthusiasm, however, planners began to realize that these technologies were not magic bullets, but instead, brought with them limitations and unintended consequences. Technology has not saved urban life, nor has it saved planning. In fact, it has in some ways marginalized planning, though due to the masking power of technocratic ideology, planners are not quick to realize this.

Reflecting on the implications of this analysis for planning today, I offer several lessons for planners as they contemplate the adoption and use of technology.

- *The impact of technology on cities and planning is part of a complex social process*

Technological innovation is socially constructed. Each of the technologies examined here have been held by planners to be instrumental in deconcentration policies; but it is clear that the causes of suburbanization, for example, were varied and complex. Besides energy and automobiles, social and economic forces such as housing finance programs and consumer preferences converged to stimulate suburbanization. As Graham and Marvin point out, simple technological determinism "is attractive because it creates powerful scenarios, clear stories, and because it accords with the dominant experience in the West" (1999, 91). Technology does not develop in a vacuum, however, and is adapted and changed as part of social processes. As we think about current technological trends, we should remember that the adoption of technologies is not simply a matter of introducing the innovation and letting fate simply take its course. If, for example, planners want to use GIS to increase community participation in planning, simply introducing a computer with GIS software to residents will not suffice. The planner will have to ensure that the

residents have access to critical information, are skilled in operating the systems that produce it, and are trained and have the capacity to maintain these systems.

- *Disparities may result from new technologies*

It is normal that new technological innovations take some time to become accepted and that their adoption is not equally distributed throughout society. For example, primarily wealthy residents first escaped the industrial city, as they could afford the increased costs of transportation and energy, while low-income workers had to remain in congested central cities. While mobility has certainly improved, it is still the poor who are most vulnerable in an automobile-dominated place like Los Angeles. They are literally dependent on the decisions of transit officials for their survival in a society and economy that requires mobility (Mann 1997). This history should force us to reflect on the current trends of "e-commerce" and "e-government." It is one thing if businesses allow people to make purchases over the web, and quite something else if citizens are required to interact with government in the same venue. While proponents point to the potential for increasing political participation through "e-voting," critics argue that this will simply enhance current disparities in access to the Internet. Regarding the trend toward voting on the web, Anthony Wilhelm, author of a recent book on *Democracy in the Digital Age*, contends: "There's just this default to the Internet culture. It seems like we're sacrificing our democratic process on the altar of our faith in technology" (cited in Chapman 2000, March 20). Likewise, planners should consider how using new information technologies in planning might reinforce technocratic ideology and end up creating social or economic disparities.

- *There has been a recurring tendency in planning to ignore the possibility of unintended consequences from new technological innovations*

Planners have generally greeted each new technological innovation as the answer to all their problems. The ethic of the "technological fix" means that planners have tended to look to technology for answers to urban problems, often looking past the limitations of the innovations. The clearest example of this from the three cases studies may be the automobile, which was initially viewed as a liberating machine but is now roundly seen as a source of many urban ills. Per-

haps if planners had thought more critically about the possible impacts of cars, they would have devised some mechanisms from the beginning to mitigate the negative effects. At the beginning of the 21st century, it is important, then, that planners reflect on the possible negative impacts of the digitalization of the world. How will networked computing affect interpersonal relationships, political participation, and community life? One observer who has considered these implications warns that "the city and the public sphere become increasingly virtual as we move toward interpersonal systems of communication and the 'netropolis' at the expense of face-to-face communication in physical and public space" (Boyer 1996, 229). If planners care about the public sphere, they should intervene now to ensure that it is supported by electronic communication, not supplanted by it.

I believe that if planners today seriously reflect on these lessons, they can avoid falling into the enticing trap of technocratic ideology. They should reject simplistic technological determinism in favor of a richer understanding of technological innovation as a social process. While this perspective makes interpretation of how technology and society relate more difficult, it retains a viable role for human agency. Social progress, which is at the heart of the planning enterprise, can best be achieved through the work of humans, not through technological fixes. At the same time, it is critical that planners remember that the social construction of technology does not exempt issues of technology from the everyday battles over power in society. Technological innovation is a contested terrain reflecting existing power relations, and the winners in these battles often triumph at the expense of losers, thus resulting in social and economic disparities. Planners need to be sensitive to the impact of new technologies, especially their possible unintended consequences.

In the context of the digital age, planners need to be wary of the hype surrounding new information technologies. While these can be important tools for planners, they — no more than energy, the automobile or early computers — are not going to lead to better planning or better planned cities on their own. These tools must be designed and used by persons well versed in, and concerned about, making cities more livable. In the hands of someone with a balanced perspective and a historical memory, these new technologies can further planning goals by informing analysis and democratizing data.

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