A Census of Public Computing in Toledo Ohio

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Foreword

This paper reports on research that was designed to identify every public computing site in the city of Toledo, Ohio. As well as describing these sites, we analyze their social environment. Our goal is to explore how different social processes are influencing the informatization of society and the persistence (or not) of the digital divide.

Executive Summary

This study looks at public computing, computers and Internet access in the public sphere. Toledo is a city moving from an industrial economic base into the information age, and has major transformations taking place in three types of computing: personal (at home), private (at work), and public (all other places). We found over 280 public computing sites and estimate a total of over 300 exist within the City. Public computing is located in four kinds f sites: governmental sites (schools and libraries), community (schools and churches), commercial (schools and apartment complexes), and universities.

The emergence of public computing signals a fundamental redefinition and expansion of democracy in the information age. Public computing adds to the quality of a labor force, bridges the emerging "digital divide" and therein contributes to social equity and community, and it deepens the basic social fabric by creating an opportunity and venue for new voices in public discussions. Toledo is ahead of most cities in the area of public computing activities, and can build on this opportunity to strengthen community, elevate social life, and promote the economic well being of the region.

Introduction

Three bridges across the digital divide

The digital divide is a concept about inequality that grabbed the imagination of scholars, activists, policymakers, and all varieties of hardware and software producers.[1] Being wired started out as an interesting innovation for scientists and the military and now has become a systemic norm for social and economic life. Moreover, social and technological change makes the digital divide a moving target. The digital divide concept, explicitly or not, is now at the heart of most discussions about workforce development, architectural and urban planning, youth and social welfare, and all levels of education.[2] The fundamental assumption is that computer literacy is a requirement for being a first class member of society.[3]

The most frequently cited measures of the digital divide focus on access (by ownership or some other means) and use. There are multiple and related conceptions and

[1] A good overview might include Norris 2001, the Benton Foundation's http://www.digitaldividenetwork.org, and the Pew Internet and American Life reports at http://www.pewinternet.org/.
[2] Schön et al 1999.
[3] NRC 1998, Williams 2002.

measures.[4] Elsewhere (Alkalimat and Williams 2001) we advanced the concept of cyberpower, a measure of to what extent individuals, groups or institutions are able to wield power with ICT.[5]

There are three ways people bridge the digital divide to access and use information and communications technologies and even have the possibility of cyberpower. They may use a computer (with or without Internet) at home; we call that personal computing. They may use ICT on the job; we call that private computing. Market forces drive personal and private computing, involving individuals as consumers or as workers, respectively. But there are many other places where people can access and use computers and the Internet: universities, schools, libraries, cybercafes, and so on. New ICTs are being introduced as well. On one block in Boston, several shops and cafes offer free wireless access to anyone who has a laptop and wireless network card.[6] On New York City streets as well as in many airports, a public telephone-like booth offers web browsing and email.[7] As part of its plan to combat the digital divide, the city of Atlanta is rolling out a mobile computer lab on a bus, building on earlier rolling computer labs in Indianapolis and elsewhere.[8] All these settings for using ICT apart from home or work we call *public computing*.

Outside the US, public computing is at least equally important. Franchise convenience stores in Japan linked to their corporate partner are the site of e-commerce opportunities for their customers using a public access terminal hooked up to the infrastructure previously used only for store-corporation communications.[9] Beijing is reported to have 2000 cybercafes used heavily for games, chatting, email and web. In Britain a recent initiative to provide public access computer in libraries is linked with community digitization work.[10] India's telephone shops often also provide an online computer. Cuba has a string of youth computer clubs where the public learns on networked computers and where teams of people write software; they have also begun setting up public browsing rooms (salas de navigación). Mexico created a small sensation recently when it agreed to purchase from Microsoft rather than adopt a set of open source software tools for the nation's public schools; and the Gates Foundation has been active in the US and abroad funding the installation of public computing to serve what it sees as marginalized communities. A 1998 survey reported that Canadian reliance on school and "public sites" for accessing the Internet increased at lower income levels.[11]

Public computing is a major aspect of how space is and will be allocated in society. This is a collaborative process involving professionals such as architects, urban planners, social service agencies, librarians, and educators as well as advocates or

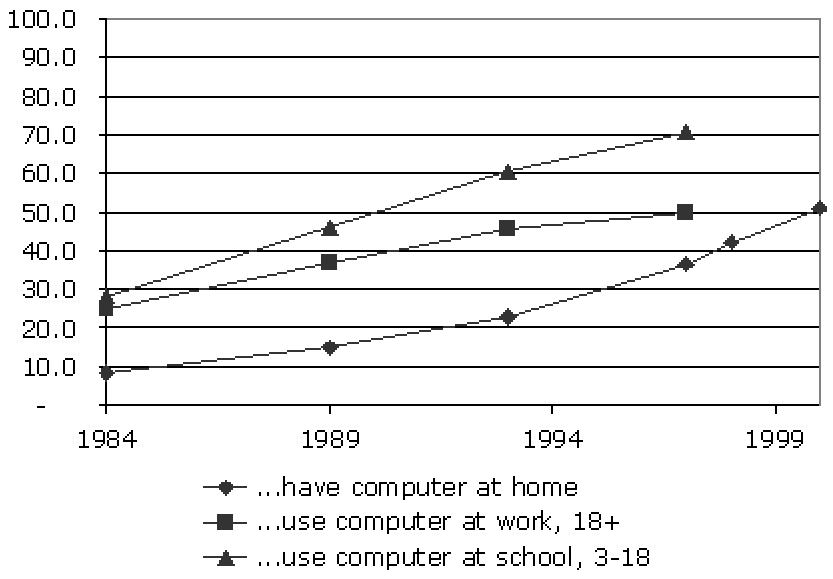
[4] NTIA 1995, 1998, 1999, 2000, and 2002, Loader 1998, DiMaggio and Hargittai 2001.
[5] Alkalimat and Williams 2001.
[6] Bray 2002.
[7] Emling 2002.
[8] Holsendolph 2001 on Atlanta; Drumm and Groom 1998 on Indiana
[9] Aoyama 2001.
[10] http://www.peoplesnetwork.gov.uk
[11] Ekos 1998, referenced in figure 4 in Rideout 2000 p 13.

activists, be they politicians, community interest groups, or social movements. This process of designing public computing into urban spaces is one theme running through a stream of books published out of MIT over the last decade by a set of public intellectuals of the information revolution, scholars and cheerleaders for their versions of the future.[12] Magazines from MIT's own *Technology Review* to the trade-oriented *Archi-Tech*[13] address this problem of designing smart spaces.

Figure 1 below compares personal, private, and public computing using data from US federal surveys.[14] By 1990, more than half of K-12 students had ICT access in school. By 1997, more than half of adults had access at work. By 2000, more than half of American households had a computer at home. This table suggests that the greatest and certainly the earliest equality of access might be found in public computing. The quality of that access—part of which is expressed in the social environment of a given public computing site—is an important determinant of digital equality. But before we can evaluate the quality of a public computing site we have to know it exists. Many public computing sites are invisible even to their neighbors and thus overlooked at the many levels of research, policy formation, and practice. Our method, explained below, can be applied to bring these sites into plain view so that research, policy and practice can be more informed.

[12] From MIT's departments of architecture, artificial intelligence, computer science, and the Media Lab, in chronological order: Brand 1987, Mitchell 1994, Negroponte 1995, Dertouzos 1997, Gershenfeld 1999, Mitchell 1999, Dertouzos 2001, and Brooks 2002.
[13] Turket 2002
[14] Figure from Williams 2001, using data from Kominski 1999, NTIA 2000.

Figure 1. Operationalizing personal, private, and public computing: Percent of U.S. households which...



Percent of U.S. households which...	...have computer at home	...use computer at work, 18+	...use computer at school, 3-18
1984	8.2	24.6	28.0
1989	15.0	36.8	46.0
1993	22.8	45.8	60.6
1997	36.6	49.8	70.8
1998	42.1		
2000	51.0		

Note: Figure from Williams 2001, using data from Kominski 1999, NTIA 2000.

Two Social Processes

We are concerned with how democracy will fare in the transition to the information society, and this has been another thread through the literature.[15] The early adoption of information and communications technology followed the dynamic of the marketplace, taking place at high income levels and in occupations related to the military, science and technology, banking and finance, and the media.

But two social processes are at work. Society functions with and within the world's markets and also depends on a democratic tradition. This tradition, encoded in laws and cultural practices, can complement or counterbalance the impact of the market on national policy and on the life chances of those with the least—people with marginal or no employment or dependent on low incomes. We are accustomed to the interplay

[15] Toffler 1995, Schuler 1996, Lévy 1997, Miller 1996, Lee 1997, Perelman 1998, McChesney 1999, Walch 1999, Rifkin 2000, Hodges 2000.

between these two traditions of social life and social change, the market and the democratic public sphere.

The strength of the market is that innovation in search of profit drives change. With regard to ICT, new hardware and software, new uses and applications, are being produced constantly and prices tend to fall. Moore's Law—every 18 months, chip capacity and doubles chip prices fall by 50%—is holding true into the 21st century.[16] The problem with the market is that we see persistent and even worsening inequalities that threaten the fabric of society.

The strength of the democratic tradition is that its emphasis on equality mediates against alienation and social conflicts. But at the same time, poverty nurtures the legacies of intolerance and authoritarianism that undercut the trust and stability necessary for democracy to be sustained.

From the earliest public computing projects—Community Memory in Berkeley, California; Playing to Win in East Harlem, New York City, and the Cleveland FreeNet in Ohio, for example[17]—to the relatively recent federal eRate legislation, the US has seen considerable democratic activity designed to provide ICT access for all. As we will see, public computing itself expresses the interplay and contradictions between forces of the market and forces for democracy. This can help us to understand prospects for the digital divide.

The social environment of public computing

People enter virtual space—to browse the Web or a play a game of virtual Solitaire—via technology that is located in actual space.[18] That space is a social environment, the result of a confluence of social forces, institutions, and histories. People negotiate their way through and into social spaces when entering a public computing site, and operate in social space when online.

The social environment of public computing includes four aspects. First, is the hardware and software configuration. Second is the institution that hosts a given public computing site. Third is the immediate surrounding community. Finally, each community is located in a larger territory or macro environment: a city, country and region. This social environment in turn impacts and shapes our use of ICT and of cyberspace.

Castells[19] has categorized various macro environments according to their position in the global transition to the networked society. Relying on Castells, we see three categories: the technopole, the unconnected areas, and the dual city.

[16] Kelly 1998, Schiller 1999, Gilder 2000.
[17] Schuler 1995.
[18] Lévy 1997, 1998, 2001.
[19] Castells 1989, 1994, 1996, 1997, 1998, 1999.

In the technopole, almost everyone is connected to and with ICT. In the world's unconnected regions, almost everyone is generally delinked from ICTs. In the dual city, some communities and strata of people are connected, and other communities and strata are not. Most of the world's industrial cities in transition to the information society are dual cities. So are most national capitals, even if the only ICT-connected are the armies, the NGOs, the state and supranational institutions, and the inevitable business and luxury hotels.

Castells and Hall[20] discuss four kinds of technopoles: industrial complexes, science cities, technology parks, and certain regions with a comprehensive technopolis program for regional development. Their summary points to three main functions of these cities: reindustrialization, regional development, and synergy for innovation. Castells[21] also advances the concept of the Fourth World, the world's delinked regions and countries. He explores[22] how the typical "informational city" is a dual city and asks whether and how the digital and other social divides in such a place can be reversed. There are many empirical measures being discussed in these works, but it appears that public computing is not in the picture.

Examining Toledo, Ohio, as a dual city, we have pursued two research questions. What are the public computing sites? What is the social environment of public computing?

Public computing: The national picture

There is a growing body of research literature on the process of informatization of US society. Here we scan this literature with four questions in mind:

1) To what extent are people using ICT?
2) What has been the impact of government policy on public computing?
3) What has been the contribution of the community technology center?
4) What trends provide leading models for change?

People using ICT

The US Department of Commerce released its latest digital divide report in 2001. As of fall 2001, the number of people using the Internet in the US was increasing by 2 million people per month. Overall, 66 percent of individuals use computers, 54% use the Internet, and 45 % use email. Among children age 5-17, 96% use computers.[23]

Table 1 below uses data from the last Department of Commerce/NTIA report to summarize trends among selected population strata.[24] Each of these population strata increased its use of computers and the Internet during the 1997-2001. The digital divide

[20] Castells and Hall 1994 p 10-11.
[21] Castells 1998.
[22] Castells 1999.
[23] NTIA 2001.
[24] NTIA 2001.

between men and women practically vanished. But the other paired strata show a different trend, as the shaded cells in the table highlight. For white/Black and college degree/no high school, the digital divide in both computer use and Internet use widened. For employed/unemployed and >$75,000 income/<$15,000 income, the computer use gap narrowed, but the internet use gap widened.

Table 1. Percent of US population using computers and the Internet.

		Computer Use		Internet Use	
		October 1997	September 2001	October 1997	September 2001
Gender	Men	53.8	65.5	24.3	53.9
	Women	53.3	65.8	20.2	53.8
	difference	**0.5**	**(0.3)**	**4.1**	**0.1**
Employment	Employed	61.7	73.2	28.5	65.4
	Unemployed	24.8	40.8	12.4	36.9
	difference	**36.9**	**32.4**	**16.1**	**28.5**
Household income	$75,000 and above	80.8	88.0	44.5	78.9
	less than $15,000	29.8	37.3	9.2	25.0
	difference	**51.0**	**50.7**	**35.3**	**53.9**
Ethnicity	White	57.5	70.0	25.3	59.9
	Black	43.6	55.7	13.2	39.8
	difference	**13.9**	**14.3**	**12.1**	**20.1**
Education	College degree	74.3	84.9	41.4	80.8
	No high school diploma	7.9	17.0	1.8	12.8
	difference	**66.4**	**67.9**	**39.6**	**68.0**

Source: NTIA 2001.

Eventually, every strata could be on par. But the widening divide in the interim is troubling because late adopters have a different relationship than early adopters with the technology –- and with the economy and society that are structured around this technology.

Government public computing policy impacting public computing

Government policy with regard to public computing has resulted in expanding funds for schools, libraries and community centers. Where there is quantitative data, we see different rates of ICT availability across the population within the overall trend of increased ICT availability to all.

The eRate, which provides technology funds for schools and libraries, has amounted to a $6 billion investment in public computing since it was implemented as part of the 1996 Telecommunications Act. In 1994, 35% of US schools were connected to the Internet; by 2000 98% were. Table 2 below summarizes trends among selected types of

schools.[25] Every of these types of schools has more school Internet and more classroom Internet in 2000 than they did in 1994. But as the shaded cells in the table indicate, certain gaps widened: between high and low minority-enrollment schools and between schools with high and low percent of students receiving free lunches (the most measured indicator of student poverty). In minority/poor schools, Internet access tends to be more limited to libraries, computer labs, or computers used only by teachers and administrators.

Table 2. Percent of schools and percent of classrooms with Internet access.

		Schools with Internet		Classrooms with Internet	
		1994	2000	1994	2000
Minority enrollment	6% or lower	38	98	4	85
	50% or higher	27	96	2	64
	difference	**11**	**2**	**2**	**21**
Percent of students receiving free lunch	35% or lower	39	99	3	82
	75% or higher	20	94	2	60
	difference	**19**	**5**	**1**	**22**

Source: U. S. Department of Education, Office of Educational Research and Improvement 2001.

Library provision of computers and Internet is nearly universal, with 95.7% of the country's libraries having Internet connections, 94.5% making Internet connections available to their patrons, and an average of 8.3 workstations per library location.[26] The Gates Foundation has set out to boost public computing in library branches located in low income communities, and in a study of Toledo libraries, we found that each library branch did provide public computing, but that the branches with more ICT were located in communities that were more white, with higher income, and more educated. So our small local study of libraries suggests a trend similar to the schools and to ICT use across the population.[27]

The Pew Public Internet Project has been issuing a stream of empirical reports that include figures for public awareness of public computing. They report 51% of the adult population knowing of a public place to use computers and get on the Internet (whites 53%, Blacks 44%). Among computer users, awareness increases to 63%. Of various sites they mention libraries (42% aware of these), schools (2%), cybercafés (1%) and copy centers (1%).[28]

Community technology centers and community networks

[25] U. S. Department of Education, Office of Educational Research and Improvement 2001.
[26] Bertot and McClure 2000 p 25.
[27] Williams 2002.
[28] Horrigan 2001 p 26.

The community technology center is a more varied category than schools and libraries and has so far included technology centers in community centers, apartment complexes, churches, and trade unions. A combination of grassroots efforts and federal funds (Department of Education, Commerce, Housing and Urban Affairs, and NSF), state funds (especially from suits against monopolistic practices of telecommunications companies) and private funds has resulted in the proliferation of these organizations. Today a number of CTCs are organized on the national, state, and local levels. The Community Memory project mentioned above, where computer hobbyists installed a public access terminal outside a shop in Berkeley, is perhaps the earliest community technology site.[29] Community networks, which originated before the Internet to network home computer users together, were early originators of CTCs, placing terminals in laundromats and elsewhere to broaden access beyond computer owners.[30]

Ohioans work in active CTC associations at all three levels. CTCNeT (more than 650 members) was launched in 1994 based on the experience of the early CTC Playing to Win, established by Antonia Stone in New York City.[31] Ohio Community Computing Network (more than 66 members[32]) formed in 1995 to oversee the allocation of funds for community technology projects from a settlement against Ameritech for unequal phone service provision across the state. CATNeT, based at the Urban Affairs Center of the University of Toledo, formed in 1996 and has a current membership of 29 centers.[33]

Model cities for public computing

The national projects mentioned above could certainly be taken as models. But on a smaller scale, a number of cities have taken the initiative to overcome a digital divide identified between communities and organizations. These cities have set out to create and shape public computing. Some are technopoles and other are readily identifiable as dual cities:

- Technopoles such as Austin, Seattle, and Portland, Washington.
- Government cities such as Nashville, Atlanta, and Washington, D.C.
- University towns such as Blacksburg, Virginia, and Urbana-Champaign, Illinois.
- Diversified cities such as New York and Boston.

Noteworthy among these cities is Seattle, where public computing is a major thrust for city government. The city department of information technology is implementing Citizens Technology Literacy and Access programs, providing funds, and conducting research aimed at making Seattle a “technology healthy city.”[34] Seattle is the home of Microsoft Corporation and also the highly successful Seattle Community Network, which

[29] Farrington and Pine 1997.
[30] Bishop 1993, Agre and Schuler 1997.
[31] http://www.ctcnet.org
[32] Stuber, personal communication; see also http://www.occcn.org
[33] http://www.uac.utoledoedu
[34] http://www.cityofseattle.net/tech/

played an early role in public computing by installing and supporting computers in libraries, laundromats and other public locations.

The city has created an online directory which links to 132 Seattle CTCs.[35] In a recent survey, 82% of residents reported having access to the Internet, 72% having home Internet access. The 10% reporting access only outside the home report using the Internet at work (81%), school (76%), an Internet café (62%), a community center (39%), or a public library (34%).[36]

Methodology

Our method depends on surveys, key informant interviews, statistical analysis, and keeping our eyes open as involved actors in the city under study. But in order to recruit students to responsible positions within the research project, we reconceptualized our method as the D6 method. This served to orient inexperienced young people both to what scientific research is about and to the specific tasks of researching public computing in Toledo. Several of the students then used the D6 method in their master's theses.[37]

We call the method the D6 method because it has six parts, each beginning with the letter D: definition of the problem, data collection, digitization, discovery, design, and dissemination. Table 3 describes the basic activities associated with each concept.

[35] http://www.cityofseattle.net/tech/techmap/
[36] Information Technology Indicators Residential Survey 2000 p 24.
[37] Hamilton 2002, McGreevy 2002, Zelip 2002.

Table 3. D6 method.	
Definition	Defining the problem, summing up the relevant literature and formulating the research question and/or hypothesis
Data collection	Operationalizing the variables, drawing a population sample, collecting data regarding the variables
Digitization	Inputting, scanning, otherwise putting the data on computer, organized in a useful way
Discovery	Analyzing the data to test the hypothesis or answer the research question
Design	Laying out in the data and the analysis in text, tables, and figures in order to convey the findings to various audiences.
Dissemination	Sharing the findings with the various audiences as widely and effectively as possible.

D1, Definition of the problem

Our definition of the problem came as much out of experience as it did the research literature. Dealing early on with technology as a potential solution to social problems, with technology as ubiquitous on major campuses but hard to find off-campus, we experienced the importance of public computing. We searched constantly for places where people could get online, and eventually became involved in a community technology center.[38] The large datasets such as the NTIA surveys have not placed much emphasis here, but the literature close to everyday practice with technology tells many tales that suggest its value to people seeking work, social connections, even political impact.[39]

D2, Data collection

We collected data in the setting of an academic department and a community technology center, using students who worked in both. The students were paid by the Federal work-study program and/or were earning academic credit through enrollment in the University of Toledo course "Cyberspace and the Black Experience."[40] Data

[38] Alkalimat and Williams 2000
[39] McKeown 1991, Mark 1997, Chow 1998, 2000, and Williams 2001.
[40] Chronicle of Higher Education 2000.

collection included a phone survey, visits to sites, and the use of various digital devices – camera and tape recorder.

We created a list of all of the potential sites for public computing that we could find. Our starting point was the telephone as a near universal feature of organized public life. In the United States nearly 90% of the entire population has at least one telephone at home, or lives with a few block of a public phone. We assumed that organizations would have a phone, and used the phone directory as the starting point in our enumeration.

We constructed a list of organizations to contact using the hard copy yellow pages, online yellow pages then available for free at www.555-1212.com, several local directories, news clippings, and personal leads. We identified 96 yellow page categories as relevant to our search, based on personal familiarity and on our review of the research and policy literature about community computing and other forms of public computing.[41] The daily newspaper, for example, mentioned a children's hospital providing computers for patients to use, so for that reason alone we included hospitals as a category for potential sites. We called coffee houses because we knew of at least one cybercafé in town.

After compiling a list of more than 1,578 organizations that might host public computing sites, we began canvassing them by telephone to find out who actually did provide computers for non-staff to use. Students made most of the calls. Each call began as follows: "Hello I'm calling from the University of Toledo researching computer use in the area. Do you have any computers for (the public/your members/parishioners/students/or other relevant term for that institution) to use?" We made on the average of three attempted calls before recording the site as a no response. These calls were made over 18 months during 2000 and 2001. As we made the calls, we also located the addresses and verified that exactly 1,578 of the organizations were actually within Toledo city limits. Those outside the city were omitted from the dataset. We also contacted institutions that we estimated would host multiple sites (the public library, public schools, Catholic schools, and so on) and gathered data from them in person.

D3, Digitization

Digitization began when we used the online yellow pages to build our call list and continued building a database of our call data. We also used geographic information systems software for geolocating the possible and actual sites.

D4, Discovery

[41] Available from authors.

Discovery proceeded using GIS software (ArcView) to map the location of the public computing sites and the demographics of Toledo, and using a statistical package (SPSS). We made use of class sessions and team meetings to discuss results periodically.

D5, Design

Design involved writing this paper and producing a website that will provide information about the public computing sites in a searchable database.[42] The University of Toledo Urban Affairs Center will also publish the paper.

D6, Dissemination

In addition to disseminating the book and the website via academic and online channels, we will present findings to a growing network of business and community leaders who are interested in a technology plan for Toledo to advance new-technology-related local industries and boost the skills and connectivity of the local and future workforce.

Enumeration and analysis of data

Our search for public computing in Toledo, Ohio found 253 sites hosted by a variety of institutions, as shown in table 4 below. We coded these 253 public computing sites as community, government, commercial and university, according to their host institutions. *Government* public computing sites are those located in public institutions, a direct reflection of public policy and political forces. *Community* public computing sites are those hosted by non-governmental, not-for-profit organizations. These represent the diversity of civil society. *Commercial* public computing sites are those operating for a profit, in response to market opportunities. *University* public computing sites are those established at colleges and universities. While they will always be fewer in number, they will likely be the most technology-intensive public computing facilities in any community. Each type of public computing has its own economic imperatives, social dynamics, and spatial realities or demographics.

[42] http://www.communitytechnology.org/toledo.

Table 4. Public computing in Toledo, Ohio, by host institution.	
Schools - K-12 public	92
Public libraries	14
Apartments, hotels, and other group residences - public	2
Government offices	1
Total Government	**109**
Schools - K-12 private	29
Schools - preschools and child care - nonprofit	8
Schools - other	1
Churches and temples	29
Civic organizations - other	12
Civic organizations - youth	4
Civic organizations - seniors	6
Apartments, hotels, and other group residences - nonprofit	4
Civic organizations - unions	3
Museums and parks	2
Hospitals and health care centers	1
Total Community	**99**
Schools - preschools and child care - for profit	13
Schools - trade - for profit	10
Apartments, hotels, and other group residences - for profit	15
Copy shops, cybercafes, stores	4
Total Commercial	**42**
Schools - universities and colleges	3
Total University	**3**
Grand Total	**253**

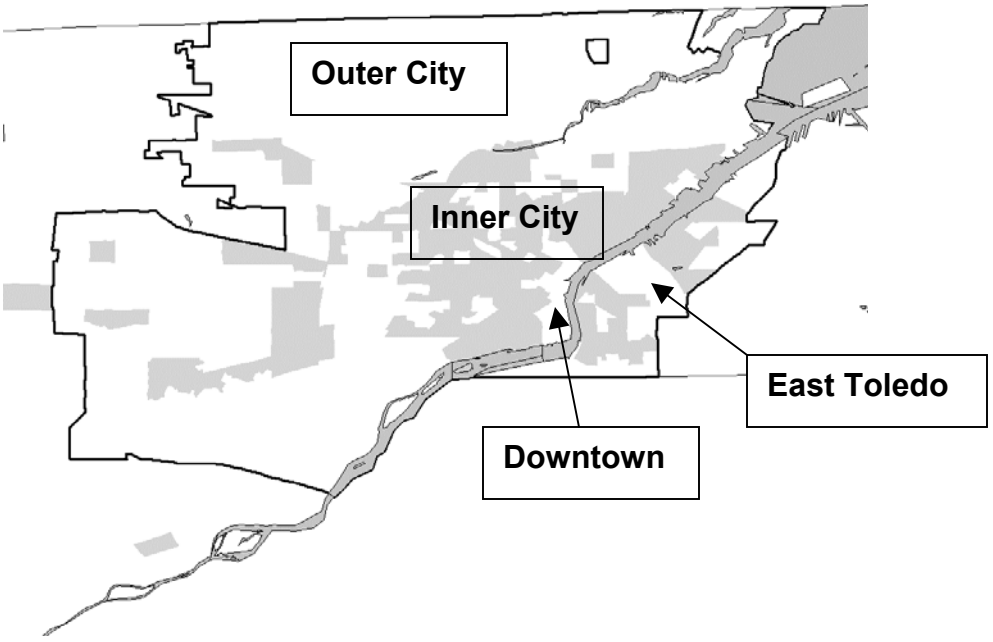
As table 4 indicates, schools are the largest number of site in each of the four categories. So government sites are primarily schools and libraries. Community sites are primarily schools, churches, and community centers. Commercial sites are primarily schools and apartment complexes.

Table 5 below provides an overview of the response rates that led to the enumeration in table 4. We can use these figures to estimate the actual count of public computing sites in the city. Of the 1,578 potential hosts we sought to ask, we got yes or no responses from 761, or 48%. Of these, 253 (33%) reported that they do host public computing. The 817 sites we could not contact may or may not host public computing. So we calculate that between 16% (253 out of 1578) and 33% (253 out of 817) of the institutions on our list of 1,578 do host public computing. We believe the sites we could not contact are less likely to host public computing. As a result, we chose to settle on a rate of 20%, and estimate that Toledo is likely to have 316 public computing sites.

Table 5. Contact data on public computing in Toledo, Ohio.

	Potential host institutions	No, do not host public computing	Yes, host public computing	Yes as percent of all responses	No response	Response rate
Government	138	21	109	84	8	94.2
Community	935	270	99	27	566	39.5
Commercial	501	216	42	16	243	51.5
University	4	1	3	75	-	100.0
Grand Total	1,578	508	253	33	817	48.2

Toledo is a "rust belt" industrial city, historically connected to the auto and glass industries. The 2000 US Census reports its population as 313,619, 23.5% African American.[43] The distribution of the population is similar to other Midwestern cities: the Black population is concentrated in the inner city and people with higher incomes live near the periphery or in the suburbs. Toledo also has a working-class east side, home to many Latinos and to a concentration of Toledoans of Hungarian descent. This demographic pattern allows us to identify four areas: East Toledo, a commercial downtown, the inner city, and the outer city. Toledoans call the outer city the North, West and South Sides. The map below shows these four areas. Shaded areas represent poverty rates of greater than 25%. With this in mind, we can examine the four types of public computing uncovered in our enumeration.



[43] http://www.census.gov

Government public computing

Of the 109 government public computing sites, 92 are public schools and 14 are public libraries. There are also two computer labs operated by the county's public housing administration, and one county tax assessor's office. This office provides computers for the public to use to search the county's real estate databases.

Toledo is a city with five overlapping school systems: the Toledo Public Schools, Washington School District (an autonomous district wholly within the Toledo district), the Catholic schools, charter schools, private schools, and an emerging but tentative statewide virtual school system of online schools. Except for the virtual high schools, all of these are surrounded by suburban school systems. In Toledo Public Schools there are eight high schools, eight junior High Schools, and 44 elementary schools.[44] There are over 37,000 students, of whom 46% are African American, and 7% are Latino. On the other hand the staff is only 20% Black. The legacy of segregation persists, such that the high schools fit into three groups. One school is mainly Black (95% Black), three schools are in the middle (Blacks making up 61, 56, and 51% of enrollment), and four make up the third group (26, 24, 19, and 13% Black enrollment). Thus the school system suffers from de facto segregation based on class and race. The Supreme Court of Ohio has ruled that the current arrangement of school districts in Ohio is unfair as it produces major inequities in funding levels for different school districts, especially ones like Toledo.[45]

[44] Toledo Public Schools, http://www.tps.org.
[45] DeRolph v. State (2000), 88 Ohio St.3d, http://www.catalyst-cleveland.org/06-00/DeRolph.htm

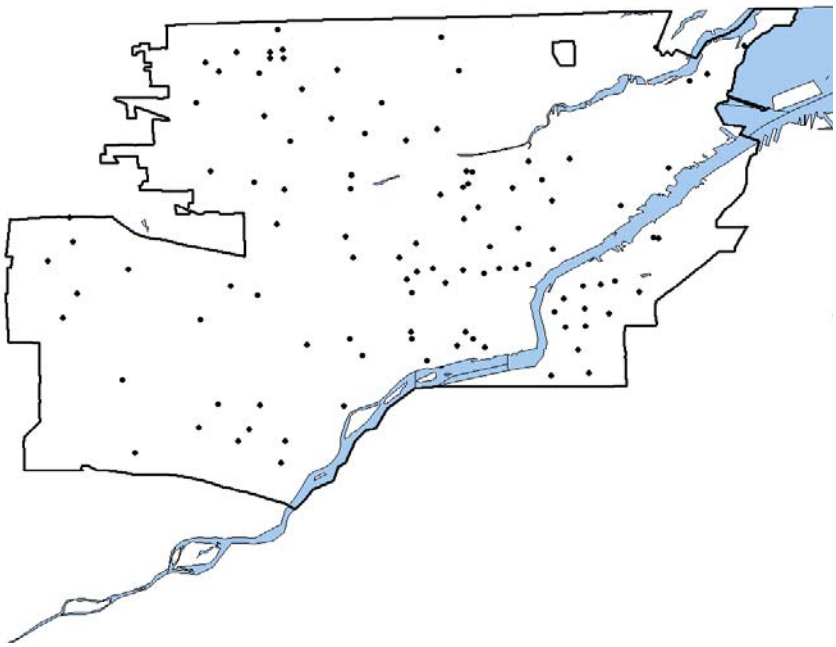


Figure 3: Government Public Computing Sites

The technology transformation of the public schools got a boost when a bond issue passed in 1994 providing additional funding. A technology commission was set up within TPS that also included telecommunications industry representatives. The period from 1995 into 2001 was a period of rapid technological development. The State of Ohio invested over $800 million in K-12 technology. A TPS official reported that the system grew from about 4,000 client computers to its current size of 10,000 clients, and the figure would rise to 15,000 within a year and a half.[46] As of early 2001, every elementary classroom had about five networked computers, and almost every school has at least one computer lab for the entire school.

There are many organizations attempting to expand technology access in the schools and enhance training. The State of Ohio has SchoolNet and SchoolNet Plus which offer funding and training.[47] They fund support for Tech-Prep programs for students going into technical careers, but this functions primarily in the suburbs of Toledo. For the city, state funds are channeled through the University of Toledo to programs like Prep-Tech, Excel, and Gear Up, which are designed to enhance the educational achievement of higher scoring minority students (B grades or better, for Excel) or students being challenged (grades of C or lower for Gear Up).

The public schools' computer labs service the student body of each school. In the past the Toledo Public School System has had an open door policy, e.g., the lighted school

[46] "Toledo Public Schools: NetApp Scores an A+ for Improving Content Delivery", no date.
[47] http://www.osn.state.oh.us/home/

concept involved having an open school for community use one night a week. This is no longer commonplace, and would certainly not involve the use of the computer labs. In contrast, some of the suburban schools do exactly this, running computer classes in the evening for the public. Another important feature of the computer labs is that Toledo Public Schools invested in reading and math drill software for[48] and have avoided providing Internet access in the labs in order to drive teachers to make full use of the software. However, the majority of TPS teachers do not have full command of the software and therefore it is merely a "drill for skill" process that does not use the far-reaching diagnostic powers of the software to customize test questions to the strengths and weaknesses of the individual; student. The district runs free classes on the software in the summer but few teachers take the course.

The public library sites are all part of the Toledo-Lucas County Public Library.[49] In addition to the 14 sites in Toledo, there are four branch libraries in the suburbs. There are approximately 250 computers in the system dedicated to Internet and/or database access, children's software, or word processing functions are available. The library sought and won several grants from the Gates Foundation to acquire computers to equalize the access of lower income communities, and these computer were allocated primarily to the most needy branches, as mentioned above.[50]

The library has a part-volunteer, part-paid program of Web Wizards who assist patrons in using the Internet. Printing used to be free but for the last year has cost 10 cents a page. In general, the Wizards and the general library staff help anyone who comes in with this technology. In answer to the state requiring a plan to protect children from pornography, children have to have their parent's signature and be issued a card before going online at the library.

Public schools and public libraries are located in all neighborhoods of the city. They are government agencies and fall under the mandate of the 14th Amendment that requires equal access under the law for all citizens. Our sense is that this government mandate, even supplemented by private initiatives, is not yet enough to overcome the disparities of race and class.

Community public computing

There are a total of 99 community computing sites. The host institutions are non-profit organizations, neither commercial nor government, although they may receive public funds. There are 38 schools and preschools, 29 churches, 28 community facilities or centers of various kinds, and 4 apartment complexes.

[48] Computer Curriculum Corporation, http://www.ccclearn.com.
[49] http://www.toledolibrary.org.
[50] Williams 2000.

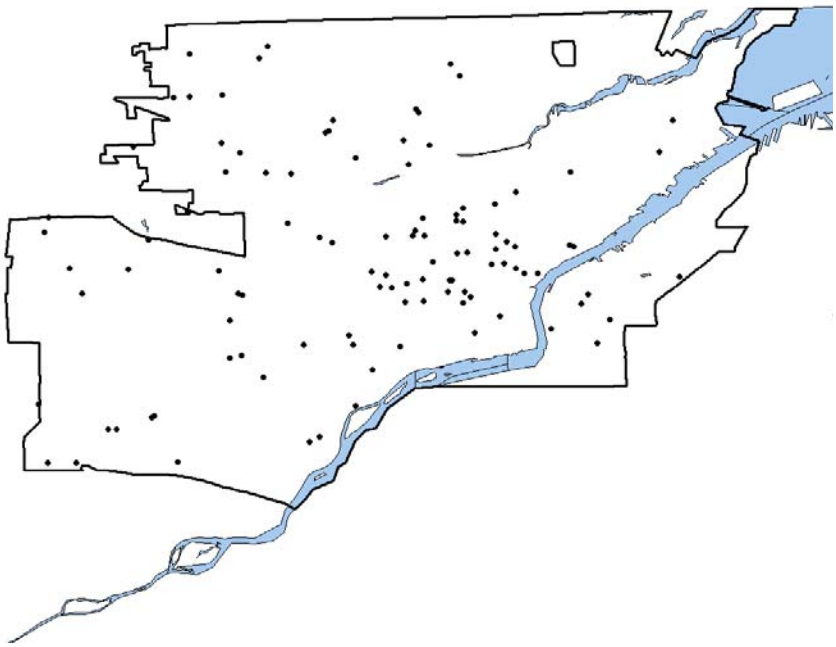


Figure 4: Community public computing sites

Of the 38 schools, 22 are part of the Catholic Diocese of Toledo. As elsewhere in the US, many of the European immigrant populations were Catholic and built churches in what was a smaller city. In a sense, the Catholic schools[51] are a parallel system to Toledo Public Schools as well as link to their respective churches. But these schools are tuition based, so they represent a form of community schooling oriented to those who can pay. As such, they are friendlier to parents, community, and congregation.

The 29 churches include 17 different Christian denominations. The highest representations are Lutheran (10), Baptist (7), and Catholic (3). In many cases these are churches with affiliated schools, but they have computer access for church use.

The remainder of the community public computing sites consists of community centers oriented either to the general public or a specific constituency. They include community centers for the general public (e.g. Wayman Palmer YMCA, W. J. Murchison Community Center, Adelante), for seniors (e.g. Alpha Community Programs, Eleanor Kahle Senior Center), for youth (e.g. Boys and Girls Clubs, Black Data Processing Associates), for union members (Farm Labor Organizing Committee, Toledo Federation of Teachers, Police Patrolmen's Association), for museum visitors (Center for Science and Industry and the Toledo Museum of Art) and the Medical College of Ohio hospital. The last two are unusual: the museum has a computer in its K-12 resources center that is used by children and teachers, and the hospital has a PC set up in a lounge near its physical therapy department for inpatients to use.

[51] http://www.cyss.org/Schools/SchoolPage.html

The map shows a concentration of community sites in the inner city along with sites in higher income areas near the northwest suburbs. The community centers with computers are primarily dedicated to poorer central city populations, and the remaining sites are located in communities that can afford computer labs.

Commercial public computing

There are 42 commercial public computing sites in Toledo. Of these 23 are commercial schools and preschools, 15 are apartment complexes, 3 are Kinko's copy shops and one is a cybercafé. The map makes it clear that these public computing sites are either in the downtown area or in the outer city, especially in the western part of the city.

Several of the apartment complexes belong to the same owner, who won a Department of Housing and Urban Development grant to set up computer labs and thus improve his apartments. He has helped to grow the CTC association in town, CATNeT.

Kinko's is a copy shop that developed a business model and a reputation around public computing. Their sites are near the suburbs and the University of Toledo campus. The cybercafé is also near campus.

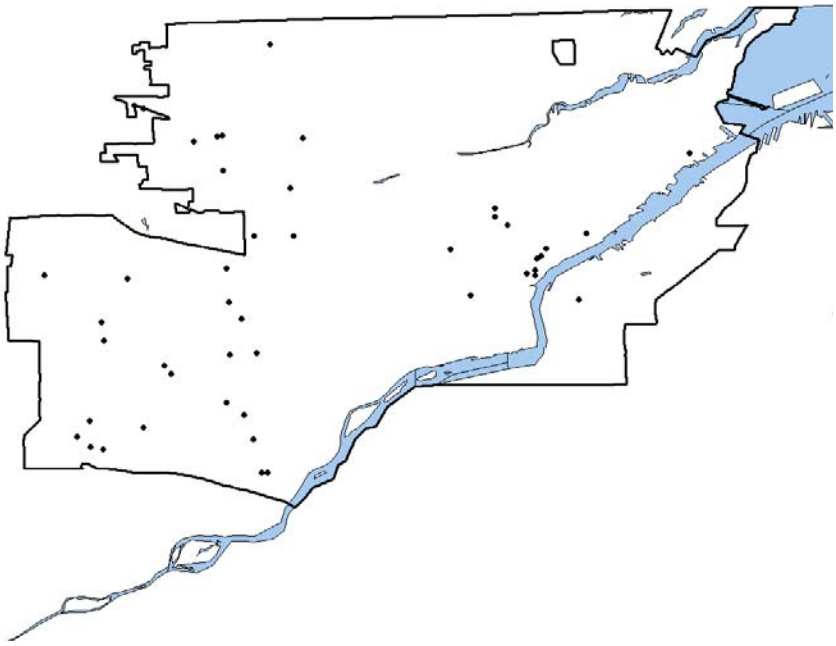


Figure 5: Commercial public computing sites

Commercial sites are far fewer than government or community sites. This might reflect a lack of effective demand from the local population, or a lack of imaginative capital from Toledo entrepreneurs.

University public computing

Three universities and colleges in Toledo provide computer labs for their students: the University of Toledo, the Medical College of Ohio, and Mercy College of Northwest Ohio, a nursing and allied health college. Each of these institutions is oriented towards educating professionals and technical workers. UT and MCO are located in outer Toledo, and Mercy College is located in the inner city near what was once a hospital complex.

Their computer facilities are open only to students or rare one-time public events, with two important exceptions. Mentioned above is the computer available for patients at MCO hospital. UT's women's studies program operates a women's computer lab as part of their support to un- or underemployed women in Toledo.

The university and college facilities are possibly the most advanced public computing sites in the city. For instance, the UT business school is a wireless zone for laptop access to the network. Many departments provide specialized hardware and software. UT also teaches computer classes of all kinds in several off-campus labs downtown.

The university is an important partner for public computing. UT faculty helped start and continue to work with CATNeT, the local association of community technology centers. A larger group of faculty is also proposing an associates degree in social informatics. This program would link with public computing across the city in order to place interns for potential future employment, conduct research, and collaborate for advocacy and policy formulation.

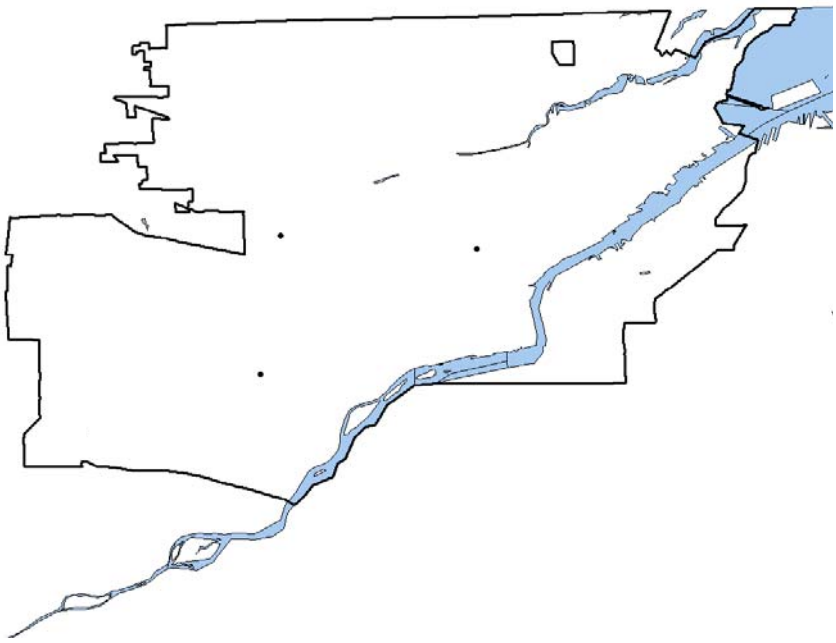


Figure 6: University public computing sites

Findings

We hypothesize that the four kinds of public computing fit three patterns in relationship to the social environment.

- Government sites are randomly located, the same proximity to rich and poor.
- Community sites are located close to the opposite ends of the social spectrum, the rich and the poor having community sites but not the middle strata.
- Commercial and university sites are located according to market demand, closer to upper income and students.

As the maps indicate, our data suggest this pattern, but weakly. We expect that a broader dataset would make a more compelling case.

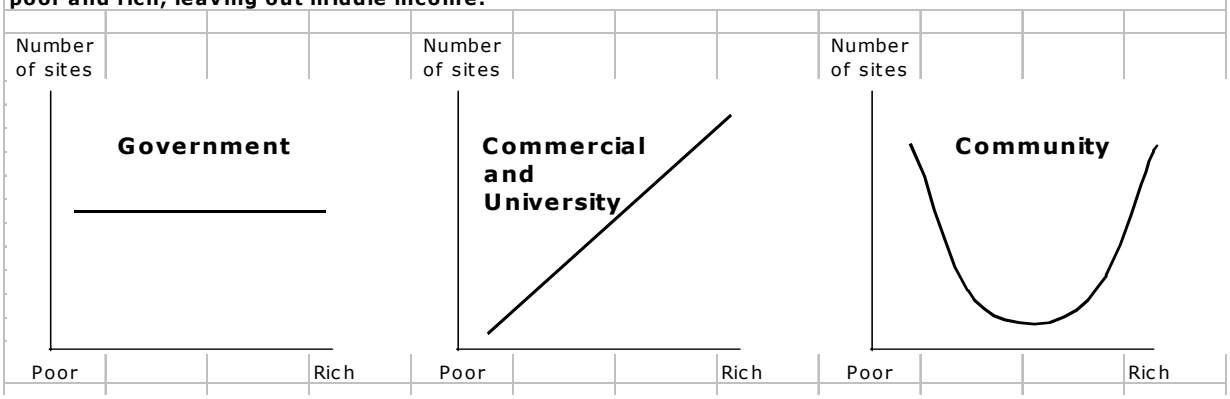
The marketplace has a direct impact on the location of commercial and university sites. There are however, two important particularities. University sites combine upscale owner occupied single family homes with low cost apartment complexes for students. Further, a large concentration of ICT users live in relatively affluent suburbs (Sylvania, Perrysburg, Maumee, etc), which transforms this urban pattern into a metropolitan one.

The U-shaped pattern of the predicted community public computing sites may prove to be the best countermotion to the market as a foundation for democratic traditions. The

role of the church and other institutions of bonding social capital is to give poor and working populations a basis for collective consciousness and action, including self-empowerment projects with ICT.

Government public computing sites are a result of public spending that reflects increasing commitment to an ICT transformation of education at all levels. As figure 7 below indicates, the informationalization will be equal, but the level of access and use is a matter of available state revenue and relative level of commitment. In times of expanding revenue, an egalitarian state is a major factor, but in dire times the impact can be relatively negligible.

Figure 7. Modeling the distribution of public computing. Government distributed equally across poor and rich communities, commercial and university distributed more to rich, community distributed more to poor and rich, leaving out middle income.



In general, changes in the hardware and software will dramatically impact what we mean by public computing, especially the increasing use of wireless, voice recognition, broadband, and technology convergence (phone, computer, TV, music, camera, etc.). But we will still have the basic four categories of public computing. In each case, we are interested in the rate of adoption and pattern of use, and then in what cyberpower[52]—people's ability to use ICT to achieve their goals—results.

We are arguing that the stream of technical innovation is a force banging against society and like the beginning of a game of billiards the balls are scattering. Each type of public computing expresses a structural force, an aggregation of institutions, people and spaces, constituting a power dynamic. All together it is the configuration of all the power dynamics of a society that determines the likely course history will take.

We envision two stages of future research. First, to confirm this description of public computing and measure variation in different urban and rural areas as well as different countries. Second, to examine what is going on in public computing sites, what users are doing, and what cyberpower emerges. We believe the stakes to be the nature of democracy in the information age.

[52] In an earlier study (Alkalimat and Williams 2000) we elaborate on the concept of cyberpower as an outcome of a community technology center.

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