PROJECTIONS

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making places
Through Information Technology

contents

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Cyborg City Surfing
William J. Mitchell

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Long, long ago (I'm going right back to the mid-nineties here), when the web was being woven, when dot and com were newlyweds, and when you could still speak of the "new economy" with a straight face, it seemed that physical was physical, virtual was virtual, and never the twain should meet. There was space and there was cyberspace. There were bricks-and-mortar stores and there was e-commerce. There were place-based communities and suddenly there were burgeoning virtual ones. There was old-fashioned flesh2flesh and there were lurid fantasies of cybersex. An implicit apartheid kept the spheres of atoms and bits, things and sims, comfortably apart.

Then the boundaries began to blur. Ambient blather about "virtual reality" - a clumsy, oxymoronic coinage disclosing our inherited language's incapacity to frame our new condition - signaled the change. The technological principle was simple, and had been around since Ivan Sutherland first formulated it in the 1960s; by wearing head-mounted, location-sensitive computer graphics displays, you could immerse yourself in a virtual three-dimensional environment, and even walk around in it. Furthermore, by means of tactile feedback devices, you could feel, grasp, and manipulate virtual objects. Fine. But the physical world didn't just go away. If you didn't take care, you could walk into an actual wall.

There is, however, a technological fix. With the addition of prisms or equivalent devices to the eyepieces, and with careful attention to spatial registration, you can superimpose these virtual three-dimensional environments on the physical world. This not only saves you from bumping into things, it allows you to coat your surroundings with useful information; architects and construction workers can examine designs in situ, tourists can see reconstructions of the past, surgeons can superimpose medical images on the bodies of patients, visitors to a city can get signage in their own languages, and so on. This goes by the prosthesis-flavored name of augmented reality.

Fortunately, you don't always need head-mounted displays to deliver the digital coating. (Though it is now less of an issue; these devices have evolved from clunky laboratory devices to

light, fashionably styled consumer electronic items - like a Walkman for the eyes.) Automobiles and airplanes, for example, can have heads-up displays on their windshields, registering information directly on the terrain ahead. Or the superimposition may be less literal, as in the GPS-driven navigation systems that are becoming increasingly commonplace in automobiles; these maintain the spatial registration of a map with its surrounding environment (the map is always oriented in the direction of travel, and you are always at the center), but simply present it on a dashboard display.

Portable wireless devices - particularly digital phones and PDAs - add the possibility of transmitting and receiving situationally relevant information in real time. Thus Japanese teenagers, with their instant-messaging Do-Co-Mos, keep track of one another, and what's going on, as they move around Tokyo. Seattle street demonstrators brilliantly coordinate their actions by cell phone. Rave organizers in Bologna use Web sites and pagers to put out the word about time and place. Online games like Majestic engage real places and physical props such as faxes - so spilling out into the everyday world. It is easy to imagine wireless services (and they are, indeed, in the works) that warn you of developing traffic blockages ahead, point you to the nearest hotel with current vacancies, tell you when the next bus will be arriving at your present location, summon the nearest taxi (even if it's not within sight), and provide guidebook information that is personalized according to your interests and filtered according to what's open right now. In other words, the electronic overlay of digital information on the city can be keyed to both spatial and temporal coordinates, and to the most transitory and idiosyncratic of personal interests.

In the near future, these digital overlays will become increasingly dense, complex, and dynamic. For good or ill, they will be crucial mediators of economic, social, and cultural life. They will change the ways in which we construct and reconstruct our knowledge of cities and their ongoing life. They will constitute a new territory for the exercise of power and for resistance to it. They will establish a radically new condition for architects, urban designers, and planners to engage.

Baudelaire, in Paris, was a flaneur. Isherwood, in Berlin, was a camera. Lynch, in Boston, was a cognitive mapper. Banham, in Los Angeles, was a motorist. Me, today? Through my electronic

extensions, and the connections they construct with the growing digital information layer, I'm a cyborg city surfer.

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Introduction to Volume Two: Making Places Through Information Technologies
Anthony Townsend

intro

In his 1910 chronicle of the first great revolution in telecommunications, Herbert Casson wrote, "No invention has been more timely than the telephone. It arrived at the exact period when it was needed for the organization of great cities and the unification of nations."[1] The Internet and other applications of new computing and networking technologies that exploded onto the urban landscape in the 1990s were equally as timely, providing the means for an expansion of globalization from economies to entire cultures and societies. During the 1970s and 1980s, only large financial institutions and governments could afford the information and communications technologies that were needed to push back the limits of space and time. Today, as often as not, it is environmental activists, political dissidents, and techno DJs who live and die by the global system of telecommunications. Unlike the telephone a century ago, the Internet has proved more useful for the de-construction of nations. But what impact has it had on cities?

To date, most public debate about the Internet has lacked a connection to the communities of place that urban planners and designers deal with on a daily basis. The largely publicized ability of the Internet to transcend national borders, rendering geography irrelevant, has been one of the myths surrounding its existence since the early 1990s. Granted, the World Wide Web and email have been the tools for some remarkable acts of space-time transformation. Who would know the plight of the Zapatista rebels in poverty-stricken southern Mexico, the horror of being bombed by the U.S. Air Force in Belgrade, or the sordid doings of President Clinton in the White House if not for the Internet?[2] How much longer could the students have held on in Tiananmen Square if they'd had laptops and modems instead of fax machines? But as the dot-com bubble burst has shown, the Internet does not operate in a vacuum. Web retailers quickly found out that distribution by express delivery services such as Federal Express was only feasible for lightweight goods with a high profit margin. While Amazon and Expedia survived,

1. Casson Herbert N. 1910. The History of the Telephone. (Project Gutenberg e-text, ftp://ibiblio.org/pub/docs/books/gutenberg/etext97/thott10.txt)
2. It was Matt Drudge, Internet muckraker, who first published details of the Monica Lewinsky affair on www.drudgereport.com, after Newsweek decided not to run the story.

ventures that traded in low-cost, bulky items could not.[3]

One example of how strongly the fate of the Internet is linked to the existing pattern of human settlements is Akamai Technologies, a spin-off from MIT's Laboratory for Computer Science. Seeing a mismatch between the location of content producers and consumers, and not enough bandwidth in between, Akamai's founders built a distribution network that reaches every major city in the world. When you visit cnn.com, the HTML code that determines the page appearance and textual content may come from Atlanta, but the audio and video multimedia content is almost certainly being delivered from an Akamai cache server in your city. With a market capitalization of nearly $4 billion (even after the dot-com crash), there is no doubt that Akamai, and others like it, are proof of the indisputably physical roots of cyberspace.

The contributors to this issue span a range of disciplines and institutions. All students, they represent the vanguard of new research in urban planning and design, architecture, technology policy, and media arts and sciences. With contributors from the University of California, the University of Michigan, the Technical University of Braunschweig in Germany, as well as many departments at MIT, we have tried to reach beyond the bounds of our own campus and engage other young scholars in debate about these important issues. This should come as no surprise, as universities drove the development of Internet technologies - Tim Berners-Lee invented the World Wide Web so that physicists could collaborate more easily over great distances. We hope that urban scholars will make an even greater effort in the future to seek out and engage each other to share knowledge and experiences by electronic media.

Section 1, "Information Technology and the City: Issues and Concerns", investigates the powerful connection between advances in information and communications technologies and contemporary patterns of urbanization. A good deal of excellent scholarly work has laid the landscape for this section, not least among them William Mitchell's *City of Bits* and *E-Topia*, and Manuel Castells' *Rise of the Network Society*. Our contributors take a magnifying glass to three different aspects of the invasion of information technology in urban communities, expanding on issues raised in these pioneering works. **Emy Tseng** unveils the often-ignored plumbing of the Internet; the physical

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3. Pets.com, WebVan, Urbanfetch, etc. - the list is long.

infrastructure, protocols, and policies that determine who gets bits, when, and where. Her article highlights the way in which information technology is being used to micro-manage access to computer networks based, above all, on willingness to pay, often with disturbing social consequences. The "Digital Divide" is the subject of **James Spencer**'s contribution. He highlights the error and danger of casting the discrepancy in access to information technology along racial and class lines as a technological issue. In fact, this new technological divide is merely reflecting the structural causes of poverty in the United States. Finally, **Mandeep Grewal** reminds us that information technology means more than just the Internet, by highlighting the enormous impact of television and newspapers on the adjustment process of new immigrant women in the United States.

Section 2, "Information Technology As A Catalyst for Community Development" presents three articles that investigate recent efforts to introduce new technologies in disadvantaged inner-city neighborhoods. These articles stem from a series of initiatives to introduce new information technologies into Roxbury, a low-income neighborhood in Boston. **Malo Hutson** presents a comparative analysis of two such initiatives, the Mandela Computer Learning Center and Roxbury Community College's Adult Continuing Education program. He finds that initiatives like these provide the only avenue to acquire computer skills for most members of low-income communities. Roxbury, long one of Boston's most disadvantaged neighborhoods, is also the subject of the article by **Richard O'Bryant**, whose contribution looks behind the rhetoric of community technology access and finds that promises of ubiquity often fall short due to inadequate supply of funds and equipment. Finally, **Randall Pinkett** argues for a broader understanding of how society and technology influence each other. The asset-based approach to community technology initiatives Pinkett advocates seeks to involve participants as active agents of change rather than passive beneficiaries or clients, and as the producers of information and content, rather than passive consumers or recipients. Pinkett concludes by describing a web-based community building technology he is currently developing as a doctoral student at MIT's Media Laboratory. Putting these ideas into practice, **students from MIT's Center for Reflective Community Practice** showcase a website they developed, "Central Square Conversations", which is facilitating community discussion about the redevelopment of a neighborhood near MIT in Cambridge, Massachusetts.

Section 3, "Designing Livable Communities for the Information Age," focuses on design, both of cities and the technologies that will define them in the future. **Francisca Rojas** offers a compelling investigation of how cyberpunk science fiction's visions of future cities can inform new strategies in urban design.[4] Just as the urban environment needs to adapt to new technologies, so must those technologies adapt to the urban settings in which they will be deployed. **Beatrice Witzgall** and **Joseph 'Jofish' Kaye** argue that electronic interactions, especially ones that interrupt our daily lives, should present some context to observers of those interactions. Through "context output", technology can not only minimize its negative impact on human environments, but also provide an additional rich layer of information about how virtual spaces interact with physical places. Finally, **Luke Yeung** documents an innovative new technology being used to educate urban designers and architects at MIT. Relying on a new theory of human-computer interaction, tangible media, the Luminous Planning Table - developed at the MIT Media Lab - lets designers explore computational simulations of urban worlds without ever touching a machine.

This issue of *Projections: The MIT Student Journal of Planning* takes a critical look at the last ten years of social, economic, and political change that have resulted from the introduction of new digital technologies. As students at an institution that thrives on pushing back the technological frontier, it is both a duty and an opportunity for us to confront these issues honestly and vigorously. All too often in history, technologists have washed their hands of the broader implications of their inventions on society. Yet merely critiquing these inventions and their impact on the world is not enough. And so our theme - "Making Places Through Information Technology" - reflects the practical side of life at our campus on Boston's Charles River. After all, our mascot the beaver is a master builder of places.

We hope you find the articles in this issue both thought provoking and practical, and look forward to your continued interest in *Projections*. ⊡

4. Don't underestimate the impact of cyberpunk. The term 'cyberspace', now officially enshrined in Webster's dictionary, originated in William Gibson's 1984 novel *Neuromancer*.

Social and Economic Consequences of the New Internet Infrastructure

Emy Tseng

Many in the technology field claim that the Internet brings about the "end of geography". The Internet has created a world not bound by the geographical, social or economic constraints of the physical world. However, the Internet is built on a physical entity -- the telecommunications networks that connect computers around the world. Currently, the next generation of these networks is being built and designed. In order to participate on the Internet, one needs to connect to these networks. Therefore design can determine the level of participation available to individual, organization and community. This article describes some of the emerging technologies that define the new Internet infrastructure, and how geographic, social and economic factors are guiding its design, deployment, and use.

1 Introduction

> Ours is a world that is both everywhere and nowhere, it
> is not where bodies live. We are creating a world that all
> may enter without privilege or prejudice accorded by
> race, economic power, military force, or station of birth.
> We are creating a world where anyone, anywhere may
> express his or her beliefs, no matter how singular,
> without fear of being coerced into silence or conformity.

Many in the technology sector argue that the Internet is a
separate world - a world not bound by the geographical, social or
economic constraints of the physical world. For them, the
Internet brings about the "end of geography".[2] In cyberspace, one
can transcend time and space. Time differences and physical
distance no longer matter. Anyone can communicate with
anyone else from anywhere at anytime. Virtual spaces and
communities emerge separate from physical places and physical
communities. As cyber-citizen, the promise is that everyone has
an equal voice regardless of race, gender, or economic status.

However, as Stephen Graham and Simon Marvin argue, "the
constraints of space, place and time still exist; they are modified
rather than abolished by these changes."[3] After all, the virtual
world is connected with the physical world in a very fundamental
way. The Internet is built on a physical entity - the
telecommunications networks that connect computers around
the world. Graham and Marvin point out that these networks
"support these new 'electronic spaces' and 'instantaneous times'
but only in the physical spaces where the right infrastructure is
built and can be accessed."[4]

In order to participate on the Internet, one needs to connect to
these networks. However, it is not enough just to be able to
connect. The size, speed, type and quality of the network
connection determines the level of participation available to
individual, organization and community.

1. John P. Barlow, "A Declaration of the Independence of Cyberspace", *Wired*, Issue 4.06
June 1996, available at http://hotwired.lycos.com/wired_online/4.06/declaration
2. William Mitchell, *City of Bits*, 6th ed. (Cambridge, MA: MIT Press, 1999), 17.
3. Stephen Graham and Simon Marvin, *Telecommunications and the City*, (New York:
Routledge, 1996), 70.
4. Graham and Marvin, 69.

2 Bandwidth, Bandwidth, Bandwidth

> If the value of real estate in the traditional urban fabric is
> determined by location, location, location ... then the
> value of a network connection is determined by
> bandwidth, bandwidth, bandwidth.[5]

William Mitchell notes that access to bandwidth determines the
haves from the have-nots in the new information economy. In
the emerging Internet infrastructure, the ability to receive and
disseminate content over the Internet increasingly depends upon
geographical location and economics. Access to bandwidth is
unevenly distributed amongst regions, cities, organizations, and
individuals.

The type of bandwidth also matters. The amount of available
downstream bandwidth (for receiving data) determines what
content one can access to and what applications one can use.
The amount of availability of upstream bandwidth (for sending
data) determines how effectively one can communicate and
disseminate information over the Internet.

3 The Changing Landscape of the Internet

> ... how should virtual and physical public space relate to
> one another?[6]

The Internet infrastructure is currently being rebuilt and
redesigned. The massive fiber-optic networks that make up the
Internet backbones are being upgraded. Fiber optic cables are
being installed in telecommunications networks closer to homes
and businesses. Broadband access technologies such as cable
modems and Digital Subscriber Lines (DSL) are being deployed
in residential neighborhoods. New network technologies and
protocols are being developed that enable the network to serve up
data even faster than before. However, the next generation
Internet that is emerging is in some basic ways very different
from the popular utopian vision.

- The Internet is moving to a broadcast model where
individual consumers have access to less upstream
bandwidth than downstream. Therefore, the infrastructure
comes to reflect "the asymmetry of vendor and customer".[7]
- The Internet infrastructure is being redesigned and built so
that the networks handle content more favorably
depending on who is providing the content, who is
requesting the content, and where the content is going.

5. Mitchell, 17.
6. Mitchell, 127.
7. Neuman et al.

The central factors contributing to the restructuring of the Internet include:

- Convergence of telecommunications technologies including telephony, radio, TV and the Internet.
- Emergence of new applications arising from this technology convergence including streaming audio and video, video-conferencing and IP telephony.
- Commercialization of the Internet as it becomes an entertainment and commerce medium.

The Internet infrastructure has both physical and logical components - the telecommunications networks that comprise the physical infrastructure and protocols that comprise the logical infrastructure of the software that runs the Internet. We are in the process of partitioning this infrastructure, both physical and logical, into information conduits of different speeds and sizes. Access to these conduits depends on who and where you are.

In the following sections, this article examines several emerging Internet infrastructure technologies, including:

- Local Broadband Access Networks
- Caching and Content Delivery Networks
- Quality of Service and Policy Protocols

Additionally, it explores how geographical, economic and social factors are shaping the development, deployment and use of these technologies.

4 The Local Loop: Broadband and Beyond

Shall we allow home-based employment, education, entertainment, and other opportunities and services to be channeled to some households and not to others thereby technologically creating and maintaining a new kind of privilege? Or we can use this infobahn as an equalization mechanism -- a device for providing enhanced access to these benefits for the geographically isolated, the homebound elderly, sick and disabled, and those who cannot afford wheels?[8]

In both residential and commercial areas, telecommunications companies are currently in the process of upgrading local access networks to provide broadband access to the Internet. The following table shows the broadband technologies currently being deployed:

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8. Mitchell, 103.

Broadband Technology	Typical Downstream Bandwidth	Typical Upstream Bandwidth
Cable Modem -Hybrid Fiber Coax (HFC)	.5-1 Mbps	256-500 Kbps
Asymmetric Digital Subscriber Line (ADSL)	256-500 Kbps	256-500 Kbps
Fiber to the Curb	2-10 Mbps	2-10 Mbps
Fiber to the Home	4-100 Mbps	4-100 Mbps
Fixed Wireless	128 Kbps	30-40 Kbps
Satellite	1-2 Mbps	30-40 Kbps

Broadband Technology	Maximum Downstream Bandwidth	Maximum Upstream Bandwidth
Cable Modem -Hybrid Fiber Coax (HFC)	27 Mbps	10 Mbps
Asymmetric Digital Subscriber Line (ADSL)	15 Mbps	610 Mbps
Fiber to the Curb	Not Available	Not Available
Fiber to the Home	100 Mbps [9]	100 Mbps
Fixed Wireless	1-2 Mbps	128 Kbps
Satellite	8-10 Mbps	256 Kbps

Source: Bernstein and McKinsey & Company, Inc.

A Hybrid Fiber Coax (HFC) network is a cable TV network that has been upgraded to provide high-speed Internet access. Fiber optic cable is installed from the provider premises to a neighborhood node, coaxial cable extends from the node to individual businesses and homes. Digital Subscriber Line (DSL) is a technology that provides high-speed Internet access over existing phone lines. Asymmetric DSL (ADSL) is a variant of basic DSL technology that provides more downstream than upstream bandwidth. Fiber to the Curb (FTTC) refers to a telecommunications network where fiber extends to the curbs close to homes and businesses. Coaxial or twisted pair copper

9. I've seen numbers of 625 Mbps, but this seems overly optimistic to me.

cable then is used to carry data into the buildings. In Fiber to the Home (FTTH) networks, fiber extends all the way to the homes.

Both Fixed Wireless and Satellite technologies provide wireless broadband Internet access. Fixed Wireless uses microwave technologies to transmit data from points close to the homes and businesses. Satellite systems transmit data to and from satellites orbiting the earth.

In comparison, dialup Internet access at 56 Kbps is not sufficient for the new generation of applications that are emerging.

Applcation	Required Bandwidth
IP telephony	64 Kbps
Video-conferencing	128 Kbps to 1 Mbps
Streaming MPEG Video	1 to 1.54 Mbps

Source: Cisco Systems, Inc., "Networked Multimedia Overview"[10]

However, as Neuman and McKnight point out, "… the catch is getting on the net: local connection to the long-haul network is still constrained by physical parameters and gateway circumscriptions."[11] Because of geographic constraints, the process of upgrading and deploying these local networks is by far the most costly part of building the telecommunications infrastructure. "Indeed, the cost gradient does not rise steeply for telecom today until the last few hundred feet of local access and distribution."[12]

In a process Graham calls 'infrastructural consumerism', companies target more privileged communities located in more densely populated areas such as the primary cities and their wealthy suburbs.[13] "High-speed access services must choose geographies carefully. Providers of cable modem and ISDN services risk investing millions in infrastructure to reach the wrong communities."[14]

The most commonly deployed broadband technologies, cable modem and ADSL, follow a broadcast model by offering more downstream bandwidth than upstream bandwidth, as shown above. Some cable companies limit upstream bandwidth even

10. Cisco, Inc., 1999, available at http://www.cisco.com
11. W. Russell Neuman, Lee McKnight, and Richard Jay Solomon, *The Gordian Knot*, (Cambridge, MA: MIT Press, 1998), 65.
12. W. Russell Neuman, Lee McKnight, and Richard Jay Solomon, *The Gordian Knot*, (Cambridge, MA: MIT Press, 1998), 65.
13. Stephen Graham, "Constructing Premium Network Spaces: Reflections on Infrastructure Networks and Contemporary Urban Development", *International Journal of Urban and Regional Research*, Vol. 24.1 March 2000, 192.
14. Josh Bernoff, Shelley Morrisette, and Kenneth Clemmer, "Technographics Service.

further to 256 Kbps in order to discourage subscribers from setting up servers from their homes.

While this amount of upstream bandwidth may be sufficient for household entertainment and e-commerce usage, with the bandwidth demands of the new applications it limits the future ability to run information-based businesses. So the selective geographical access to large upstream communication channels becomes a type of electronic zoning restriction. This belies the idea that the Internet would lead to a prevalence of "electronic cottages". "Data services providers should craft advertising -- including on-line ads -- focused on the work benefits of a fast home connection and roll out service first in the upscale bedroom communities...".[15] In fact, telecommunications companies plan to leverage their business infrastructure by first enabling access to fiber to the curb for residential communities located close to business fiber builds.[16]

Because of the high cost of fiber optic networks, companies are being very selective about where they deploy this technology. Fiber access networks cost between $2000-$5000 per home today.[17] Although industry analysts expect that costs will decrease by fifty percent within five years, the high cost will cause telecommunications companies to target neighborhoods that contain the most lucrative potential consumers - consumers most likely to buy bundled services.[18]

This process of 'cherry picking' customers and communities puts residents and businesses in lower-income neighborhoods at even more of an economic disadvantage. Also, because of the high costs of providing wireline services, remote rural communities only have access to wireless broadband technologies that offer minimal upstream bandwidth capabilities. [Editor's note: Everything old is new again. AT&T supported residential zoning when communities across the United States adopted land use regulations in the 1920's. The company saw zoning as a means of segregating profitable customers and infrastructure from low-income, low-profit districts during a period of rapid expansion in the telephone industry.]

15. Bernoff et al., 11.
16. Maribel Lopez, "Beyond Broadband". *The Forrester Report*, March 2000, Forrester Research, Inc., 12.
17. Lopez, 8.
18. Lopez, 13.

5 Caching and Content Delivery Networks: The Toll Roads of the Internet

> (Commuters) can now choose the 'premium' roadspace of higher speed and guaranteed congestion-free highways, over the 'free', grid-locked and public highways that were the legacy of the standardized infrastructure role ideal.[19]

Although Graham is referring to highways for automobiles, his observation also applies to private Internet data throughways currently being developed. In order to overcome bottlenecks encountered on the Internet, companies are developing technologies that allow large corporate customers to bypass the public Internet infrastructure. The Internet infrastructure is being partitioned into publicly and privately accessible data conduits or throughways. Since access is based on payment, these private throughways can be thought of as the new toll roads of the Internet.

Companies such as Akamai and iBeam are deploying private networks called content delivery networks. Content delivery networks replicate and store content in geographically dispersed servers close to the end users, reducing the distance that the content data needs to traverse. Large content providers pay these companies to store and serve their content on these networks.

A cache server stores copies of content. Internet Service Providers (ISPs) often install these cache servers in their Internet Points of Presence (IPOPs) to store their own affiliated content or rent the cache space out to content providers.

The Internet's physical infrastructure consists of a system of interconnected networks. The major ISPs' networks interconnect at Network Access Point (NAPs). NAPs act as the major intersections of the Internet backbone. These public intersection points can become congested, so the company InterNAP has built and deployed private network access points called P-NAPs. The P-NAP sends customer data directly to the major global Internet backbones directly rather than through the public NAPs or at a random private peering point. Peering is the arrangement between Internet service providers (ISPs) that allows them to exchange data traffic on each other's networks. Unlike private and public peering relationships, InterNAP pays these backbones for full Transmission Control Protocol/Internet Protocol

19. Graham, 183.

(TCP/IP) connectivity and then passes these costs on to their customers.

The deployment maps of the Akamai content delivery network[20] and InterNAP's P-NAPs[21], indicate that these companies are deploying this private infrastructure at the same select group of highly-connected U.S. cities cited by Moss and Townsend[22]. Thus the private infrastructure serves to further the advantage these 'global cities'[23] have over other cities and regions.

Because of high fees, only large content providers have access to content distribution networks. Access to the cache servers may even be further limited. In this era of vertical integration, where corporations own both conduit and content, companies are often choosing to store only their affiliated content on these servers. Note that while an individual or organization can still distribute high bandwidth content such as streaming video over the public Internet system, the performance and quality may be so low as to effectively censor this content.

6 Quality of Service: The Priority of Packets

Do culture and justice have anything to do with setting protocols?[24]

The Internet is defined by a set of protocols, the TCP/IP protocols, which governs how data is transferred across the physical networks. These protocols comprise the Internet's logical infrastructure.[25]

The Internet originally was designed with a single level of service known as "best effort." Data flows through the networks as packets. In a best effort system, all packets are treated equally within the network. The routers attempt to route each packet to the best path it knows. The level of quality of transport therefore depends on the network conditions. Network congestion and differing locations of the content lead to inconsistent levels of quality.

20. See http://www.akamai.com/service/network.html.
21. See http://www.internap.com/html/news_05022000.htm.
22. Mitchell L. Moss and Anthony M. Townsend, "The Internet Backbone and the American Metropolis", *The Information Society Journal*. 16(1):35-47. 2000. Available at http://www.informationcity.org/research/internet-backbone-american-metropolis/index.htm
23. Stephen Graham, "Global Grids of Glass: On Global Cities, Telecommunications and Planetary Urban Networks", *Urban Studies*, Vol. 36, Nos 5-6, 1999, 929.
24. Caesar McDowell. "Bridging the Digital Divide", *Making Places through Information Technology*. MIT, Cambridge, MA March 2, 2000.
25. Lessig, 101.

The Internet was originally optimized for "bursty" data traffic, characterized by rapid and unpredictable clusters of transmissions. The inconsistent transmission of data can slow but does not usually hinder the running of applications such as email and web browsing. However, applications such as streaming media and IP telephony require dedicated bandwidth for steady streams of data. Jitter and delay in voice or video data can render the application unusable. Therefore, different protocols and methods are being developed to provide Quality of Service (QoS) over the Internet. Quality of Service provides a guaranteed consistent level of network capacity and capability for an application.

QoS protocols allow ISPs to define differing levels of service by providing preferential treatment to some amount of the network traffic. The consumer can then subscribe to different levels of Internet service including basic data services or high-end services that supports streaming applications and IP telephony.

Smart routers, known as policy routers, enable network providers to define policies on how certain data packets should be treated. The routers can discriminate between and prioritize the handling of these packets based on information such as the destination, the source, the ISP it originated from, the type of data content, etc.

These protocols and policies represent a departure from the original peer-to-peer architecture where each party, sender and receiver, was considered of equal importance and every data packet was treated equally. The ability to discriminate and prioritize data traffic is being built into the system, permitting economic factors to shape the way packets flow through the networks and therefore whose content is more 'important'.

7 Technology, Choices and Values

We stand on the edge of an era that demands that we make fundamental choices about what life in this space, and therefore life in real space, will be like. These choices will be made; there is no nature here to discover. And when they are made, the values we hold sacred will either influence our choices or be ignored.[26]

Democratic ideas (and the lessons of the telephone system) suggest that they should strive to provide universal access - to affordable, ubiquitously present, high bandwidth service to all their citizens. If equality of

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26. Lessig, 220.

> opportunity and symmetry of participation are valued, then all classes of users (not just privileged groups and institutions) should be able to create as well as receive information; this means that the infrastructure has to provide two-way digital pipes and allow anyone to set up a server.[27]

We are currently in the process of designing and building the next generation Internet. This article has described the emerging technologies that will define that network, and how economics, geographic and social factors are guiding choices about their design, deployment, and use. Just as the current architecture of the Internet reflects the values of its original creators, this next generation Internet will reflect our choices and our values.

Is the Internet fundamentally a public or private space? Who will have access? What information will people be able to access? Who will be allowed to provide this information? The answers to these questions will depend in large part on how the infrastructure is designed and built. Whose values should form the basis of the new infrastructure? Should we leave the construction subject to market forces alone or should ideas of social equity and fairness be embedded in the technology?

Technologists, policy makers (at both national and local levels), urban planners, researchers and the general public all have a part to play in making these decisions.

> · Policymakers should implement policies that promote competition and innovation and yet ensure equitable access to all citizens.

> · Urban planners and local policy-makers need to recognize how this infrastructure can determine the economic viability of their cities and regions. They should explore investment both public and public-private investments especially in traditionally marginalized areas.

> · Researchers should continue to analyze the investment in and deployment of the infrastructure. They also are in the position to look across the disciplines of economics, technology and urban planning and design, and understand their complex interactions and the implications of these interactions.

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27. Mitchell, 168.

· Technologists should consider the policy and societal implications of the technologies they build and use their knowledge to help guide the use of these technologies.

· The public should realize that they have a voice and can affect what the Internet will be. The consumer movement surrounding open access and privacy showed that the public has the ability to bring these issues to the awareness of the policymakers and corporations and effect change.

In this way, we can build an Internet that benefits all, instead of a privileged few. [P]

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Technology and Urban Poverty:
Understanding the Barriers to Equality
James Spencer

Current research on the Digital Divide has begun to examine the implications of rapid technological changes on low-income urban communities, in the hopes of discovering opportunities for the urban poor to accumulate assets. This article examines two frameworks for understanding the Digital Divide, racial inequality and spatial mismatch, and places their findings in the larger context of the multiple barriers that the poor face in finding jobs, housing, education and other assets. It refocuses the debate on a definition of the underclass, and finds that the Digital Divide is merely another manifestation of the socio-spatial concentration of poverty in American inner cities. This article concludes with an argument for the integration of technology policy approaches with other efforts aimed at alleviating concentrated poverty.

1 Introduction

To date, many analysts have speculated on technology's potential to alleviate poverty in a generic sense (Wolpert 1999; Hall 1999; Castells 1999). However, only a theoretically rigorous analysis of how technology specifically affects the poor can lead to policies and technologies that increase equality rather than decrease it. In a general sense, the phrase "Digital Divide" refers to the divide between rich countries and poor, or between rich people and poor people within rich countries. For urban planners interested in technology's impact on equality, these differences are significant. In particular, this national/subnational distinction should be made since the policy approaches required to address each would be different.

When the digital divide operates internationally it is clearly between national administrative spaces; domestically it is increasingly between neighborhood and community spaces. This article examines the importance of spatial inequality in understanding the anti-poverty potential of technology for neighborhood and community spaces. Technological inequality is not so different in its root causes from other kinds of inequality such as access to education, home values, or job access levels. However, technological approaches to poverty alleviation, like other approaches to poverty that have been framed previously, risk overlooking the multiple causes of inequality and therefore miss opportunities to coordinate technology policy with existing efforts to reduce poverty.

Although conventional thought sometimes advocates education, home ownership, or car ownership as a sufficient basis for alleviating poverty, most researchers recognize that narrow policy solutions focusing simply on one aspect of the many inequalities affecting particular places and communities will never achieve lasting improvement of individual opportunities. Likewise, discussions and policy prescriptions of technological approaches to improving equal access should avoid simple models of hardware provision, but rather develop approaches that combine hardware provision with programs that deal with housing, job

access, transportation and other aspects of poverty. Given this multiple-level approach, physical places themselves become a critical parameter for policy, emphasizing the role of urban planners.

This article seeks to place discussions of technological divides into the spatial context that is common to the debate on many other kinds of inequality. Once the Digital Divide is placed in a neighborhood context it becomes clearer as a policy-relevant research problem specifically suited to urban planners and other researchers interested in spatial relationships. Urban planners understand the interacting roles of markets, regulation and space in regional development and are therefore well suited to understand the complexity of policies that affect neighborhoods.

In short, spatial inequalities in technological access between countries and between neighborhoods and communities are quite different from a policy perspective. Countries have formal governments and policies and therefore inequality can be addressed through incentives for training and hardware provision within existing borders. Given the costs of transfer of labor and materials across those borders, governments' ability to respond to digital divides is stronger in nations than in neighborhoods.

Neighborhoods usually have no formal authority. Therefore, without a clear understanding of market processes, social mobility and physical mobility, policies focused on hardware provision and training will likely exacerbate inequality. A discussion of spatially concentrated poverty follows, explaining how market processes and government interventions have increased poverty for some urban minorities while simultaneously providing opportunities for others. The current understanding of the digital divide overlooks these processes, however, and thus points only to minor and isolated policy efforts.

2 Current Understanding of the Digital Divide in the United States

Research on inequality in technology access is embryonic because the mainstream is only just now integrating computer technologies into every aspect of daily life. However, some researchers have begun to develop a literature on technological changes and poverty. While important in providing baseline data on access and usage, these scholars stop short of complex

understanding of the other forces creating poverty and inequality that also affect poor people. Since their focus is on developing models or collecting primary data on the technological access side, they neglect more comprehensive analysis of the populations experiencing poverty and fall back on two conveniently narrow definitions of inequality, racial inequalities and spatial mismatch.

Hoffman and Novak (1998) document the effect of technological changes on poor urban neighborhoods as reinforcing an already-existing social divide. Their work describes a racial divide within the US in computer use and access. They find that only about 30% of African Americans owned a home computer while almost 45% of whites did. Moreover, only about 9% of blacks had used the World Wide Web at home while about 15% of whites did. However, they also find that many more blacks (28%) than whites (17%) were planning to buy a home computer in the near future. Thus, while a Digital Divide exists between blacks and whites, this gap is closing for home computer access. For those who make over $40,000 per year, blacks own computers in higher proportions than whites, further indication of a closing of the racial computer gap.

Hoffman and Novak use a social dividing line that does not clearly express a technological divide. Blacks, although currently at lower levels of computer ownership and usage, are likely to cross the divide without significant policy interventions as long as current trends continue. It seems that blacks and whites converge in computer usage over time independent of technology-specific policy.

However, Hoffman and Novak uncover an interesting fact: white students without a computer in their home are much more likely to find other ways to obtain access to the World Wide Web. Approximately 38% of white students with no home PC used the Web in the past six months, while only about 17% of comparable black students did. Even more starkly, as 22% of white students with no PC at home used the Web at another location, only about 3% of blacks did. Thus, as the authors note, "white students lacking a home computer, but not African American students, appear to be finding some alternative means of accessing the Internet." Given their finding that whites and blacks are equally likely to access the Internet at school, it seems that the gap in accessing the Web comes from other social networks and community institutions. This article argues that

this gap confirms that the digital divide is yet another manifestation of the growing problem of concentrated poverty and socio-spatial isolation of the underclass in the US.

Shen (1999) considers the digital divide in the context of existing social inequality, focusing on the relative priority of spatial access and telecommunications access in poor neighborhoods. He finds that, in general, increased telecommunications capabilities are associated with greater accessibility to work, while those relying on traditional transportation means are increasingly less accessible. Thus, Shen makes the case that geographic proximity is of reduced importance in finding work while transportation and telecommunications are increasingly important in defining work accessibility.

This study is important in extending the race divide that Hoffman and Novak examine, because it refocuses the digital divide on locational and social variables beyond race. However, Shen's study is limited in its narrow focus on proximity - both spatial (transportation, neighborhoods) and virtual (telecommunications). Shen claims that:

> [W]ealthier communities, especially in the suburbs, are better off because their residents tend to have telecommunications capabilities. In contrast, poorer communities, particularly those in the central city, are worse off. Unless effective policies are implemented to make new telecommunications a viable option for disadvantaged groups, the resulting spatial and social effects will undoubtedly aggravate the problems of the central city (p. 353).

Certainly, there is an association between telecommunications use and location; however, the importance of this relationship requires further study. It seems clear that geographic location is becoming less relevant in the labor market as transportation and telecommunications technology become more important. Less clear, however, is the relative importance of Shen's telecommunications access variable. There are many reasons why suburbs are better off than central cities and many reasons why technology divides will further isolate central cities and other poor areas. Policy based solely on Shen's analysis would prematurely imply a priority on access to telecommunications as a means of reducing poverty.

This virtual proximity resembles spatial mismatch analyses that equate locational isolation as the primary reason explaining unemployment and low wages (Spencer 2000; Sjoquist and

Ihlanfeldt 1998; Kain 1968). Like the spatial mismatch hypothesis, however, Shen's analysis, which simply substitutes virtual location for physical location, overlooks the multiple causes of poor labor market and other kinds of opportunity. Specifically, it separates locational disadvantages from other kinds of inequality and focuses on space rather than the interaction of spatial factors with other social ones.

Both Hoffman and Novak's and Shen's studies contribute to an understanding of the role that technological inequality plays in social inequality. However, researchers and policymakers interested in using technology policy to decrease social inequality and reduce poverty should consider nesting the Digital Divide into a broader understanding of the multitude of issues confronting the urban poor.

Analysis both on causality and policy have isolated and prioritized particular factors to the exclusion of others. However, if the focus of policy analysis is the persistently poor who show little hope of economic advancement, then the issue is a complicated mix of structural, personal and infrastructural processes that interact to define a set of particularly disadvantaged populations. The unifying theme of all these processes, however, is that central cities and their primarily minority residents are increasingly isolated socially, economically, physically, and possibly virtually from the American mainstream.

In the absence of an integrated understanding of the forces affecting the socio-spatially concentrated poor, policy focused simply on giving technology to the poor by adding technology classes and computers to high schools, will overshadow those that attempt to provide hardware and training as part of more comprehensive programs.

3 Concentrated Poverty and the Underclass

Amsden and Clark (1999) note that even though Bill Gates did not complete college, it is not appropriate to think that a college education is irrelevant for developing the ability to use technology to create economic opportunities. The fact that the future CEO of Microsoft had a strong family structure, a stable household, employed parents and a secure community can be overlooked when thinking about the interaction of education and technological opportunity. The lack or presence of formal education is only one of several interacting factors that created an

environment for Gates to mobilize his individual talents. It is important for those debating the role of technology in support of low-income communities to remember this fact and draw on research documenting the multiple barriers that low-income people face.

In addition, any discussion of the Digital Divide should focus not simply on those without technology and the means to use it, but on those who face significant barriers to accumulating this hardware and skills through the operation of the free market. Thus, the Digital Divide is not simply about the poor. Even if Gates' parents had been relatively poor it is not unlikely that he would have been successful. Many of the poor in stable communities, with stable jobs and housing who have the desire to acquire technology and skills, will do so. On the other hand, poor and isolated communities in urban and rural areas face a constellation of barriers that combine to depress education, social ties, work stability and assets in addition to incomes. Combined, these factors define an "underclass" that will be the most negatively affected by the Digital Divide and therefore should be the focus of creative public policy and analysis. This section describes some of the factors that limit opportunities for the underclass and that form the basis of a more nuanced understanding of technology and the poor.

Table 1 provides a general picture of poverty in the United States from 1970-1990. Several important conclusions can be drawn from these data. First, it is clear that (contrary to popular opinion) most people who live below the poverty line are ethnically white, not African-Americans or Latinos. From 1970 through 1990 there were twice as many whites living below the poverty line than blacks, and more whites lived in poverty than both blacks and Latinos combined. Thus, strictly speaking poverty cannot simply be attributed to minorities, even though "underclass" characteristics have been. The data do show, however, that blacks and Latinos live in poverty with much higher frequency - 29.1 and 24.7 percent respectively - than do whites, who experience poverty at a 9.0 percentage rate. Although the data show increases for all groups over the past twenty years, there have also been much greater percentage rises in the number of poor for blacks and Latinos - 11.1 and 148.1

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1. The vastly greater increase in Latino poverty may be attributable to a major change in immigration rates.

Table 1. Who is poor in the United States?

		1970		1980	
		Number poor (000s)	Percentage poor	Number poor (000s)	Percentage poor
Total		26,931	13.6%	27,393	12.4%
	White	17,157	10.3	16,353	9.0
	Black	7,596	34.6	7,649	29.9
	Latino	2,178	24.4	3,391	23.6
		1990			
		Number poor (000s)	Percentage poor	% change 1970-90 in # of poor people	
Total		31,743	12.8%	17.9%	
	White	17,893	9.0	4.3	
	Black	8,441	29.1	11.1	
	Latino	5,403	24.7	148.1	

Source: Jargowsky (1997:41-2). Calculations from and adaptions of original tables.

percent - than for whites, 4.3 percent.[1]

In general, the term "underclass" connotes the social, economic and spatial isolation of a particularly poor subgroup. According to Jencks (1991), the definition includes several attributes of what was once termed the "lower class" and the "persistently poor." Like these previous definitions, Jencks believes, four ranking schemes combine to create the problems of the underclass: low income levels, unstable income sources, low "cultural"[2] skills, and different moral norms. Importantly, he notes that by the 1980s a general "consensus had developed that the underclass was a subset of America's poor and that it included only those families and individuals whose poverty was somehow attributable to their behavior" (p. 31, emphasis added). This has been and continues to be a controversial statement. Nonetheless, consistent through these categories is a principle of social and economic isolation.

There is also a popular understanding that the underclass involves deepening inherited poverty among American blacks. This perception is not exactly accurate. In fact, African-American

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2. Here Jencks means the different social norms between local underclass interactions and the larger society. In particular, the barrier that these differing norms often erect when underclass individuals seek employment in the larger economy where different norms exist.

poverty rates, for example, declined from 35% in 1970 to 29% in 1990. Thus, there seems to be some economic mobility among African Americans in spite of a popular perception that more blacks are falling into intractable poverty. Despite this aggregate progress, however, a significant question remains on how unequally this economic progress is distributed. Simply because more blacks are staying out of poverty tells us very little about those who remain poor and the magnitude of the gap between them and the non-poor.

Spatially concentrated poverty (SCP) places the underclass issue in a spatial context and is defined as the mutually reinforcing phenomena of socio-economic problems such as crime, unemployment, poor education, single parent families, and urban fiscal crises leading to diminished services - all problems associated with inner cities and to some degree isolated rural areas. The literature on SCP describes not simply a question of economic development and income per se, but the cumulative effects of these factors as they interact with family breakdown, crime and drug use and reinforce each other in particular locations. This fact is important for understanding technology-transfer approaches to the digital divide, since computer ownership based on subsidy does not necessarily imply computer use.

The concentration of poor people has been a persistent policy problem in the US for the past 20 years. Research documenting an increase in neighborhood poverty rates indicates that location is a significant factor in understanding the changing face of poverty for some groups in the United States - particularly blacks and Puerto Ricans. Table 2 shows that poverty has different spatial characteristics for blacks and Latinos than for whites. In 1990 3.5 percent of whites living below the poverty line lived in a census tract where greater than forty percent of the population was poor. The figure for Latinos is more than five times greater, and that for blacks more than seven times greater. Over the past twenty years the concentration rate of poor blacks has increased 8.6 percentage points as it has increased only 2.0 points for whites and 0.7 for all Latinos. Thus, spatial concentration of poverty, though increasing for both whites and blacks, has come to define African American poverty and stands out as the primary characteristic of the underclass. This physical isolation may help explain the fact that Hoffman and Novak (1998) found such a stark gap in computer usage between blacks and whites without a computer at home.

Table 2. Spatially Concentrated Poverty: percent of poor people living in high poverty census tracts

	1970	1980	1970	Percentage point change 1970-1990
All poor persons	7.0%	8.7%	11.8%	4.8
Poor White	1.5	1.8	3.5	2.0
Poor Black	16.4	20.2	25.0	8.6
Poor Latino	17.7	15.6	18.4	0.7

Source: Jargowsky (1197: p.41). Calculations from orginal table.

Many analysts have tried to explain the spatially concentrated African American underclass that Jencks described. Early researchers saw the problem as one of a "culture of poverty" where poor groups endogenously evolved adaptive social mechanisms to deal with economic marginality (Lewis 1968; Banfield 1970). Later research has retained a focus on these endogenous factors of the underclass (Galster 1992) but usefully expanded to include external factors. These factors range from historical and industrial macro-economic change (Lemann 1991) housing segregation and policy (Massey and Denton 1993), general earnings inequality (Danziger and Gottschalk 1987; Sawhill 1994), structural unemployment and industrial mobility (Wilson 1996) and suburban residential mobility (Jargowsky 1997). While the focus varies as to the causes of underclass and concentrated poverty, each of these analysts attempts to explain the causes of SCP using both endogenous and external factors.

To the extent that there is consensus on the causes of the underclass, unemployment and underemployment have become accepted as critical drivers of SCP (Wilson 1996; Jargowsky 1997; Kasarda 1989). Many writers have analyzed unemployment and income as it relates to concentrated poverty, focusing on a spatial mismatch between poor urban blacks and emerging low-wage labor market opportunities. These analysts describe the effect of housing segregation, mobile firms and the suburbanization of low-wage manufacturing jobs as the key reasons for the creation of and continuation of concentrated poverty. This basic framework, which has influenced much of the concentrated poverty scholarly literature and the policies that stem from it, is that physical distance from jobs creates the socio-economic conditions of the underclass. (for reviews of the spatial

mismatch literature see Holzer 1991; Kain 1992; Ihlanfeldt and Sjoquist 1998; Spencer 2000). Thus, Shen's (1999) focus on the labor market's relationship to improvements in communications technology is likely to be an important perspective in understanding the opportunity structure of the underclass. However, many more studies of when and how virtual proximity can be substituted for physical proximity remain to be conducted before relevant policy can be formulated. As with the spatial mismatch framework, which elements of proximity constitute the barrier? Is it the ability to overcome distance to access jobs? Is it the fact that information flows differently in either real or virtual places? Is the barrier one constraining the kinds of jobs for which poor people look? Information-sharing on jobs, ability to circumvent slow public transportation constraints, or improvement of real estate values, for example, are three distinct aspects of concentrated poverty that could be targeted by technology policies.

The case of Latinos is not as clear regarding SCP and underclass characteristics. To be sure, many Latinos are poor. The median household income of Puerto Ricans, Mexican Americans and blacks were comparable at $6,100, $5,500 and $6,000 respectively in 1989 (Rivera-Batiz and Santiago 1994:30). Their percentage living below the poverty line was also comparable at 30.3%, 25.4% and 29.8% in 1990 (Rivera-Batiz and Santiago 1994:41). These data suggest that Puerto Ricans and blacks are slightly worse off than Mexican-Americans regarding the poverty line. However, a key element of the definition of underclass includes the spatial concentration of poverty that almost certainly affects their ability to take advantage of technological improvements.

Table 3. Neighborhood Poverty Rates by Ethnic Group[3]

	US Total	US Metropolitan Areas
White	1.0%	1.3
Black	14.3	17.1
Other non-Hispanic[4]	3.3	3.8
Mexican	9.0	10.2
Puerto Rican	19.1	19.7
Cuban	3.3	3.3
Other Hispanic	6.3	6.8

Source: Jargowsky (1997:p. 69).

3. Neighborhood poverty rate is defined as the percentage of a metropolitan area's poor population living in census tracts with a 40% poverty rate or higher.
4. In this context, the terms Latino and Hispanic are used interchangably.

Table 3, for example shows Puerto Rican neighborhood poverty rates higher than for blacks both nationally and for all metropolitan areas. Nationally, blacks have neighborhood poverty rates of 14.3% compared to 19.1% for Puerto Ricans. By comparison, Mexican Americans - who have similar individual poverty rates - show much smaller rates of neighborhood poverty at 9.0%. Therefore, it is not clear that all poor Latino groups exhibit SCP and underclass characteristics since the evidence of their spatial concentration and the associated cumulative effects differ. Thus, considering the spatial aspects of technological divides, poor Puerto Ricans and African Americans may respond to technology access in fundamentally different ways than other poor groups.

4 The Underclass and the Labor Market

There are several causes of unemployment, only some of which are relevant to an understanding of the underclass. Frictional and search-related unemployment is related to the "natural" rate at which individual workers constantly find and leave jobs based on personal preference. The characteristics of this kind of unemployment are that it is short-term, based primarily on the relationship between the firm and the worker, and generally seen by economists as an element of an efficiently functioning labor market. Long-term unemployment falls into two categories: structural and permanent unemployment (Smith and Ehrenberg 1997).

Structural unemployment results from macroeconomic shifts that eliminate some occupational categories and replaces them with others. This kind of shift forces some workers into a labor market that requires retraining and other kinds of human capital investment. Permanent unemployment, on the other hand, simply refers to workers who, for both supply and demand reasons, are shut out of labor market opportunities with no real prospects of becoming employed. As time passes, internal-external labor market exclusion further disadvantages them. In the U.S., it seems that these two categories may be related for the underclass, with structural unemployment placing a great stress on low skill minority workers, thereby leading - in part - to high levels of permanent unemployment since the 1960s. If this is the case, then the increasingly computer-dependent working world may exacerbate underclass-mainstream divides through labor market exclusion. Moreover, efforts to increase technology access of certain groups at work may not reach the bulk of the

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underclass poor.

According to the underclass framework, however, unemployment is not simply unemployment. First, unemployment among spatially concentrated poor people is generally associated with social and economic instability. Table 4 shows that roughly half of spatially concentrated inner city youth are on welfare, three times as many inner city as overall black youth are in public housing, and about 8% more are unemployed than all black youth. Furthermore, only 28% had a man in the household compared to 51% for all blacks. Thus, family, housing and employment instability have often been associated with the underclass and the ghettos or barrios in which they live. Interestingly wages remain relatively constant across all groups, thereby suggesting that employment rates are a more important difference between the groups than pay levels.

Table 4. Inner City Youth Compared to Other Youths, 1979-1980

	Inner City	All Black	All White
Out of School Youth			
% in Labor Force	80%	90%	94%
% Unemployed	41	33	20
% Employed	48	61	76
Average Wages	$4.26	$4.29	$4.53
Average Weeks Worked in a Year	26	29	37
Family Background			
Man in Household	28%	51%	69%
Household Member Working/ inSchool	41	56	71
Family on Welfare	45	--	--
In Public Houing	32	10	1

Source: Freeman (1989: 124).

In their analysis of both income and its translation into stable assets such as homes, cars and financial assets, Oliver and Shapiro (1994) point out the importance of work stability as one of several important factors determining the wealth accumulation capacities of poor blacks. They show that work instability is perhaps worse for developing assets than it is for simple income measures. Table 5 shows that moderately stable white workers make only 62% of the incomes of highly stable white workers[5]. For blacks this figure is 51%. More starkly, moderately unstable white workers accrue 43% of the net worth of highly stable

5. This figure is obtained by calculating the income ratio of moderately stable workers to highly stable workers.

workers while the figure for blacks is 26%. Thus, work instability affects blacks more than it does comparably employed whites, particularly regarding assets. This work and family instability's disproportionate effect on African Americans' ability to accumulate wealth is clear.

Table 5: Work Stability and Wealth

Degree of work stability	Income	
	White	Black
High	$32,420	$23,545
Moderate	20,081	12,070
Low	6,553	5,129

Degree of work stability	Net Worth		Net financial assets	
	White	Black	White	Black
High	$46,082	$6,675	$7,199	$0
Moderate	20,000	1,740	500	0
Low	1,000	0	0	0

Source: Oliver and Shapiro (1994: 117).

Table 6 confirms the central role of unemployment, work instability and lower labor force participation rates for blacks, Puerto Ricans and, to a lesser extent, Mexican Americans in the

Table 6: The Underclass: Ethnicity, Employment and the Labor Force

	Labor Force Participation Rates 1990		
Males	US-Born	Immigrant	Average
% US Average	75.7	77.7	
White	76.4	69.9	73.0
Black	69.3	82.2	75.8
Puerto Rican	73.3	69.9	71.6
Mexican-American	76.1	84.8	80.4
Females			
% US Average	57.9	52.8	
White	57.7	46.0	51.8
Black	58.9	71.7	65.3
Puerto Rican	59.8	44.8	52.3
Mexican-American	58.9	50.4	54.7

Table 6: (continued) The Underclass: Ethnicity,
Employment and the Labor Force

	Unemployment Rates, 1980-1990		
Males	1980	1990	% Change
% US Average	6.4	6.2	-0.2
White	5.7	5.0	-0.7
Black	11.8	13.4	1.6
Puerto Rican	9.7	12.0	2.3
Mexican-American	8.9	9.8	0.9
Females			
% US Average	6.5	6.2	-0.3
White	6.1	4.8	-1.3
Black	8.4	12.0	3.6
Puerto Rican	13.0	12.2	-0.8
Mexican-American	12.5	11.6	-0.9

Source: Rivera-Batiz and Santiago (1994:57, 64). Tables combined by author.

mutually reinforcing nexus of assets, family and work instability. Of the disproportionately poor populations (blacks, Puerto Ricans and Mexicans), native-born blacks and all Puerto Ricans experience slightly lower-than-average labor force participation rates[6]. Moreover, of the poor populations, immigrant Puerto Rican and native born black men[7] worked at only about 69%, compared to 85% for immigrant Mexican and 76% for US-born Mexican American males. Comparing the average Puerto Rican attachment to the labor force, 72%, with the average Mexican-American attachment at 80% shows a somewhat significant difference within the Latino poor regarding labor force participation. Slightly lower numbers for the average of Puerto Rican immigrant and native-born women support the thesis that Puerto Ricans work in lesser proportions than do Mexican-Americans. However, there is a downward trend for native-born Mexican-Americans, supporting the claim that the native-born poor, through lesser workforce participation, may be one way to describe an underclass and how it develops. Table 6 also shows that from 1980 to 1990 similarly high levels of unemployment increased most significantly for Puerto Rican males (2.3%), somewhat significantly for black males (1.6%) and not as significantly for Mexican-American males (0.9%), a trend that is mirrored on the female side only for black women. Thus, between 1980 and 1990 there were much higher percentages of

6. Labor force participation means an individual is actively looking for or holding a job.
7. Black immigrants are excluded because immigrants from Africa and the Caribbean differ not only in government entitlements but also in socio-economic characteristics from American blacks.

blacks and Puerto Ricans - particularly black and Puerto Rican men - unattached to the labor market. A similar but not quite as pronounced trend applied to Mexican Americans.

Employment is clearly a problem for the poor, yet its level varies by gender and by ethnicity. If technological policy is to promote either human capital development or access to information and other assets, then it must recognize the current structure of poor populations. As this analysis indicates, technological approaches may differ for poor men versus women and between blacks and Puerto Ricans versus Mexican-Americans. Women and Mexican-Americans, in aggregate, may respond better to policies that focus on the workplace, since much of their free time is occupied by work tasks and since their presence in the workplace may subsidize their access to technology. On the other hand, black and Puerto Rican men may respond better to non-workplace technology access such as schools, libraries and other institutions that can subsidize access.

5 Technology-Based Approaches to Poverty Alleviation

Despite significant popular attention, to date there has been little academic research on the relative importance of technological developments on the poor. Some emerging research has begun to move beyond simple statements about the ability of the poor to benefit from technological innovations by looking at how they may reinforce pre-existing inequalities (Shen 1999) or how they may benefit the poor (Stegman 1998). However, much of the policy debate is driven by popular calls (for example, to provide a computer for every classroom) that have yet to be influenced by the body of knowledge on the multiple causes of poverty.

Nonetheless, the promise of technology to help the poor has centered on four concepts: business development, improved public services for the poor, increased connectivity, and job creation. Further research on each of these areas and their ability to improve the barriers of spatially concentrated poverty described above should be undertaken by those interested in using technological advances to provide asset accumulation opportunities for the urban poor. Specifically, researchers should place each of these discrete ideas into larger, more comprehensive strategies to assist the poor.

Business Development

Many new technologies have created opportunities for inner-city

entrepreneurs to both start businesses and provide services in high-poverty neighborhoods where computer use is not high. One international program that has begun to see success is the basis for programs currently being developed in the US. Grameen Phone, an offshoot of the highly successful Grameen Bank. The program provides loans to poor Bangladeshi entrepreneurs to purchase mobile phone services in remote rural areas where phone lines do not exist, or where service is too expensive to be open to individual farmers. These entrepreneurs sell connection minutes to farmers who need up-to-date information on current market prices of rice, road conditions, and potential buyers, for example. Better and timelier information enabled by the phone gives them a chance to circumvent costly middlemen as they search for the best price for their produce. Simultaneously the phone entrepreneur taps a "hidden" market for phone services from a very poor population. High volume, high consumer density and low cost, some argue, enable this program to provide a public service and an opportunity for the small entrepreneur to sustain a business in extremely poor areas.

This model may be appropriate for inner-city neighborhoods where the demand for technological services and access through broadband networks is great but the infrastructure - computer hardware and connections - is insufficient. For example, the proliferation of ATMs (Automatic Teller Machines) in poor neighborhood establishments can be seen in these terms as a means of generating income for local businesses. As many banks have left poor neighborhoods, bank services have also disappeared from inner city neighborhoods. Thus, small shops with ATMs provide some banking services in areas where most families do not own a computer and cannot access their accounts without long out-of-neighborhood trips. For each transaction the business receives a small commission. Thus, while such a model still charges fees to those in poor neighborhoods with bank accounts, it can reduce the cost of long trips to access some bank services.

Overall, while this model does provide some opportunities to use technology to improve opportunities for the urban poor, it obviously has many shortcomings as a sustainable solution for concentrated poverty. Poor residents still must pay relatively high transaction fees if they have a bank account, and the large numbers without bank accounts remain unaffected. More importantly, this model depends on the availability of strong

local businesses and entrepreneurs as well as sufficient amounts of investment capital directed towards profitable enterprises.

Improved Government Services

Although many inner city residents have no bank account, all manage their income in some way. For a significant number this financial management takes the form of processing government benefits. The Electronic Funds Transfer (EFT) program reduces the cost of benefits transfers to both government and consumer. [Editor s note: In some jurisdictions, EFT is also known as Electronic Benefits Transfer, or EBT.]   Rather than mailing monthly checks to recipients who must then cash them for a fee, EFT allows recipients to obtain the funds through electronic stations. By reducing paperwork and the costs of postage, EFT allows government agencies to distribute funds more efficiently. From the consumer side, recipients can circumvent the fees of private check-cashing that extract significant amounts from each check. Stegman (1997) found that under the old system recipients can pay between 1% and 20% of the face value of their checks to cashiers, and that 60-70% of residents without bank accounts purchase ten or more money orders per year (21). The EFT program promises to cut this loss to recipients significantly.

In addition to immediate cuts to transfer fees, the EFT program is intended to integrate the poor without bank accounts into the larger system of banking and money management. The development of the EFT program depends on recipients' appointment of a financial institution to accept the payments on their behalf and provide the distribution services. If the recipient fails to select a private institution to receive these payments, the Department of the Treasury plans to integrate them into the conventional banking practice through the development of Electronic Transfer Accounts (ETA). In sum, they plan to offer those welfare recipients without bank accounts cards that act like conventional ATM cards for those with bank accounts. These welfare accounts would offer recipients the same consumer protections as private sector accounts and give poor people a safe way to manage and withdraw their money as they see fit (Stegman 1997). Thus, in either case, recipients of government benefits will be integrated into the mainstream of money management.

Improved government services are one way to use technology to improve the money management skills of poor people so that they are more consistent with current banking practice.

However, it is not clear that simply providing the service will ensure that recipients will use it in the most effective way. For example, although over the long term it is likely to improve poor and isolated people's familiarity with technology and computer access, in the short term many of those receiving benefits are unfamiliar with electronic media and may have difficulty using the services provided. This problem of familiarity with basic network practices such as downloading information, working through Windows-based technology environments and developing trust in virtual communication is likely to dampen the effect of improved government services in the short term.

Connecting People to a Digital Society

Unfamiliarity with electronic communication points to the third approach to technological approaches to the poor: digital connectivity. This area of work is amorphous since there is no clearly defined objective of "connection." However, conventional knowledge suggests that society places an increasing number of daily tasks in the realm of virtual communication. In a recent speech to graduating students at MIT, President Clinton summed up the problem of the growing divide between those familiar with technology and those unfamiliar with it through a focus on its potentially great positive influence.

> For the very first time in our history, it is now possible for a child in the most isolated inner-city neighborhood or rural community to have access to the same world of knowledge at the same instant as the child in the most affluent suburb. Imagine the revolutionary democratizing potential this can bring. Imagine the enormous benefits to our economy, our society, if not just a fraction, but all young people can master this set of 21st Century skills (Clinton 1998).

It is possible, but is it probable? Many policymakers see educational institutions as the key to increasing this kind of "cultural" knowledge. Clinton noted that in 1994 only about 3% of classrooms were "connected" - presumably to the Internet - while in by 1998 he had planned to have over 50% of the nation's classrooms connected and 100% of the classrooms in the nation's 50 largest school districts. Hoffman and Novak (1998) also advocate increased familiarity with Internet technology at the school-level, saying that policy needs to ensure adequate education levels of African Americans for them to remain connected in a digital society.

The optimism of this focus on reaching youth and increasing their ability to access information electronically is premised on the assumption that simple access stimulates a desire and comfort level with performing simple tasks on-line. However, one report to the President showed that a far higher percentage of the poor drop out after going on-line because they have fewer resources to draw upon when they run into technical problems (President's Advisory Committee on Information Technology 1999). Further, between 1994 and 1998 the gap between educated and non-educated that remain connected to the Internet increased by over 24% (US Department of Commerce 1999). Familiarity at the school level, it is hoped, will help to dampen these troubling statistics.

Although improved access to technology through the school system will help familiarize youth with the Internet and other kinds of "21st Century" technology, a simple educational approach is likely to be overwhelmed by the fact that low-income students in poor schools face the multitude of negative family and neighborhood characteristics described above that also influence their ability to benefit from school connectivity. Can we expect kids with stressed home and school environments to "log on" as much as everyone else?

In sum, though improving schools will undoubtedly improve poor youths' connectivity, their lives are still conditioned in large part by unemployment of themselves, their family members, and their neighbors as described above. Thus, while one use of technological changes is greater connectivity to mainstream society, an important corollary of such an approach would be the improvement of the larger neighborhood environment, housing conditions and the labor market affecting the urban poor.

Hi-Tech as the Industrial Revolution of the 21st Century

Although it is not widely researched and debated, the real opportunity that the technological revolution offers to poor communities may not simply be from the demand for technology, but also from its supply and production and the labor market opportunities it provides. While the demand for technology has increased gradually among poor people, the demand for low-skilled workers in the production of computer technology has also increased. The current understanding of the growth in low-wage opportunities for America's urban poor remains anecdotal. President Clinton for example, has drawn the comparison between the computer revolution and the industrial

revolution, saying that "...already the Information Age is transforming the way we work. The high-tech industry employs more people today than the auto industry did at its height in the 1950s" (Clinton 1998). If the low-skilled manufacturing industries of the postwar era were the basis for the creation of a black middle class, what are the opportunities offered by a computer production boom?

If Clinton and other analysts are right, then the computer revolution's ability to directly alleviate poverty is great. In 1949 55% of employed black men were in blue-collar manufacturing jobs, a figure that had dropped slightly to 52% in 1979 and more significantly to 47% in 1996 (Levy 1998: 100). Thus, blue-collar manufacturing jobs such as those in the auto industry have been one of the major employers of black men and a significant means of accumulating assets. With a similar kind of production revolution currently unfolding, what are the opportunities for America's persistently poor?

The answer is not clear. Most industrial analyses of technology and the poor emphasize the negative role that trade and technological changes have had on lower-skilled American workers (Freeman 1995; Adams 1997; Berman, Bound and Machin 1997; Richardson 1995). In general, these analysts attribute the hardships of the US native-born poor either to the outsourcing of the lower-skilled stages of production to low-wage countries or to the role that technology has played in "upwardly biasing" the skill requirements for most industries. However, few studies examine the positive implications of Clinton's claim for the underclass. The American economy has continued to expand despite hypotheses of the negative impact of trade and technology on low-skilled Americans - in large part due to the growth of high-tech industries. This growth has fueled the lowest unemployment rate in decades - even amongst the underclass (Freeman and Rodgers 1999) - and is a major avenue through which technological changes and continuous development have provided avenues for the urban poor to find jobs either through the secondary or tertiary labor market. Have the underclass benefited either directly or indirectly from this growth in technology industries? Have they remained unaffected?

Though currently undeveloped, research on this kind of effect may uncover the most significant impact that the technological revolution will have on the urban poor. However, further study of the degree to which job opportunities are open to the poor, as well as the secondary and tertiary effects of technology-driven

industrial growth, is needed to understand whether there are significant opportunities for policy to affect the technology job market for the underclass and other secondary benefits. In particular, even though greater job opportunities in the technology fields may improve the labor market position of the poor, given the above discussion of the underclass, there remain questions about the multiple other factors affecting low-income urban minority workers and their interaction with the specificities of the urban underclass.

As important as each of these broad categories is for providing opportunities for the spatially concentrated poor, each should be nested in a solid understanding of the populations it attempts to serve. Taken alone, however, each of these policies seems woefully inadequate as a strategy to assist the underclass. Small, inner-city entrepreneurs may be able to start small technology-oriented businesses, for example, but their ability to help improve opportunities for the vast numbers of the underclass is likely to be minimal without the support of other kinds of programs. Improved government services do show some promise at reaching larger numbers of the poor, yet they do not fundamentally approach the important issue of job creation and asset accumulation. Greater connectivity is an important concept, but without clear ideas about why, specifically, poor people should remain connected given many other competing priorities, greater access will not mean greater use. Finally, low-skilled labor market opportunities may be increasing for the urban poor. If the technology industry has jobs, what are the competitive advantages of America's urban poor, and what are the barriers that both the firms and the workers face in establishing an employment relationship?

Each of these instances shows the complexity of the issues facing the poor that influence any technology approaches to poverty. To date, none has integrated the fundamental issue of concentrated poverty and the underclass into its orientation. Thinking only about technology and its effects on the concentrated poor is not as helpful as seeing technological change as one of several factors that combine to limit the opportunity structure of low-income urban minorities. In particular, the current technology literature indicates that technological inequalities reflect other kinds of inequalities, and that location and the concentration of poverty play an important role. Policymakers, therefore, should take into account the effects of concentrated poverty on the poor when making investments in technology provision and other kinds of technology-oriented policies aimed at the poor. [P]

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Linked or Connected?
Mass Media and Immigrant Indian Women in the United States
Mandeep Grewal

This research explores the association between employment, mass media and degree of adjustment among immigrant Indian women in the United States. Ten college-educated women in the Detroit metropolitan area who immigrated to the U.S. as wives during the past decade were interviewed. In-depth interviews were supplemented with a brief structured questionnaire. The findings indicate that both employment and media wealth have a strong positive association with degree of adjustment. Informal networks also have a significant impact on adjustment levels. Hence, employed and media-rich women with extensive local familial contacts are most likely to be adjusted. The results will be used to specify future research that can inform the design of mass media programs aimed at providing information to immigrant women to assist them in their adjustment process.

1 Introduction

How can the mass media be used to expose immigrant women to their economic and political choices in the United States such that they are more likely to enter the labor market and thereby further their adjustment process?[1]

Middle class Indian women who immigrate as wives within the arranged marriage system have been chosen to address this question because they are most dependent on exogenous factors for their adjustment. This derives from the fact that these women have no legal status independent of their husband for at least the first six months and they have to learn to operate in a foreign environment with a strange man without the support of friends and family. Past research on middle class immigrant women has shown a positive relationship between employment and adjustment (Lichter 1983; Maxwell 1988). However, no research has addressed the impact of mass media on immigrant women. This paper investigates the role of mass media in the adjustment of immigrant women.

There are a number of complex and inter-related factors that contribute to this process of adjustment via the recreation of networks. This study limits itself to the role of mass media in providing information to immigrant women which allows them to access the job market, thereby reducing their isolation and contributing to the adjustment process. In particular, it examines the association between employment, mass media and degree of adjustment. Again, mass media serves a multitude of purposes; this article focuses on formal networks established via participation in the labor market.

Networks are defined as established links of a given person with individuals, groups and institutions with which they have, in the

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1. For the purposes of this research, mass media refers to newspapers, television, radio and the Internet. In some applications, Internet technologies are classified as a narrow-cast technology, rather than broadcast, and hence is not technically considered a mass medium. Since this difference is directly relevant to this research, the singular categorization of mass media is used for all these mediums of communication.

present or past, had one-way or two-way exchange of one or more of the following: information, services, emotions (Johnson 1973). The core of these networks is comprised of informal relationships with family and friends that also are strongest in terms of allegiance. As one moves further away from the core, the relationships become more defined by a formal and prescribed exchange of services and information (Johnson 1973).

Networks, adjustment and socioeconomic status are closely inter-connected for all immigrants. Research indicates that, "the extent to which individuals and families rely on kin and non-kin networks…is associated with social class, in particular with the level and the stability of economic resources." (Gallo and Bailey 1996: 210). In particular, immigrants from the lower socioeconomic classes are more dependent on their informal networks not just for information on the host country but also for employment. With increasing stability in employment, the importance of informal networks declines and "higher level immigrants make less use of networks because they are less useful." (Gallo and Bailey 1996: 210) Hence, middle-class immigrants are likely to rely on formal networks and mass media as opposed to informal networks to obtain information and adjust.

Finally, this research is not intended to be representative of immigrant women but to be explore the access and participation of middle-class Indian immigrant women vis-à-vis mass media. The reference to immigrant women in general is made only when discussing the literature and pointing to potential planning implications. However, if we accept the assumption that regardless of their unique cultural contexts, all immigrant women are exposed to the American world via mass media, the results from this study can be used for other immigrant groups, given the significant socialization role played by American media (Meyerowitz 1985, Bandura 1995).

2 Why Study Immigrant Women and Mass Media?

2.1 Lack of attention to Immigrant Women

There is a rich body of literature on immigration. Most research addresses the economic and political aspects of immigration for the host country, sometimes in relation to immigration law (Fitzgerald 1996, Morris 1985, Duleep and Wunnava 1996, Smith and Edmonston 1997, Booth, Crouter and Landal 1997).

Others examine the immigration process through the lens of the immigrants themselves (Reitz 1998, Edmonston and Passel 1994, Pozzetta 1991, Elovitz and Kahn 1997). There is also a thread of literature that studies the affect of immigration on cities (Loveless, Surette and Norris-Tirrell 1996, Muller 1993). Recently, there is an emerging body of literature on the immigrant experiences of women (Espin 1999, Weatherford 1995, Gabaccia 1992, Kelson and DeLaet 1999, Seller 1994).

It was not until the early 1980s that women's experiences in the immigration process began to be examined. Specifically, it was not until the Presidential Commission on Immigration in 1991 that there was a rekindling of interest in immigrant issues, especially with regard to women (Gabaccia 1992). This is a major oversight, given that women comprise an increasingly greater proportion of total immigrants[2]. Women entering the United States as wives mostly do so as dependents under the Family Sponsored laws[3] which form the "centerpiece of US immigration laws" (Assar 1999: 85). According to the Immigration and Naturalization Service, of the total immigrants in 1998, the majority (72 percent) came under the Family Sponsored laws, commonly referred to as the family reunification law. Of those who were family-sponsored, 65 percent were spouses and children. A large percentage of female spouses (39 percent) gain entrance as newly married spouses (Assar 1999: 85).

Indians in particular began immigrating to the United States in considerable numbers only after the Immigration Act of 1965, when racial restrictions were lifted (Rayaprol 1997). The 1990 Census showed a 110.6 percent increase in the Asian Indian population of the United States from 387,223 in 1980 to 815,447 in 1990 (Rayaprol 1997: 15). According to the Immigration and Naturalization Service, as of 1998, Indians are the third largest immigrant group in the U.S. after the Mexicans and Chinese. This influx of Indians means that a larger number of Indian wives must deal with the challenges of re-defining and re-negotiating their identities, while at the same time understanding and making sense of their new host country. This has sparked new research interest that examines the meaning and

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2. Since 1930 female immigrants have outnumbered their male counterparts (Pedraza 1991). Overall, more women (353,426) than men (299,946) immigrated to the United States in 1998.

3. Initiated as part of the Immigration Act of 1990, this stipulation accounts for "both family-preference visas and immediate relatives of US citizens...the new law increased [relative to the Immigration Act of 1965] potential family-related immigration by approximately 65,000 annually" (Weissbrodt 1998: 33).

process of immigration for Indian women in the United States (Bhattacharjee 1992, Dasgupta 1989, Rayaprol 1997, Assar 1999).

Since women constitute the majority of immigrants and Indians the third largest immigrant group, immigrant Indian women are a growing constituency in the United States. Their successful adjustment into American society is not merely an issue of assuaging their feelings of isolation; it will also reap positive externalities[4] for society at large.

2.2 The Inability of US Immigration Policy to Address Needs of Immigrants

Despite their large numbers, there is no policy in place that addresses the needs of immigrant women independent of their families[5] (Kelson and DeLaet 1999, Espin 1999). On the contrary, the family reunification law is aimed at a hands-off government policy since it places the responsibility of the "settlement process...on family networks"[6] (Reitz 1998: 104). This implies total dependence of new immigrants (mostly wives) on their sponsors (mostly husbands) for economic and emotional survival because they have no independent legal status[7]. As a result of this dependence, immigrant women stay in abusive and other exploitive situations (Espin 1999, Bhattacharjee 1992). In less extreme situations, they become entrenched within ethnic communities that discourage their active participation in American society and reinforce traditional gender roles (Espin 1999, Dasgupta 1989). Hence, there is a compelling need to explore channels that allow immigrant women economic and legal independence and lobby for policy change to allow for their access to services independent of family.

Historically, immigrant women - including Indians - have

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4. Positive externalities occur when the marginal benefit to society from an individual's consumption of a commodity or service is greater than that which accrues to the individual herself. In the case of immigrant Indian women, awareness of their legal and economic choices will also provide network externalities, i.e., the more they use this information, for instance to get jobs, the more valuable the information becomes to society as a whole, e.g., larger base of productive and tax-paying citizens.
5. Some policy changes have been instituted to allow women access to emergency services. For instance, the 1994 Violence Against Women Act "includes protections for battered undocumented women and children" (Fix and Zimmermann 1997: 255).
6. It should be noted that the family reunification law, by facilitating the formation of "effective immigrant networks" does favor less skilled immigrant men who rely on these networks to find jobs (Gallo and Bailey 1996: 204).
7. Research shows that in cases where women who are dependent on their families for legal status "experienced an exacerbation of traditional patriarchal relations" relative to women who enter with full immigrant status (Assar 1999: 87).

organized and created informal associations that act as information-exchange and distribution centers (Gabaccia 1992). Citing the example of Korean immigrant women in Hawaii, Gabaccia explains how they take care of each other's children and shopping, thereby providing "community information" (1992: 48). The importance of these networks lies in the fact that they serve as "communication links" (Gabaccia 1992: 46). They are "crucial for disseminating information…about various institutions of the host society" amongst immigrant women (Gabaccia 1992: 50). These informal associations are most effective in areas where immigrant populations are spatially concentrated, such as in the gateway cities of New York City, Los Angeles, and Chicago (Muller 1993). However, increasingly, especially since the mid-1990s, there has been a diffusion of new immigrants to the suburbs. This is especially true for middle-class Indian immigrants who are increasingly being admitted into the United States to meet a labor shortage in the information technology industry. These immigrants are not waiting, as their predecessors did, to "make it" before moving from cities to suburbs. They are able to afford a house in a middle-class suburb, a car and other amenities right away. This geographic dispersion makes it more difficult to determine not just the fiscal but also social implications of immigration as ethnic enclaves within inner-cities become the limited purview of economically disadvantaged, less skilled immigrants.

This, informal associations can no longer fulfill, among other things, the information needs of middle-class immigrant women. In cases where these associations and networks continue to exist and assist in gaining familiarity with the host environment, they also reinforce traditional gender roles, thereby discouraging women to step outside the roles of wife and mother, in the Indian case (Bhattacharjee 1992). Hence, the need for an exogenous information source (mass media) that provides opportunities for creating formal networks.

2.3 Informing Immigrant Policy that Furthers Adjustment Processes of Immigrant Women

The viability of relying on mass media to reach the population of immigrant women has, paradoxically, been heightened as the reliance on informal networks has declined. The dispersion of Indian immigrants within the United States and across the world has fostered the growth of ethnic media to serve this community, mostly delivered through the Internet and television. Diasporic Indians are increasingly relying on these media to recreate a sense

of home outside of their home country. This reliance on mass media to "connect" with the homeland is most relevant for women who immigrate as wives within the arranged marriage system. They leave behind their support network and experience high degrees of isolation as they learn to live not just with a stranger but also in a strange land with different social and cultural norms.

None of the existing research has examined the role of mass media in the adjustment process of immigrant women. Gumpert and Drucker point to the importance of media habits "in the cultural adaptation and assimilation of immigrant and refugee groups" (1998: 9). They discuss the importance of communication in general, and mass media in particular, in recreating familiar social and cultural contexts within foreign environments and private spaces[8]. As such, mass media serves "immigrants in two major ways: to connect members to the immigrant community with each other and to link individuals to their homeland" (Gumpert and Drucker 1998: 88). Gumpert and Drucker also highlight the uniqueness of each ethnic group's media profile (1998)[9]. This profile usually comprises "material self-produced, imported from countries of origin, and information and entertainment produced by the host country" (Gumpert and Drucker 1998: 91). With increasing communications flows between nations, this material is rarely self-produced but rather imported or downloaded directly from the home country.

This pervasiveness and availability of mass media technology has made it easier for diasporic communities to maintain real-time links with the home country, resulting in the conversion of private spaces into sites for recreating familiar environments. It also blurs the boundary between "electronic space" and "ethnic space" (Vale and Dobrow 1998: 91). This inter-linkage between private, electronic and ethnic space has tremendous implications for the process of adjustment for immigrants, in particular female immigrants for whom the private sphere holds greater significance[10]. Hence, it would be remiss not to consider the implications of these inter-linkages in the adjustment process of immigrants, especially women, given their greater susceptibility

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8. Communication in this context refers to "all cultural artifacts and practices such as dress code, culinary habits, languages, music, and other social activities" (Ebo 1998: 75).

9. Park conducted research in the 1920s and found that ethnic newspapers played an important role in "developing people's ties to the local community and increasing their participation in various settings of the community" (Shim 1998: 154).

to feelings of isolation. As suggested by Gumpert and Drucker, then, does the mass media serve to connect them to the immigrant community and link them to their home community also?

2.4 Linking Immigrant Women and Mass Media

The traditional view of immgration, based on the earlier experience of European immigrants, was that they would assimilate into the host country by adopting its language, culture and traditions. Assimilation implies "disappearance of all values, customs, and behaviors originating in the home culture" (Espin 1999: 21). It ignores the "desire of many contemporary immigrant groups to retain vestiges of their indigenous cultures" (Ebo 1998: 62). The increasing validity and recognition of this desire over time has resulted in a redefinition of the immigrant experience as a process of acculturation rather than assimilation. Acculturation refers to "the sustaining processes whereby minorities are incorporated into the dominant culture" as their behavior and attitudes changes in accordance to those dominant in the host country (Malik 1989: 7). This process is understood to occur over a period of time that varies for each individual as a function of certain exogenous (environment) and endogenous (personality) factors[11].

This research refrains from categorizing the immigrant experience as either assimilative or acculturative. Rather, the term "adjustment" is used to imply individual determination that may either occur over a period of time or continue indefinitely. Adjustment also leaves open the possibility that no acculturation takes place in the case of some individuals. The increasing possibility of this outcome, especially for immigrant women who do not enter the job market, results from the use of mass media for creating private spaces that virtually simulate the home country environment.

As mentioned earlier, there is a dearth of knowledge about the role of mass media in assisting immigrant women in accessing

10. The restriction of women within the private - household and religion - has been present since time immemorial. As such Indian women have identified the household as the primary site of oppression ever since the beginning of feminist literature around 6th century B.C. (Tharu and Lalita 1991). This subordination became formalized and institutionally enforced by the Indian patriarchal structures since British colonial rule in 1757 when the definite public-private divide of the West (Church-State) was transferred to Britain's colonized territories including India (Carroll 1989).

11. Research has established the followed stages that a typical immigrant passes through during the acculturation process: "initial joy and relief, disillusionment with the new country, and, finally, acceptance of the good and the bad in the host country" (Espin 1999: 20).

information, reducing isolation, and establishing networks. This gap in knowledge persists despite findings that "alienation and isolation tend to stimulate heavy media consumption" (Hirsch 1981: 32). Hence, information on the process of adjustment and its relation to media use can be invaluable to the countless women who arrive in foreign lands and face the challenge of finding information on everything from groceries to day care to employment. As mentioned earlier, the process of adjustment is unique for each individual, and is also affected by his or her external environment. However, the ubiquitous nature of mass media makes it an efficient and potentially invaluable source for disseminating information valuable to immigrant women's adjustment process.

2.5 Immigration and Women's Adjustment Process

All immigrants experience the adjustment process, but it is more challenging for those women who come here as wives because they have little choice of place of residence and exposure to others, at least in the beginning (Espin 1999). This exacerbates their feelings of loneliness, common among immigrants as a whole (Ramanujam 1997, Gabaccia 1992, Kelson and DeLaet 1999, Espin 1999)[12]. Hence, the immigrant experiences of women are more arduous relative to those of men. Dasguta points to the loss of the "female world" as being the central cause of immigrant Indian women's sense of isolation and alienation (Dasgupta 1989). The female world includes a woman's long-held female friendships and relatives. This female world defines her identity and supports her existence prior to marriage and immigration (Dasgupta 1989). One of the most challenging tasks for immigrant women is to begin re-interpreting interpersonal relationships that up until their immigration were defined by existing familial structures (Ramanujam 1997). They have to do this, for the first time in their lives, "without the support system provided by the other female members of her family" (Dasgupta 1989: 140).

In her work on the experiences of immigrant women in the nineteenth and early twentieth centuries, Seller notes that most of their marriages were "social and economic arrangements" that made their adjustment process difficult (1994). This occurred not only because these immigrant couples faced new challenges, but also because they had to redefine established role assignments

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12. This is not to suggest that men do not experience similar feelings of isolation and alienation. Rather the point is that women who immigrate as wives are more likely to have these feelings, as is well established by existing research.

without the help of a supportive network of friends and community (Seller 1994). All of this resulted in feelings of loneliness and alienation among immigrant women (Weatherford 1995). Experiences of twentieth century Indian women who immigrate as wives continues to reflect these realities because the majority of Indian marriages continue to be "social and economic arrangements" (arranged marriages) that makes the possibility of isolation significant. Gabaccia observes that the "most negative results of migration are the temporary or permanent loss of kinship support system", especially for those who are unable to tap into community networks which are fast disappearing in middle class immigration that is characterized by suburbanized dispersal (1992: 46).

However, not all experiences of immigrant women have been negative. There is a body of literature that documents the gains in power that immigrant women have been able to achieve after immigration owing mostly to the absence of traditional norms and elders that enforce women's secondary status[13]. Women have taken up jobs outside the home and renegotiated their roles with family and the community, thereby allowing them to take on decision-making positions (Gabaccia 1992, Rayaprol 1997). However, this occurs only in the presence of supportive spouses, familial support networks, and the self-empowerment of women (Kelson and DeLaet 1999). The absence of one or more of these factors makes the immigrant wife dependent on her husband and other community members financially and emotionally.

The process of redefining roles and identities arising from the immigrant experience is a complex one which is affected by numerous inter-related factors (Espin 1999, Ramanujam, 1997, Mani 1993, Bhattacharjee 1992, Gabaccia 1992, Dasgupta 1989). It involves a non-linear and continuous series of changes undertaken by all immigrants, including women, whereby decisions are made on the extent to which behavior is altered with the aim of fitting into the dominant host environment (Sodowsky and Lai 1997). Individual-specific experiences and exposures affect these decisions. However, regardless of individual-specific factors, all immigrant women are exposed - in varying degrees - to the American world via mass media.

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13. It should not be inferred that women in India lack total agency and are unable to obtain employment. Rather the point is that they have greater probability of altering traditional gender roles owing to America's relatively more egalitarian social environment and structures.

2.6 Mass Media and Attitude Change

The majority of the literature on mass media that address women as a separate unit of analysis concerns itself with the negative portrayal of women (Prasad 1994, Joseph and Sharma 1994, Jha 1992, Kahn 1996, Valdivia 1995) and their lack of inclusion in content determination (Andersen 1997, Sawant 1998). Mass media research has also established that women, along with other groups that have been marginalized, are information-poor. That is, they are less likely to receive information then men owing to structural (access to mass media, social norms) and individual (cognition, motivation) factors (Delli, Carpini and Keeter 1996, Bartels 1996). The information-poor status of women not only highlights the need to address structural-level factors to increase the probability of women receiving information, but also the fact that women are more likely to be influenced by information from mass media. On the other hand, as postulated by the dependency theory, the less clear people's frame of reference (the lower their store of pre-existing information), the greater their dependence on mass media communication (Zaller 1992, McGuire 1968, Converse 1962, Ball-Rokeach and DeFleur 1986, Eilers 1994). Since immigrant Indian women are likely to have a low store of information about American society and they are more likely to be information-poor in general, theory would suggest that mass media should play an important role in their formation of attitudes and opinions within the context of their new environment.

The literature on attitude change arising from mass media has gone through various phases through the years. It began, in the 1940s and 1950s, with the "hypodermic needle" model, which postulated that mass media had direct, immediate and powerful effects on a mass audience (Schramm 1964). Since then there have been extensive regional and national experiments that have refuted this obsolete theory (Mody 1991). Later, the two-step model was proposed, which argued that the first step is the feeding of information through mass media. At the second step there are a multitude of factors, both endogenous and exogenous, that come into play in determining whether an individual assimilates and processes that information. In the end, individual-level factors of awareness and predisposition interact with message-level factors of intensity of change-inducing messages and familiarity/unfamiliarity of messages to determine attitude change (Zaller 1992).

A third theory of information dissemination and attitude change

is that of homophily-hetrophily (Rogers 1983). Homophily is the degree to which pairs of individuals who communicate are similar in certain attributes, such as beliefs, education, social status, and the like. Homophilous channels are the most effective for interpersonal communication. The importance of homophilous communication and interpersonal networks is also highlighted by the social learning theory, which seeks to explain how individuals change their overt behavior as a result of communication with another individual. In addition, the existing social and communication structures and networks either impede or facilitate attitude change (Rogers 1983). A communication network consists of interconnected individuals who are linked by patterned flows of information. This information is usually supplied by a hetrophilous source in relation to the viewer. Owing to their hetrophilous nature, the nature of the messages tends to be inappropriate to induce attitude change. Hence, the need to determine the information needs of immigrant women using homophilous channels and disseminate it via mass media. This research is the first step in gathering information from middle-class immigrant women that allows for the design of appropriate messages that are aimed at empowering them via an increase in their knowledge store about their host country.

The use of appropriate messages as a mandatory prerequisite for inducing attitude change via mass media is supported by the theory of priming. This theory states that the greater the intensity of media coverage of some information, the greater is the likelihood that the public will alter their decision-making criteria by assigning more weight to that information (Iyengar and Kinder 1987). There has been considerable research supporting the presence of priming (Price and Tewksbury 1997, Etman 1992, Huddy 1997, Mendelberg). The proposition is that if pertinent information, as defined by the immigrant women, is provided to them through mass media, they will use this information in making decisions that could help further their process of adjustment.

2.7 Research Framework

A strong likelihood exists that mass media is an effective vehicle in providing pertinent information to immigrant women in order to assist them in the adjustment process.

The framework presented in Figure 1 outlines the research presented in this article. Is exposure to and use of mass media in

any way associated with the employment and degree of adjustment of middle-class immigrant Indian women in Detroit? Being employed outside the home provides access to formal networks, which have been established by literature to be positively associated with immigrant women's adjustment. Access to family members in the United States (informal network) is considered to be independent of mass media and employment but may play a significant role in adjustment. Put simply, as the number of family members increase, so should degree of adjustment.
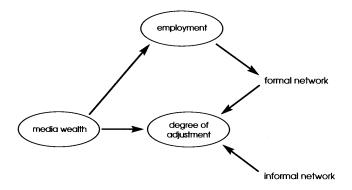
Figure 1

The aim of this research is to examine the viability of using mass media as a planning tool in order to provide immigrant women with pertinent information to assist their adjustment process. It relies on data collected from in-depth interviews with ten college-educated Indian women who have immigrated as wives to the Detroit metropolitan area in the past decade.

3 Data Collection and Measurement

Ten immigrant Indian wives who immigrated to the United States in the past decade and had at least a bachelor's degree were interviewed in the Detroit metropolitan area.[14] In-depth, face-to-face interviews were conducted with the subjects. The interviews were conducted in keeping with ethical standards (Lofland and

14. A total of 15 women were interviewed. The first three interviews were for the purposes of pre-testing. Two had to be dropped from the sample owing to violation of one or more controls (education and period of immigration).

Lofland 1995, Sieber 1992). Out of the sample of ten subjects, five worked outside the home while the other five did not. All women, with the exception of one who was also the most recent immigrant, were mothers. The overall profile of the interview subjects was fairly homogenous: they all belong to middle class families and come from North India;[15] each of them had an arranged marriage and was 28-32 years old.

The educational control was instituted to ensure sampling selection from particular strata of Indian immigrant society for whom job status is not equated with economic necessity and who are likely to have unfettered access to mass media sources. A sampling from another strata, such as low skill workers, would produce different results insofar as entering the labor market may have been necessary for both spouses. Furthermore, research indicates that the significance of informal networks increases as the skill set of immigrants declines (Loveless, Surette and Norris-Tirrell, 1996). The marital status control serves the purpose of capturing that section of the female population - married women - most susceptible to isolation and family dependence for legal status.

Snowball sampling technique was used to obtain the sample.[16] The sample was started through a personal acquaintance and snowballed from there covering a fairly large section of the Detroit metropolitan area including Canton, Novi, Bloomfield Hills and Troy. In most cases, each interview led to at least one contact. It is understood that using snowballing will not yield a representative sample (Press 1991). Since this preliminary research is intended to clarify and explore future research questions, this limitation should not pose any serious threats to the validity of the results.

The data were reviewed to identify and develop emergent categories (Glaser and Strauss 1967). These categories - media use, media exposure, level of awareness from mass media - were used to measure "media wealth," which is the proxy measure for the affect of mass media. Media wealth categorizes subjects as

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15. This is an important control since there are regional variations in India, especially between North and South, which lead to significantly different attitudes on gender roles and behaviors.

16. The snowball technique refers to a convenience sampling method. "In snowball sampling, one starts with a member of the desired group and asks that person for a friend, neighbor or relative in order to continue interviewing within the same class group. In this way, one obtains an informal sampling of a social group" (Press 1991: 179). Even though it does not yield a representative sample, it is an excellent tool for exploratory studies such as this one.

being either media rich or media poor. Those who have a code of high in at least two of the three measures (media use, media exposure, level of awareness) are considered media rich; otherwise they are media poor. Degree of adjustment was computed by transforming the scaled responses into standardized scores, i.e., responses for self-worth and isolation[17] were averaged to obtain mean scores. The level of isolation is assigned greater weight relative to self-worth because the former is a direct measure of adjustment, whereas self-worth captures adjustment indirectly (Espin 1999). Based on whether subjects had high (low) level of isolation and self-worth, they were placed in one of the four cells: very well adjusted (low isolation and high self-worth); somewhat well adjusted (low isolation and low self-worth); not well adjusted (high isolation and high self-worth); not at all well adjusted (high isolation and low self-worth). For the purposes of this analysis, given the small sample size, subjects are aggregated as being either adjusted (very well adjusted or somewhat well adjusted) or not adjusted (not well adjusted or not at all well adjusted).

4 Results

Table 1 summarizes the results and indicates that the majority (60 percent) of the women are adjusted, of whom most (67 percent) have jobs. The same percent (67 percent) of adjusted immigrant Indian women are also media rich. Of those who are not adjusted, none has an extensive local familial (informal) network while those who are adjusted have ten or more family member's present locally. Hence, both media wealth and employment are associated with adjustment. Local personal network has an independent and significant effect on degree of adjustment.

Overall, the findings suggest that media wealth, employment and degree of adjustment are, in fact, associated. There is also a strong positive association between local familial contacts (informal networks) and degree of adjustment. Employed and media rich women with extensive local familial contacts are most likely to be adjusted. The prominence of mass media in the adjustment process appeared at different points throughout the interview process. A number of women indicated that what helped them most in learning about American society were talk

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17. Questions for measuring self-worth (Robinson and Shaver 1978: 83) and isolation (Robinson and Shaver 1978: 278) were obtained from established scales for measuring these two concepts.

shows or television in general. Two respondents also mentioned relying on television for making parenting decisions because they are not sure about how to handle their children "because of the difference in environment."[18] When they watch "parents talking to their children on TV...you feel I may have been wrong" in disciplining too strictly. There is no other point of reference to assist in their parenting in a culture where they have to "deal with [children] very differently from how our parents dealt with us."

Table 1. Adjustment Variables

Degree of Adjustment	Employment	Media Wealth	Informal Network
Not adjusted	N	Poor	1-5. Local
Not adjusted	N	Rich	>10. Not Local
Not adjusted	N	Rich	1-5. Local
Not adjusted	Y	Poor	6-10. Local
Adjusted	Y	Poor	>10. Local
Adjusted	Y	Rich	>10. Local
Adjusted	Y	Rich	>10. Local
Adjusted	Y	Rich	>10. Local
Adjusted	N	Rich	>10. Local
Adjusted	N	Poor	>11. Local

As postulated by dependency theory, the reliance on mass media to make inferences and form attitudes is greater among women who do not work outside the home since they have a greater need for information and consequently a "stronger dependency" which increases "the likelihood that the information supplied will alter various forms of audience cognitions, feelings and behavior" (Ball-Rokeach and DeFleur 1986: 85). This manifests itself in their perceptions of American women as a monolithic group with certain stereotypical characteristics that were absent from the observations of women with jobs. The first stereotype of American women emerged when stay-home women were asked why they would like to get a job. The question captured their desire to fit in, "be in touch with things" and do what "all American women do", i.e., have jobs. The fact that not all American women work outside the home points to the reliance by these immigrant Indian women on media to draw inferences and form opinions about American society. One previous study has noted that "through the mass media...immigrant Indian women [believe that women in America] have the right and even

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18. In keeping with the promise of confidentiality to the subjects, none of the quotations from transcribed data included in the paper identify the subjects by name.

an obligation to participate in the labor force" (Dasgupta 1989: 146). Another stereotype that emerged is of American women being self-centered and not very good mothers. For instance, one respondent felt that "maintaining figures" is a primary concern for American women which makes them focus on themselves and rely on daycare centers for the upbringing of their children.

However, regardless of job status, all participants are using certain mass media to better understand their host environment. The Internet, television and newspaper appear most useful in this regard. Participants mentioned using the Internet to access information on recipes, stocks, employment opportunities, and day care. The newspaper is used to find jobs, cars, real estate, and to find out about local events to take their children to. Even as a number of participants expressed displeasure at not being able to access more international news, they appreciated some of the local focus insofar as it allowed them to "know what is going on" in their localities.

At an individual level, American mass media poses a contradiction to the idealized images of the Indian woman presented in the ethnic media which propagates the "crucial link between the unity of the family and the unity of the nation" (Mankekar 1993: 478) by relying on "formulaic ingredients" that place women within the framework of the mother and wife (Natarajan 1994: 78). American mass media introduces another dimension for immigrant Indian women insofar as it paints a picture of women as a superhuman who easily juggles multiple responsibilities, is a consumer in her own right and is a highly sexualized being (Macdonald 1995). The shift in images "provokes a thought process that might not have happened otherwise" for immigrant Indian women and brings about "a new way of thinking" for them. This might be what results in the development of bi-cultural identities[19] of immigrant women, as they use these "new ways of thinking" to exercise greater individual choices while retaining traditional familial roles and behavior (Roland 1997).

American mass media also serves to cement the desire of immigrants to protect their children from the influence of

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19. Bi-cultural identities refers to the situation in which immigrant women "become more openly assertive and display more initiative and independence than is characteristic in an Indian setting, while still retaining much of the sensitivity, emotional connectedness, and involvement in hierarchical relationships in the Indian family and groups" (Roland 1997: 155).

Americanization. The stereotypes perpetuated by American media of American men and women as sexually promiscuous with "little morals" serve as an impetus for the participants to turn toward ethnic media. It derives from their desire to ensure that their children grow up with "Indian" morals and values so they "learn that dating a new guy or a new girl everyday is not going to resolve their problems." In order to ingrain these Indian values, the women turn to ethnic mass media including Zee TV[20] and videos to make them understand "how we are."

Most women who do not have a subscription to Zee TV expressed a desire to get it in order to "teach my kids how we are" and to ensure that they are imbued with the "same moral values that my parents gave me." The popularity of Indian cinema is another vehicle for keeping the private spaces free of "contamination by dominant Western values" (Bhattacharjee 1992: 38). Television is also used to maintain a virtual connection with "back home" via Zee TV. Respondents use the Internet too, to get daily news feeds, "chat with my sister in India... catch up on Hindi movie gossip" and "Net-to-Phone[21] for [making] international [telephone] calls." On the other hand, the weekend Hindi programs on the radio are used not so much to create virtual links with India but to reinforce a distinct community identity in the United States. Most respondents mentioned listening to the programs in order to "know more about community activities", showing of Hindi movies and plays, ethnic and travel services. Media, then, is important not just in the adjustment process of Indian women but also in ensuring against "total assimilation into an alien culture" (Ramanujam 1997: 147). Watching Hindi movies on video, Zee TV, or International channel[22] appeared as another popular source of blending electronic, ethnic and private spaces.

The presence of mass media appears to bring "about a new way of thinking" for immigrant Indian women in the sample. But it also assists them in making decisions as they learn "about new products" and how to make "appropriate" parenting decisions.

20. Zee TV is said to be "the world's largest Asian television network", covering Asia, Europe, the USA and Africa, catering to the 24 million strong Indian diaspora (Thussu 1999). Its programming comprises Hindi films and other film-based shows, serials, music countdowns and quiz contests.

21. Net-to-Phone is the provision of a service by certain Web sites whereby people can connect to these sites by making a domestic phone call. These Web sites then make a telephonic connection to India for those logged on at very low rates. Hence, people in America can talk to people in India at a price comparable to that of a domestic telephone call.

22. International channel, a cable channel available in Detroit metropolitan region, plays Hindi movies on Sunday afternoons.

Mass media, then, works both at the individual and societal levels. It appears to have a much greater impact in altering certain individual behaviors: desire or actuality of gaining employment; making independent household decisions, and dealing with depression ("This one time I was really depressed and then I watched this show on TV which talked about the power of prayer and just like that my depression was gone"). However, the mass media has little impact at the societal level where culture and tradition continue to enjoy a stronghold, as manifested in the desire of immigrant women to be good mothers and have "a peaceful family life." Overall, American mass media is relied on to make individual-level changes and decisions, while ethnic mass media sustains family-level and societal priorities and behavior.

The fusion of the two patterns is epitomized in the desire to seek employment. Of those women who did not have a job outside the home, all expressed a desire to either be employed or go to school. Their primary motivation was to be financially independent, but also the need to feel more involved in American society. One respondent explicitly stated the desire to get a job to not only feel more adjusted but also because it would allow her to be a better mother: "...raise my children right by blending over here by doing a job, [taking] care of the house and [raising] my kids right." Of the four employed women with children,[23] three have chosen jobs and careers that allow them "flexibility" and "convenience" in terms of balancing family and work even though it is not "what I want to be doing." They mentioned how they would rather have different careers in business administration or "something in computers...but this job is very flexible so I like it for that." The one person who "always wanted to do a job like this one" regrets her job choice because of its demands on her time and wished she had "done something in education so I could have some more time with [the] kids."

Mass media is a fountain of information for these immigrant women as they learn to operate within a new milieu. It is used for a variety of purposes including the following: radio to find out about traffic and weather; newspaper to find jobs, real estate, and events to take children to; television to "learn about new products" and handle specific personal issues including parenting and depression; Internet for "accessing everything" from "stocks" to "recipes." Hence, the mass media is a valuable source for coping with their new experiences. At the same time, ethnic mass

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23. The fifth subject who had a job outside the home does not have any children. She was also the most satisfied with her job.

media from the weekend Indian programs on radio to Zee TV and the Internet also assist in creating a pseudo-environment for these women that heals some of the anxieties about being an Indian woman in America and assists in relaying and retaining traditional identities and culture.

Mass media also provides opportunities for women to further their adjustment process in the new host environment that do not rely upon extensive face-to-face interactions. The availability of such opportunities is beginning to be recognized by some immigrant women. For instance, one respondent mentioned that she would like to start an "online business from home." Hence, emerging communication technologies are promising spaces for immigrant women to explore ways to challenge traditional public-private distinctions and take on secondary roles even as they continue to engage in primary identification as wife and mother.
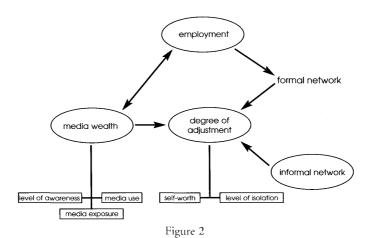
This study confirms past research that established the positive association between labor market participation and adjustment of middle-class immigrant women. There is a definite association between employment and degree of adjustment. All, except one, of the five women with a job is adjusted. The exceptional case is also the only woman in the group of working immigrant women who has a relatively small personal network. Most (60 percent) of the women without jobs are not adjusted. Hence, both family and employment appear to be strong predictors of adjustment levels for these middle-class immigrant Indian women with mass media working in the background as a tool for making individual choices and changes, passing along Indian values to children, and virtually accessing "home". Mass media, then, allows for virtual transnationalism, thereby supporting their dual desires to be a "good" mother/wife and a financially independent individual.

In a nutshell, the results suggest that women in the sample use mass media not so much to connect to immigrant communities but to learn about their host environment. In fact, they expressed a need for more information in order to increase their extent of engagement within the Indian community. As noted by Gumpert and Drucker (1998), they use the mass media to link to their home countries. Furthermore, the conflicting media messages presented in ethnic and American media complicate the relationship of these women vis-à-vis mass media. The conclusion is that while media plays a central role, its ability to determine attitudes for these women is limited to the individual-level owing to the continual legitimization of traditional gender roles via ethnic media.

4.1 Revised Theoretical Framework

The following framework (Figure 2) points to the importance of multiple factors in contributing to immigrant Indian women's adjustment process. This does not claim to be a comprehensive model, but rather one which focuses on the effects of employment and mass media on adjustment. The research results provide evidence for the positive association between employment and degree of adjustment. The findings also indicate the significance of media wealth in adjustment insofar as the majority of adjusted women are also media rich. Furthermore, most of the media rich women are employed, thereby suggesting that women with jobs are more likely to be media rich and adjusted. As such, employment (access to formal networks) and media wealth are positively associated with each other and adjustment. In addition, personal networks have a significant and independent association with adjustment. Hence, the research results confirm the proposition while revealing a greater than expected significance of media wealth.

Figure 2

5 Determining Information Needs

Having established the importance of mass media to middle class immigrant Indian women in Detroit, the ability to leverage it for planning purposes depends - according to the two-step communication model - on the transmission of programs that provide them with the appropriate information. As mentioned earlier, the first step in the two-step communication model has to be to determine what information will be provided via mass

media. In order to do so, participants were queried about their information needs. The importance of this step derives from the fact that effective planning programs have to take into account the user-side definitions of needs and issues. As noted by Trueba, "U.S. immigration policy…is a policy fundamentally based on one side of the border, without any recognition of the post-national space immigrants have created for themselves as the most effective adaptive strategy to economic instability and bi-cultural influences" (1999: 136).

When asked, at various points in the interview, whether they felt a sense of information-loss owing to their immigration, most participants agreed but also pointed to the Internet as a savior. As observed by one respondent, "You can go to the Internet for whatever you think you are missing." On the other hand, another respondent observed that there is a constant search for information because "it makes it different that we are not from this society so we don't have that information at hand which we would have, had we been brought up in this society."

When asked to outline perceived and actual information gaps, a number of respondents gave similar answers, which are succinctly captured in the following response: "Until I have more information, I think I have enough. And then I get more and then I think I didn't have enough." This points to the difficulty in obtaining data on this issue because most of us - as mass media consumers - do not think explicitly of using or needing information even though we may be relying on it heavily (Gans 1980). Hypothetical questions and probing for specific examples of use in the interview guide[24] were used to encourage participants to think about these possibilites. Surprisingly, there were some who were already highly aware of the effects of mass media on their lives and thinking and had no difficulty articulating their information needs. As observed by one participant, television programs are "continuously changing us" and making us "aware of facts."

Some of the participants felt an acute need for information on everything from "professional career to being a mom." Upon

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24. Example:
    a)   If you could get to decide what types of programs get shown on TV, what programs would they be? For example, would you like to see more programs that cover children's topics, household tips, news or something else?
    b)   Have you ever used information from a newspaper to help make a decision or change in your life? For example, did a newspaper advertisement lead to a job?
    -   If yes: What was the information and what did you use it for?
    -   If no: _

further discussion, a number of specific information gaps appeared, highlighting a dearth of information for immigrant women on ways to handle a foreign culture. Some felt they would like more information on how women handle their multiple priorities including family and housekeeping. One respondent mentioned wanting more information on "schedules, kids, how to cope with stress" and others added such topics as parenting, housekeeping, and how other women balanced the different demands in their lives. Another respondent observed that she would like information on "women's things like their career, how they are living, their social lives."

Some mentioned the desire to get more information "about community activities" such as how to participate in events. This is information that is not currently provided in the weekend Indian radio programs. Those who do not have a subscription to Zee TV expressed a desire to get regular news feeds from India. Most respondents feel the lack of international news acutely, especially when they compare it to the quality of world news they were able to access from Indian newspapers. This appears to have a significant effect on women in that it underscores the distance of United States not only from the world but also from India. One respondent expressed it: "I feel as if I am in my own cocoon. I would like more exposure to [international news]."

6 Maximizing Likelihood of Information Assimilation

The research findings indicate the centrality of employment in the informational needs of immigrant Indian women. The first issue to consider is the difference between women who work and those who do not. Working women in the sample are more willing and able to use formal (mass media) sources of information to learn about their host environment and to make personal decisions. On the other hand, women in the sample without jobs are more likely to rely on informal (personal friends and family) sources to obtain information. Even when accessing other sources like the Internet, they expressed a desire to first "talk to someone who's gone through it." This points to the need to undertake information dissemination to immigrant Indian women via multiple channels that include certain homophilous ones. The choice of homophilous channels can range from identifying opinion leaders who are willing to spread information to the community (Bordy 1991) to using ethnic media such as Zee TV and the weekend radio programs.

The second point is that even as there is a certain set of information that is desired by immigrant women regardless of employment, there is another set that is specific to their job status. Working women expressed a greater desire to find out about ways to cope with stress and balance multiple responsibilities. Stay-home women are more interested in the lifestyle of American women along with finding information on employment and school admissions. The set of information that is independent of job status includes ways to get involved in community activities and obtain international news.

Those who prefer personalized sources of information felt the information gap most significantly. As noted by one such respondent: "I want to go back to school but I can't find anyone to tell me what I should be doing...I need that." Interestingly, women who work outside the home mostly mentioned their shortcomings in regard to job skills when mentioning information gaps. They did not appear to feel "cocooned" or desire personalized sources of information. This points to their successful use of mass media to satisfy their information needs.

It is also interesting to note that the women in the sample expressed the desire to rely on mass media not only to create formal networks (employment), as proposed earlier, but also informal networks (information on community participation). This points to the potentially multiplicative role of mass media in assisting immigrant women in their adjustment process.

Figure 3

The model shown in Figure 3 attempts to capture these informational needs of immigrant Indian women in the United States as determined by this research.
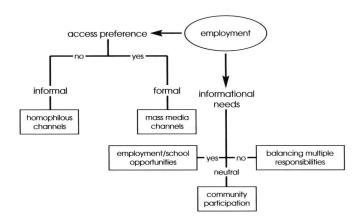
It is important to note that the information should be aimed at possible ways to reduce the isolation levels of immigrant women and not be overshadowed by ways to make them more "American." This stems from the understanding that preservation of culture and tradition are crucial in defining the identities of diasporic communities and their members (Bhattacharjee 1992, Ramanujam 1997, Elovitz and Kahn 1997, Booth, Crouter and Landal 1997). In fact, the research findings also underscore the need to frame programs that prime the family associations in immigrant women's schema owing to its centrality in the lives of these women.

7 Planning Issues

There has been no specific use of mass media either at the local or federal policy-making level with regard to immigrants. The depictions of Indian immigrants on mass media provide conflicting messages. On the one hand is the image of the "model" community that makes positive contributions to American society (Bhattacharjee 1992). On the other, Indians are portrayed in a negative light as non-English-speaking 'dot' people who drive taxis and own party stores and motels. In fact, the images of women from developing countries, including India, conjure up "images of the veil, the harem, the sati, the illiterate, the victim, unable to control her own destiny" (Valdivia 1995: 197). The effects of this stereotyping have not been examined in any systematic manner. Nor has there been any attempt to counter negative portrayals of Indians. In the past, some communities have undertaken successful experiments with ethnic media. In particular, the Chinese community in New York City, in the 1980s, operated a community cable television channel to provide local information and counter the negative stereotypes of Chinese immigrants dominant in mainstream media (Gumpert and Drucker 1998). However, the current viability of relying on locally-produced ethnic media to further the adjustment of immigrant groups is debatable since "immigrants [these days] are flooded with an array of programming (taped or live satellite feeds), records, videos, and print media imported directly and expeditiously from 'home'" (Gumpert and Drucker 1998: 79). What, then, are the options with regard to the use of mass media?

This research has established the importance of mass media and employment in the adjustment process of middle class immigrant

Indian women in the Detroit area. It has also provided an outline of information defined as pertinent by these women, including issues related to stress, parenting in a new culture, international news, and ways to get involved in community activities. Since the probability of immigrant women accessing this information via mass media is dependent on their comfort with using formal sources of information (which in turn is associated with employment status), the most viable dissemination process must rely on multiple channels. In addition to mass media, certain homophilous sources such as Zee TV, International channel, and the weekend Indian programs on radio may be relied on to pass along the information.

Extensive research has established that "the basic thrust of federal policy has been to deny recently arrived immigrants, whether legal or illegal, access to most mainstream public benefit programs" (Fix and Zimmermann 1997: 270). As remedies, some suggest merely "increasing access to mainstream programs" (Fix and Zimmermann 1997: 276) while others point to the need to alter existing highly individualistic "institutional structures" that pose "greater obstacles [to immigrants, especially women in the] realization of their economic potential" (Reitz 1998: 223). It has also been suggested that the various institutional factors that impact immigration, including labor markets, education, social welfare, and immigration policy, should "not be examined in isolation from each other" but considered "components of an institutional system" that works against certain immigrants including women (Reitz 1998: 6). However, as noted by Espin, "women immigrants are not only victims of structural forces or robots computing cost benefits of their moves. Rather they are human agents discovering and creating themselves anew through their nomadic experiences" (1999: 10).

Therefore, in determining program changes and their access to immigrants, policy makers must take into account the experiences of immigrant women. The debate must widen from merely calculating net economic changes to federal and local governments to including the specification of information needs of immigrant women. In other words, the first step must be to determine what information can be provided via mass media. This research suggests that mass media is used by immigrant women for everything from such mundane tasks as making household purchasing decisions to making parenting choices. Media wealth is positively associated with adjustment. As mentioned, the majority of the adjusted women are media rich. Media wealth is also associated with employment; women with

jobs are more likely to depend on formal sources of information and hence be media rich and better adjusted. Media poor women, who also tend to be stay-home women, prefer to rely on informal sources of information. A number of them emphasized their desire to talk to "a live person [because] that would be more helpful." This arises from their inexperience with structural and interpersonal systems in the host country, making the process of finding certain information "confusing." Since employment, the other associative variable of adjustment, cannot be manipulated,[25] the leveraging of mass media to provide the pertinent information - as defined by this research - provides a cost-effective and powerful tool to designing policy aimed at furthering the adjustment process of immigrant women.[26]

Such a policy alternative dramatically shifts the argument within immigration literature that is heavily reliant on either economic and political logic or psychological reasoning. It combines both aspects insofar as using the cost-effective channel of mass media to improve the productive capacity of the immigrant female population in the United States with the resultant impact of furthering the adjustment process of this population. The fact that Indian immigrant women are a growing constituency also has implications for the private sector. The media has traditionally targeted women in their capacity as consumers (Douglas 1995). The presence of a "new" market of Indian immigrant women for corporate America should leverage funding for mass media channels that provide pertinent information for these women. Hence, providing pertinent information via mass media that has the potential of being funded by the private sector, is one way to ensure that immigrant women extend and create their formal networks. These networks will not only assist in their adjustment process but also allow them to "apply for permanent residency status on her own behalf, regardless of marital status" thereby reducing their dependency on family sponsors (Kelson 1999: 214).

The basic idea is simple: the influence of mass media on the individual decisions of middle-class immigrant (Indian) women can be used to provide programs designed to meet their information needs, to assist them in combating loneliness and furthering their adjustment process. As mentioned, the

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25. Since the choice to take a job is closely related to immigrant women's sense of being good mothers, it is not something that can be altered via policy changes.
26. The cost effectiveness of mass media in reaching the Indian immigrant population is increasingly true as this group moves away from ethnic enclaves within cities to suburbs (Gumpert and Drucker 1998, Smith and Edmonston 1997).

importance of planning programs that further the adjustment of immigrant women lies not just at the individual level but also has positive benefits for society. The ability of succeeding generations to adjust within their adopted country is a function of how well their parents, especially mothers, have adjusted to their host environment: "patterns of adaptation of first generation set the stage for what is to come" (Portes 1997: 814).

This article is an initial attempt to establish the role of mass media in the adjustment process of middle-class immigrant Indian women and identify the areas where they feel a dearth of information. The growing constituency of immigrant Indian women combined with the potential power of the mass media in channeling immigrant women's feelings of loneliness to more productive and adjustment-furthering activities, such as employment and community participation, justifies pursuing this area of research further in order to better inform future planning and policy efforts. These efforts have to be based at the local level so that they are able to maximize the assimilation potential of the media messages. It is time for federal policy to move away from its extreme hands-off stance with regard to immigrants and instead acknowledge the need to provide assistance to immigrants after arrival, especially to those whose dependent status makes them vulnerable to emotional, physical and financial abuse.

Research has established that "in cases where women migrated with full immigrant status, they were able to negotiate relatively egalitarian family relations" and adjust better than their peers who immigrate with either conditional or undocumented status. Women entering under the family reunification law have a conditional status and it is inappropriate that they are prevented by law from accessing most public services and amenities. Using the mass media to reach this populace in a cost-effective manner and educate them about the ways in which they can pursue a path toward emotional, physical, and financial independence can and will prove to be invaluable to American society at large. The connections and linkages that mass media affords immigrant women can serve as strong building blocks for planning and policy programs aimed at assisting immigrant women during their adjustment process in the United States. $\boxed{P}$

27. Research indicates that women are relied on heavily by their husbands in order to establish and sustain self-employment activity (Pedraza 1991, Kelson and DeLaet 1999). "Immigrant women make an invaluable contribution to the development of immigrant enterprises" by donating their labor and time for free (Pedraza 1991: 317).

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Workforce Development Institutions for Low-Skilled Adult Workers

Malo Hutson

This article analyzes the role that workforce development institutions play in the "new" information-based economy. It compares and contrasts the differences between a community college computer skills training course (Roxbury Community College) and a community-centered computer skills training program (Mandela Computer Learning Center) with regards to their institutional resources, clientele, and ties to local and regional employers. Based on these two case studies, interviews and participant observation, it concludes that Roxbury Community College (RCC) and Mandela Computer Learning Center (MCLC) serve two different purposes and populations.

1 Background

Over the last thirty years there has been a major shift in the
United States away from an industrial-based economy to an
economy that is increasingly reliant on information and
knowledge-based skills. As a consequence, U.S. workers now
need to obtain computer-related skills in order to remain
competitive in today's labor market. A study conducted this year
by the Information Technology Association of America (ITAA)
found that employers will create a demand for 1.6 million IT
workers (ITAA, 2000). Moreover, it is estimated that 60 percent
of all new jobs created during 2000 will require technology skills
(Breeden and Kisler, 1998). Another study conducted by Paul
Osterman on the skills, training, and work organization of
American establishments, suggests that professional/technical
jobs are becoming more complex, with a clear trend towards
higher skills (Osterman, 1995).

Unfortunately, the rise of the new knowledge-based economy,
influenced by technological innovations and the increasing desire
by firms to increase the production of information, has left
behind a large section of adult workers, most of whom are the
poorly educated, school dropouts and minorities (Wilson, 1996).
Consequently, a substantial proportion of economically
disadvantaged adult workers in the U.S. have limited
opportunities for job mobility and have a difficult time obtaining
jobs that provide both livable wages and benefits. This situation
has created a "dual city" in which there is an increasing
bifurcation between well paid highly-skilled, highly educated
workers on one end and low paid low-skilled, poorly educated
workers on the other (Castells, 1989). More importantly, the
growing skills gap and increase in economic inequality[1] between
high-skilled and low-skilled workers is leading to an increase in
gentrification and spatial segregation in major U.S. metropolitan
areas. As Castells (1989) argues in his book *The Informational
City*:

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1. See Levy, Frank. *The New Dollars and Dreams: American Incomes and Economic Change.*
Russell Sage Foundation. New York. 1998.

> [A] large proportion of the population, made up of low-level labor forming the legions of clerical and service workers of the informational economy, insert themselves into micro-spaces, individualizing their relationship to the city, which becomes reduced, in their living experience, to a tenuous connection between home and work, in the vain hope of not being whirled into the changing dynamics of community structuration and destructuration. Structural dualism leads at the same time to spatial segregation and to spatial segmentation, to sharp differentiation between the upper level of the informational society and the rest of the local residents as well as to endless segmentation and frequent opposition among the many components of restructured and destructured labor. (p. 227)

In the new knowledge-based economy, poorly educated adults and those with limited skills struggle to increase their human capital; a failure to do so could potentially result in increased marginalization - not only economically, but socially and politically as well.

The bifurcation between low-skilled and high-skilled workers is amplified because while low-skilled adult workers seek to re-train themselves, the federal government has failed to develop a strong national employment policy that would support such efforts. Although there are some government sponsored job-training programs and intermediary agencies that try to help low-skilled workers upgrade their skills and find work, these programs have largely been ineffective[2]. The federal government:

> Has by default taken a more passive approach, with policies that simply dole out funds to those in need or regulatory policies that monitor hiring practices and working conditions. It has not emphasized policies that promote self-reliance by creating jobs, easing transitions into the labor market for those already working, and facilitating movement into employment for those entering the labor force (Weir, 1992).

As a result, there has been an increase in the number of workforce development institutions[3] that attempt to fill the void left by the federal government. For example, over the last decade new

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2. Friedlander, David, David H. Greenberg and Philip K. Robins. "Evaluating Government Training Programs for the Economically Disadvantaged". *Journal of Economic Literature.* Vol. XXXV, December 1997, pp. 1809-1855.
3. For the purposes of this paper, I define workforce development institutions as organizations that help improve the skills/education of workers and/or assist them in making transitions into or within the labor market. Other scholars have argued that workforce development is more than just job training, it also includes helping workers shift from different jobs within the labor market, job placement, recruiting, placement, and counseling. See Harrison and Weiss (1998) for a more in-depth discussion about this term.

workforce development institutions have been created and existing ones have been reorganized. These types of organizations can consist of universities/community colleges, job training centers, community technology centers (CTC's) or community-centered organizations (CBO's) (Table 1).

Table 1. Examples of Workforce Development Institutions

Institution	Target Population	Services	Examples
Computer Job-training Programs	Low-skilled adult women	Basic to advanced computer skills	Women's Economic Agenda Project (Oakland, CA)
Community Technology Centers	Community residents	Introduction to computers Internet use Web page design Graphic design	Plugged-In (East Palo Alto, CA)
Community Colleges	General population	Credit/noncredit Basic computing to advanced computer skills	All major community colleges
Community-Centered Training Programs	Local residents	Basic computing to advanced computer skills	South End Neighborhood Technology Center (Boston, MA)
Proprietary Job-Training Programs	Low-skilled adults	Advanced computer training	De Vry Institutes

On the supply-side of the labor market, workforce development institutions that offer computer skills training services, such as nonprofit community-based organizations and community technology centers, have been trying to ameliorate the growing economic, social and political divide that exists between high-skilled, highly educated workers and low-skilled, poorly educated workers. It is often argued that job training programs can compensate for inadequacies in the public education system or can provide a second chance to those who prematurely terminate formal schooling by providing economically disadvantaged adult workers with the necessary skills needed to obtain higher skilled, higher paying jobs (Friedlander et al., 1997).

Workforce development institutions typically offer low-income, low-skilled residents basic computer skills training (typing and

basic word processing, and spreadsheet applications), Internet training, and in some cases more advanced computer skills and software applications such as web page design and Adobe PhotoShop. There are examples of these types of organizations throughout the country. For instance, the Eastmont Computing Center in Oakland, California is a nonprofit community technology center that provides low-income residents with access to information technology and offers computer skills employment-based classes.

In addition to CBO's and CTC's, many community colleges have now developed computer skills-based curricula as well as vocational programs that lead to an associate of arts degree or certificate[4]. High-tech companies' increasing demand for highly specialized labor is one of the main factors responsible for community colleges' shifting their focus towards computer skills vocational training. As technically skilled workers become increasingly scarce, high tech companies are interested in working with nonprofit training vendors, like community colleges, in order to meet their growing needs for skilled labor[5]. The Microsoft Corporation, Apple Computers, and Cisco Systems are just three examples of companies that have shown interest in partnering with community colleges to meet employers' demands for workforce training in information technology (Bailey and Averianova, 1999).

2 Theoretical Framework

One concept underlying my research is the notion that new workforce development institutions have been created from traditional ones Brint and Karabel (1991) argue that community colleges in the U.S. have, for several reasons, expanded from primarily providing students with two-year liberal arts degrees to also focusing on vocational training. First, community colleges have long been subordinate to four-year institutions of higher learning. Thus, they have been unable to compete with four-year institutions of higher education in preparing students for the highest-status training markets. Secondly, community colleges are influenced by the structural power of business. Since institutions of higher learning feed their students directly into a structure of jobs that is predominately organized by business, they must design their educational programs so that it meets the

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4. Certifications can range from industry specific (Cisco, Microsoft, and Oracle) to skills-specific web page design, A+, C++, etc.
5. Many firms in the information technology industry have also been lobbying Congress to increase the annual number of H-1B visas for foreign skilled workers.

needs of business in order to maintain long-term viability.
Third, governmental bodies have direct influence on community
colleges. As Brint and Karabel contend,

> In the case of community colleges, there were, to be sure,
> instances of pressure from the state to expand vocational
> training and of fiscal incentives for the implementation
> of preferred policies. Even more common, however, was
> a pattern in which the two-year colleges worked to curry
> favor with the state by pursuing policies that, they
> believed, would gain approval.

Finally, they conclude by suggesting that community colleges
have now realized the power centers constraining their activity.
As a result, community colleges are taking advantage of their
"window of opportunity" by providing computer skills-oriented
vocational training.

Brint and Karabel's theory about community colleges can also be
applied to community-based or community-oriented
organizations. The vast majority of community organizations
cannot compete with community colleges in terms of providing
a high level of computer skills and in developing strong ties to
local and regional employers. As a result, they have put their
energies into training economically disadvantaged adults who
have been chronically unemployed. Community-oriented
workforce development institutions are trying to take advantage
of their "window of opportunity" in a labor market that has a
severe shortage of skilled labor. Since many urban communities
suffer from high rates of joblessness and economic inequality, the
primary mission of community-oriented training programs is to
upgrade the level of skills among inner-city residents, which will
increase their ability to obtain a more highly-skilled job that
provides a livable wage and job mobility.

A second key concept of this investigation is the idea that
workforce development institutions' relationship to local and
regional employers determines the type of curriculum they will
adopt, thus influencing the types of skills that are taught. It is also
very likely that workforce development institutions that are able
to develop strong working partnerships with local and regional
employers will be able to develop curriculum that benefits
employers' specific needs. For example, several community-
centered organizations or community colleges have begun
teaching their students web page design skills (i.e. hypertext
mark-up language) because it is relatively easy to learn in a short
amount of time and there is much room for growth. This has

allowed them to develop a working relationship with web design firms.

This article argues that workforce development institutions' relationship with local and regional employers has an influence on the types of students they target as well as the curriculum they teach. For example, some computer training programs, including community colleges and proprietary training programs, target adults that are already in the labor force but lack the necessary skills needed for upward job mobility. Community-centered training programs, however, are not able to build strong relationships with employers because they are not seen being as legitimate as community college programs[6]. Thus, community-centered organizations are left to target low-skilled, economically disadvantaged adults who lack a strong employment history. In most cases computer training programs that target the working poor are more likely to offer a curriculum that teaches more advanced skills than a computer training program that targets the chronically unemployed. This is directly related to the idea that some training programs approach the labor market from the demand side and serve as a direct supplier of workers to firms, while nonprofit community-centered job training programs are more likely to approach the labor market from the supply-side, by increasing the computer skills level of low-skilled, unemployed workers. As a result, they will probably start their courses out by teaching basic computer skills and gradually increase the complexity of skills that are taught over time. One would expect that the two different niches that community colleges and community-centered workforce development institutions occupy within the labor market leads them to attract different participants and to teach different skills.

Although low-skilled adult workers have limited choices when it comes to the job market, they have several choices when it comes to choosing an organization that can provide basic computer skills training. They can elect to enroll in a computer training course(s) at a community college for credit or non-credit or seek out a proprietary computer-training program. Alternatively, they can sign-up for a community-centered computer-skills training program or attend a local community technology center. These workforce development institutions may appear to share the same goals, attract similar types of students, and provide a standard curriculum. The appearance, however, may not be

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6. In the information economy, community colleges now are a reliable source to provide employers with specialized training (Brint and Karabel, 1991; Harrison and Weiss, 1998).

correct. In an effort to gain a better understanding of how different types of workforce development institutions operate, what types of students they attract, and how their curriculum is developed, this study attempts to answer the following questions. What are the differences in institutional resources, clientele, and employer ties among workforce development institutions?

3 Research Methodology

A qualitative research study was designed to address the differences between workforce development institutions. Its primary focus was on how workforce development institutions differ with regards to their institutional resources, clientele, and employer ties among workforce development institutions. Three methods were used for data collection.

1) In-Depth Case Studies:
Two Boston-based workforce development institutions were studied over a period of three months - the nonprofit community-centered Mandela Computer Learning Center (MCLC) and the Adult Continuing Education program at Roxbury Community College (RCC). Both programs are located in the Boston neighborhood of Roxbury and offer computer skills training to low-skilled adults.

2) Interviews:
Directors, instructors, and students in each program were interviewed. Interviews lasted between fi hour to 1 hour for each person. The majority of interviews were recorded using both a tape recorder and by hand-written notes. Interviews were instrumental in helping me understand the goals and mission of MCLC and RCC. In addition, interviews added clarity as to how the program operates, why students enrolled in the program and what they hope to get out of the program, and provided insight into the lives of the students.

3) Participant Observation:
Both MCLC and RCC computer training courses were visited numerous times over the three-month period of this study. Observation of the computer classes added a rich understanding of the daily operations of each program, from the way the curriculum was taught to the interaction between students and instructors to the daily challenges that students faced trying to learn computer skills.

4 The Setting: Roxbury

> *Roxbury is a community that has survived the stretch, meaning stretching the little resources we have in order to maintain good people and good community. But there is a great need for economic self-sufficiency for individuals in the community.*
> - Young Person from Roxbury, in *Boston Connects*, Empowerment Zone Application, 1998.

Originally founded by English colonists in 1630 as a suburb of Boston, Roxbury today is one of Boston's most ethnically diverse and culturally rich neighborhoods. Until the early part of the 20th Century, Roxbury was a community that consisted of European immigrants-English, Irish, and German. Roxbury increasingly became more diverse with the settlement of a Jewish community in the Grove Hall area along Blue Hill Avenue (BLC, 1994). Roxbury became a predominately African American community during the 1940s and 1950s as African Americans migrated to Boston from the South.

Unfortunately, the community that once was an area full of large retail stores, residential hotels, silent movies and banks began to decline during urban renewal projects of the 1960s and 1970s (BLC, 1994). During this time, urban renewal projects demolished buildings and cleared land in the South End that was mostly occupied by African Americans, Puerto Ricans, and other minority groups. As a result, thousands of families were displaced to Roxbury where the city of Boston spent little money to upgrade streets, subsidize public housing, and allocate money for building rehabilitation (O'Connor, 1993). Social activists including Thomas Atkins, Ruth Batson, Rev. James Breeden, Ellen Jackson, Melvin King, Paul Parks, and Bryant Rollins created organizations that challenged the Boston Redevelopment Authority (O'Connor, 1993). Many of their efforts have led to revitalization and investment in the Roxbury community. Since the 1980s Roxbury has been successful in creating the Roxbury State Heritage Park, convincing the Massachusetts Bay Transit Authority (MBTA) to relocate the Orange Line in the community, and in attracting outside investments. These investments have led to the development of Roxbury Community College and Ruggles Center (BLC, 1994).
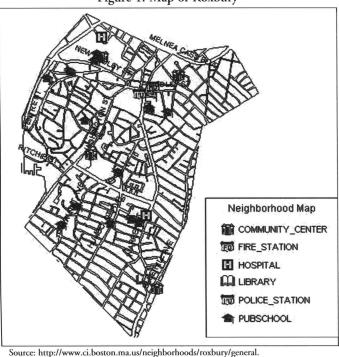
Figure 1. Map of Roxbury

Roxbury is aggressively trying to improve the economic situation of its residents and has been the beneficiary of several community technology centers. Many of these community technology centers are focusing on computer skills training and job readiness skills. In addition, these institutions are beginning to discuss ways to work with each other and the local community college to increase the skills level of residents while at the same time building their own capacity to provide resources.

5 Mandela Computer Learning Center

The Mandela Computer Learning Center (MCLC) was started in 1997 as a joint partnership between the Boston Housing Authority, the Mandela Housing Developments (a low-income public housing development) and the U.S. Department of Housing and Urban Development's Neighborhood Networks program[7]. As a federally supported and locally funded non-profit,

7. Neighborhood Networks is an initiative of HUD that uses computer technology to help residents of HUD-insured or -assisted housing to become more self-sufficient, employable, and economically self-reliant. http://www.hud.gov:80/nnw/nnwindex.html.

MCLC offers free computer training to low-skilled adults. According to their student handbook, the philosophy behind the center embodies the following commitments:

· To provide students with valuable marketable skills, increased self-assurance as a result of their accomplishments and a sense of professionalism about the way they project themselves and approach their job responsibilities.

· To offer a curriculum based on the concept that individuals learn in different ways, for different reasons, and at varying rates of speed. Therefore, provide a great deal of flexibility in the courses and programs that are offered.

· To produce a quality student. The goals include providing the best-qualified instructors, relevant curriculum and important business partnerships to provide students with the knowledge and skills required in today's technologically driven workplace.

Curriculum

The director and instructors run the computer training course and design the curriculum according to MCLC's philosophy. The current computer-training course meets Monday-Friday from 8:45 a.m. to 12:45 p.m. over a period of six months. During this period students are taught basic computer skills and gradually advance into more sophisticated computer-skills building activities. For example, since many of the students who enroll in the program have had minimal experience working with computers, instructors began the computer training course teaching students basic typing, then they learn how to navigate around the Windows 98 operating system. They then move into Microsoft software applications such as Word, Excel, Access, and PowerPoint. Eventually students are taught how to conduct research using the Internet before finally finishing the six-month course learning Adobe PhotoShop and basic web page design skills using hypertext mark-up language (HTML). MCLC does not focus on any one specific computer skill, but instead provides students with a general computer skills education. In addition, MCLC assists students with soft skills training, including interviewing techniques, developing an attractive resume, and workplace etiquette.

The goal of MCLC is to help students increase their computer skills and help them to obtain a job and one of the greatest

strengths of the program is that the curriculum is designed for students to be able to work at their own pace. For example, students with more advanced typing skills are given more complicated documents to type while those with weaker typing skills are provided with basic typing skills drills. This allows students to build a foundation and gain confidence in their ability to learn before moving on to more complex computer skills and software applications.

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Instructors
Three instructors do all the teaching, develop the curriculum, and grade the quizzes, homework, and exams at MCLC. Interestingly, none of the instructors are certified in any particular computer skill area. One instructor is the director of MCLC and the other two instructors are former graduates of earlier computer training programs. Prior to becoming an instructor at MCLC, the head instructor was an employee of the Blue Cross/Blue Shield insurance company where she took computer classes in 1993. Eventually budget cuts shut down her department and she was laid off. Not knowing what to do next, she enrolled in one of the director's computer training programs. While she was enrolled in the program she says she "was always active in helping other students out, so the director of the program approached her to teach one of his evening classes on Word Perfect." Soon after graduating from this program, she became an instructor at MCLC.

Instructors are quick to acknowledge the difficulties in teaching basic computer skills to adults that have never gone to college or have been out of school for a number of years. One instructor said, "I guess [some of the challenge] is trying to find a middle ground so that people who have a little knowledge will just pick up things and will not just be bored. While at the same time you are not going too fast and you're being sensitive to people who are just learning for the first time."

Despite the fact that the instructors are cognizant of the need to be sensitive to each students needs and try to promote a learning environment, some students are still critical of the teaching styles of the instructors. One student that was interviewed, Michael[8], felt like the instructors relied too heavily on teaching from the books and did not provide enough examples to the class:

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8. All the names have been changed in order to maintain confidentiality.

"I think sometimes we do too much learning from the books. I think the instructor needs to get in the front of the room and teach, take the time to show us specific examples of how to do things on the computer. They get paid to teach, so they should teach."

Not all the students shared the same sentiment. However many did complain that they felt like the course went too fast at times. As one student, Sara, stated, "Once you fall behind it is difficult to catch up if you do not have prior computer knowledge."

Students

One characteristic that distinguishes Mandela from other training programs is the diversity of its students. There are currently fourteen full-time students enrolled in the computer-training course and they come from various ethnic groups (Table 2), have had different life experiences, speak different languages, and they vary greatly in age. The average age of students at MCLC is about 40, and ranging from 22 to 75 years of age. One of the most noticeable characteristics between students in the training program besides age is gender. There are nine women and only five men enrolled in the course. According to the director of the program, this is a normal ratio for his computer classes.
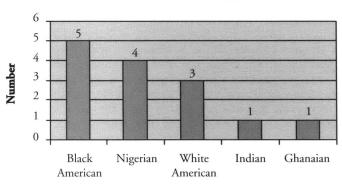
Table 2. Ethnic Breakdown of MCLC Students

As one can imagine, with a group of students of such diverse ages and backgrounds, reasons for enrolling in a computer-training course are very different. Students at Mandela can be placed into the following three categories:

1) Students who have been laid off and need to increase their skill level in order to be competitive in the labor market.

2) Students who have not had a strong employment history and need to find a job.

3) Students who are not looking for a job, but instead want to gain some basic computer skills.

A number of students at MCLC fall into the first category. Many of these students range in age from the mid-thirties up to the mid-fifties. They have earned a four-year college degree here in the United States or abroad and have had a strong employment history. Unfortunately the majority are recent immigrants to the United States and their degrees are not recognized here or they have become victims of corporate downsizing. This group includes a number of African immigrants enrolled in the course with 4-year college degrees who are having a hard time finding a decent paying job in the United States. An example is a forty-year old student named Henry. Henry fled Nigeria in 1991 with his wife and seven children and ended up in Boston. He earned a bachelor's degree in geology in Nigeria, but since coming to the United States he has only been able to find jobs as a security guard at the Berklee School of Music or as a taxi driver. His motivation for enrolling at Mandela was to learn more about computers so that he can become a computer mechanic. He says:

> I wanted to learn more about computers, I like computers. I bought one and I'd like to know more on how to use it and maybe I can get a job. I want to be computer literate, maybe I can be a computer mechanic. I would like to repair computers, that's really what I want to do.

In another example, Sara, a thirty-seven year old immigrant from Ghana, has had several years of experience working in a bank in her native country. She worked as a teller, in customer service, and held other internal jobs at the bank, but since coming to the United States six-years ago she has been denied employment at all the major banks in the Boston area. She claims that they all told her that she "lacked the necessary skills" to get a job. Feeling frustrated she enrolled at MCLC because she wanted to "gain computer knowledge and get a full-time job."

Michele, a 49-year old single mother, enrolled at MCLC for many of the same reasons as Sara. Prior to enrolling at Mandela, Michele had a job in customer service at Fleet Bank. However, her job gradually began to require more computer skills as everything began to become computerized; eventually this led to

her being laid off. One morning at MCLC she described how her job became more reliant on computers:

> If you go into the bank and you go to a teller everything they do passes through a computer program. If you go to customer service when you are opening an account or need information about an existing account or whatever, everything is on a computer. Everything is processed through a computer but there are specific software applications that get [tellers'] jobs done. They're interfaced now with all the different departments, but before you use to call another department and say 'can you answer this question?' Now you do everything right through the computer, [customer service] doesn't do its own research anymore, there is a total research department.

Michele and many people like her have become victims of technological innovation on the job. As jobs have become computerized or automated in many industries, more workers are required to have a greater understanding of how computers work so that they can perform tasks that computers cannot do by themselves. In Michele's case, she had earned a liberal arts degree years ago and now finds herself in need of computer skills training.

Despite the fact that students first enrolled at Mandela with the understanding that they needed to increase their computer literacy in order to obtain a job, many did not know what they wanted to do when they finished. As they progressed through the program however, they sharpened their goals for what they want to do when they graduate. Some did not have the confidence to enroll in a computer course at a local community college or 4-year institution, but after learning some basic computer skills several students have expressed an interest in pursuing more computer training. No student expressed this more eloquently and clearly than the 22-year old Kenyetta, the youngest student at Mandela:

> I hope to further my education in computers. I wasn't thinking about it before I came here so that's a good thing that I started here. Now I want to further my education with computers and other things as well, but seeing how computers are an ongoing educational experience, that will never finish. Before I came here I did not know what I wanted to do, that's why I am not in college now. I went to college because that was what was expected of me and not what I wanted to do. So now that I want to go back for me, for myself-I want to go back to do something in computers. I am not sure in what, but it will be a good learning experience and it is better to do it now when I am young, I don't have any

children....you know I don't have those things in my way, so it will be easier for me to attain all these things. As you get older, you have children, then it's harder, you can still do it, but it's harder. Now it's just me, I don't have bills to worry about, just me, so now is the time to do it.

Overall, the Mandela Computer Learning Center is primarily serving adult low-skilled workers that have either been laid off or are looking for employment. One reason is that MCLC classes meet everyday Monday-Friday 8:45 a.m. - 12:45 p.m. for six months. This is a major sacrifice for people to make, especially for those who need to work during the day or for those with small children. As long as the computer courses at Mandela meet during the day, it is likely that the majority of students who enroll in future courses will either be unemployed or retired.

Relationship with Local and Regional Employers
There is no institutionalized process through which MCLC develops relationships with local and regional employers and much of it is done on an ad hoc basis. In general MCLC has very few formal ties to local or regional employers. The Center is currently in the process of developing relationships with local high tech firms and regional colleges. For example, the director of the program has begun discussions with a local web page design firm in Cambridge that is interested in partnering with Mandela to assist with curriculum development. This relationship may even get to the point where the company provides internships for MCLC students. Fortunately for students at MCLC, the director is a charismatic leader and served as a Massachusetts state representative for 14 years. As a result, he knows many key players in Boston and is able to broker deals with employers to hire his former students.

6 Roxbury Community College: The Division of Continuing Adult Education

The mission of Roxbury Community College (RCC) is to provide, through its degree, certificate, and student development programs:

- Instruction and personal growth experiences that prepare students for lifelong learning

- Employment opportunities

9. RCCs Division of Continuing Education offers several types of classes for adults. For the purpose of this study, I only focussed on the noncredit basic computer training class.

· Good citizenship

· Ethical conduct and continuous development (RCC, 2000).

In addition, the Division of Continuing Education provides courses and resources especially for adults and recent immigrants.

Curriculum
The Division of Continuing Education offers credit and noncredit computer skills courses for adults. Introduction to computers, typing, Microsoft Excel '97, and a special course entitled "Navigating the Global Frontier" are among the noncredit courses that RCC offers adults with few computer skills. Unlike the Mandela Computer Learning Center, students are charged tuition for basic computer courses at RCC. The cost of a basic computer course at RCC can range anywhere from a low of $80 dollars for a six-week course to $300 for a more advanced computer course.

One of the key characteristics of RCC's Division of Continuing Education is that they provide computer training on a contractual basis to local and regional employers that are willing to pay. RCC, through the director of business and industry, develops courses that meet the needs of employers. All of these courses are designed and agreed upon by both RCC's director of business and industry and the employer. RCC has recently negotiated a contract with a local labor union that does work in the construction industry. In this contract RCC has agreed to provide all of the members of the local labor union with basic computers skills training, including keyboarding, a general understanding of how to navigate through a computer operating system, and Microsoft Word.

This particular study did not analyze any courses at RCC that were provided on a contractual basis. Instead, it focuses on a case study of a noncredit basic computer course for adults, "Introduction to Computers and Windows". In this course students meet every Tuesday evening from 6 p.m.- 8:30 p.m. for seven-weeks. During this period students learn basic computing skills and Microsoft software applications like Word 2000, Excel, Access, PowerPoint, as well as learn to develop resumes and cover letters. This course is seven-weeks long and costs each student $80.

Instructors

All of the computer classes offered by RCC are taught by certified instructors who are trained in the specific discipline in which they teach. In the "Introduction to Computers and Windows" course, there are two instructors. Both have several years of experience teaching computer courses and the lead instructor has a master's degree in education. According to the instructors one of the biggest challenges is getting adult students comfortable with reading books. As one instructor stated, "Since many students are not coming in with a solid education, it is important to choose books that students are not afraid to use." As a result, the instructors for this course have opted to use the book entitled "Teach Yourself Visually" which provides more pictures and diagrams than the average computer text book.

Students

There are only five students enrolled in the seven-week evening course at RCC. Unlike MCLC, all the students have steady jobs while enrolled in the computer training course. Moreover, all five students, three women and two men, are immigrants that have come from the Cape Verde Islands (2 students), Haiti (2 students), and from Guinea.

One of the main reasons students have enrolled in the computer course at RCC is to increase their job mobility. They have found themselves in jobs with little upward mobility because they lack the necessary skills or they are in dead end jobs. For example, a student named Theresa is a 33-year old, high school educated, single mother of two from Cape Verde who has worked in several low-paid jobs from data entry to typing to a cashier in a local check cashing store . She never seriously considered enrolling in a computer course at RCC until her friends encouraged her. According to Theresa, "my friends told me about the good teachers the college has and the college is near my job, so I decided to enroll."

Sheila, a 29-year old single mother of two, decided to enroll in the computer class at RCC because she needs to find a better job that can support her and her children. She has two part-time jobs, one as a security guard at the Harvard University Medical School campus and the other as an assistant at a nursery school, and is trying to complete her undergraduate degree. When asked whether completing the course was a major obstacle for her to

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10. Theresa has recently landed a job as a teller at Fleet Bank. It is unclear how much the computer skills she is learning at RCC played a role in her getting a job with Fleet Bank.

accomplish in her life right now, she stated, "The obstacles are not here, they're out there. And even then, they're challenges to me. Learning computer skills is not part of it. Trying to balance a seven-day job, attend school part-time, attend a [computer class] weekly and motherhood, that's a challenge!"

Sheila's response is typical of the challenges that many women are faced with while attending computer-training courses. At both Mandela and RCC, women are struggling to increase their technological skills, while at the same time trying to raise their children and maintain their personal relationships. This could very well be one of the reasons why so few people are enrolled in the evening computer course at RCC. Since it is an evening course many people who may be interested in the training do not sign-up because they have young children at home or have to spend time maintaining their personal relationships. This can be particularly burdensome for individuals who have a family and work during the day.

Relationships with Local and Regional Employers
The Division of Continuing Education at RCC has established extensive formal relationships with local and regional employers. The college has a paid full-time staff person (director of business and industry) that is in charge of building working relationships with employers. The director of business and industry goes out into the community to work with local businesses and industries to talk about their employment needs with regards to employee training. Training can be anywhere in the area from ESL courses to front desk counseling to computer skills development. In recent months, RCC has established partnerships with the World Trade Center in Boston, Logan International Airport, and a large health center.

Although a large portion of computer training is provided on a contractual basis with employers, students enrolled in "regular' computer courses still benefit from many of RCC's connections to regional employers. It is not uncommon for employers to contact RCC about specific positions that need to be filled. It is clear that RCC's Division of Continuing Education has been beneficial in not only meeting the needs of employers, but in meeting needs of students (i.e. helping them find jobs, increasing human capital. etc.).

7 Major Findings

The Mandela Computer Learning Center and Roxbury Community College are two examples of workforce development institutions that are providing low-skilled adult workers with computer skills training. Nevertheless these two institutions differ substantially with regards to their institutional resources, the type of students they attract, and in developing partnerships with local and regional employers (see Table 3).

Table 3. Key Differences Between MCLC and RCC

Training Programs	Students	Curriculum	Instructors	Employer Ties
MCLC	A mix of background, age, emplotment status	Basic computer skills	Non-certified	Few, weak
RCC	Primarily working poor	Basic computer skills, specific skills, training for local employers	Certified	Many, strong

Training Programs	Funding	Function of Organization	Barriers to Entry
MCLC	Public	Gateway to jobs, higher education, certificate programs, personal knowledge	Low: very few fees, no application process
RCC	Public and private	Upward job mobility	Moderate-high: fees, application process, prerequisites

Institutional Resources

Roxbury Community College's Division of Continuing Education has a competitive advantage over the Mandela Computer Learning Center when it comes to providing students with a wide range of computer skills training. Since the Division of Continuing Education is located within a larger institution such as a college, it has the resources to hire certified instructors that can teach credit or noncredit computer courses. Moreover, RCC does not have to rely on federal funds or other public funding to support many of their computer courses because they

are able to raise a substantial amount of money by providing computer skills training to local and regional employees on a contractual basis. For example, one eight-week course can cost employers anywhere from $8,000-$11,000.

Students
One of the key differences between MCLC and RCC is that they serve two entirely different populations. MCLC's computer training program is serving low-skilled adults that vary greatly in age, education, and employment history. In addition, a majority of students have been unemployed for a long period of time or have been recently been laid off and now need computer skills training to increase their chances of getting a job. On the other hand, RCC primarily serves adults who are already working. In the computer course that was analyzed for this study, all the students were recent immigrants, had full-time jobs, and were similar in age.

There are several possible explanations for the differences between MCLC and RCC. First, community colleges are viewed as more legitimate by employers in providing firm-sponsored training than are community-based or community-centered organizations. As a result, community colleges target adults who are in most cases already in the labor force, whereas community-centered organizations attract a segment of the adult population that has either been laid off or has been chronically unemployed. This can explain why MCLC's course meets everyday during the week from 8:45 a.m. - 12:45 p.m. for six-months, a time when very few full-time working adults could attend. In the case of RCC, the vast majority of their continuing education courses meet in the evenings and students must pay a fee to enroll. So it is likely that adults who are already working could afford to pay a fee to take the course, and are able to enroll in the course because classes are offered at a time so that it does not conflict with their work schedules.

Secondly, MCLC and RCC differ in the types of students they serve because MCLC targets adults who have very little or no formal education. In other cases, they target students who have been out of school for a long period of time. For many of these students, the thought of going to a community college for computers skills training can be intimidating. Therefore, some adults feel more comfortable attending a community-centered training program because they feel like it is an environment where they can get the help they need. When students were asked what they liked about the program at MCLC, many responded

that it is a place where anyone can learn:

> Instructors are always available to help you and no one
> cares about your age. People (other students and staff)
> are always friendly.

Another student responded:

> I like the attitude of the staff. I think they are really
> dedicated people to the program, not just because it's a
> job, but they seem really interested in what they do and
> helping each of us as individuals.

A third student responded:

> The teachers are dedicated and the teacher student ratio
> is very good.

A final reason that may explain the differences that exist between MCLC and RCC with regards to the students they serve is that RCC does not seem to offer one computer course that offers "everything". Unlike MCLC, RCC's courses are broken down into segments. For instance, a person can enroll in an introduction to computers course, or a Microsoft Office course, or a web page design class. At Mandela, these skills are all taught over a course of six months, so students with no prior knowledge to computers may be more inclined to enroll in that type of program rather than at a community college.

Relationship with Employers
When it comes to developing ties to local and regional employers RCC has more success by far than MCLC. RCC has developed long-term partnerships with several major employers in the Boston metropolitan area such as Logan International Airport and the World Trade Center. These partnerships allow RCC to provide training to employees of these organizations on a contractual basis. In exchange, employers are given equal power in developing the curricula.

MCLC is still struggling to make contact and build relationships with employers. The main reason is that MCLC is still viewed by many employers as not being a "legitimate" or "good" source for skilled workers and the program does not offer a certified degree. Although MCLC has established informal ties to a few local high-tech firms in the Boston area, they have not yet signed any contracts.

The Level of Computer Skills A Person Can Learn
Even though this study did not evaluate the ability of MCLC and RCC to teach students basic computer skills, one can speculate

about the level of skills that an individual can acquire in a two-to-six month computer-skills training program. Both programs teach basic computer skills, but in an accelerated program or computer class that covers a vast amount of material, a person can only learn so much. It is highly likely that a person's previous background knowledge of computers will dictate the level of computer skills a person can learn in such a finite amount of time. For MCLC students, the basic computer skills education that they acquire will only allow them to have a "general" knowledge of computers. In contrast, the students at RCC are also learning basic computer skills, but three of them are working in jobs that requires some basic computer skills. This in turn allows many of them to apply their skills directly on the job, so they appear to learn the "basics" to computer rather quickly.

8 Conclusions

In an era of unprecedented economic growth, an increasingly large number of high tech firms have been complaining about a labor shortage of skilled U.S. workers.[11] Unfortunately, many of these job openings require moderate to advanced computer skills that a large section of American workers do not possess. This has led to an enormous gap between the skills people have and the jobs that are available.

One solution that could potentially increase the number of skilled U.S. workers is job-training. The federal government, private industry, and the nonprofit sectors need to make more employment-based training available to workers in the United States, especially for economically disadvantaged, low-skilled workers. Workforce development institutions, such as community colleges and community-serving institutions, have begun to bridge the skills divide by providing more basic to advanced computer skills training courses for low-skilled adults. For most low-skilled workers, these types of institutions provide the only avenue to acquire computer skills that are both readily affordable and accessible in their communities.

Workforce development institutions like the ones described in this study can be beneficial to economically disadvantaged workers because they tend to be flexible with regards to the types

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11. In recent years several IT firms have put pressure on Congress to increase the number of H1B-Visas for skilled foreign workers. In 1998 Congress passed a law to increase the number of H1B-Visas from 65,000 a year to a limit of 107,500 until 2001 (see *New York Times*, "Clinton Asks Congress to Raise the Limit on Work Visas for Skilled Workers". May 12, 2000.

of computer skills training they provide and different populations they serve. In the case of both Mandela and RCC, they were able to provide basic to advanced computer skills training to a diverse population. However, the two institutions serve two entirely different purposes. For Mandela, it serves as an entry point or gateway into more advanced computer skills training or an entry-level job for economically disadvantaged adults. While RCC tends to serve the working poor that wish to gain upward mobility in the jobs in which they already work or to help them switch careers.

Employment-based training, through nonprofit institutions, not only benefits their constituents, but can benefit industry as well. Workforce development institutions could improve the skills of the economically disadvantaged and provide more skilled labor for the IT industry, even if after training, many are only qualified for entry-level positions. It would be logical then for nonprofits, employers, and the government to establish partnerships that would be beneficial to all parties involved. For example, CBO's could train individuals that otherwise would be too intimated to attend a community college. After completing their training at the CBO, they could have the option of continuing their education at a local community college or opt to find a job. The federal government and private industry could provide the bulk of the money for training and assist in developing the curriculum.

The reality is quite simple. Unless institutional partnerships are developed between workforce development institutions, the private sector, and federal, state and local governments, it is likely that low skilled, economically disadvantaged adults will continue to fall behind in the knowledge-based economy. P

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Establishing Neighborhood Technology Centers in Low-income Communities: A Crossroads for Social Science and Computer Information Technology

Richard L. O'Bryant

Neighborhood technology centers have emerged as a new tool for developing low-income communities. With the growth of computer information technology and the Internet, public debate has emerged over approaches for establishing technology and Internet access for low-income communities. The preferred strategy has been targeting communities for technology centers which are available to that community's residents. This article argues that establishing technology center access in low-income communities requires inclusion of a component that is sensitive to social issues specific to that community. With this consideration the presence of a technology center in a low-income community has the potential for spatial as well as environmental impact. Access to technology without consideration of social conditions of the community will fail or at most garner minimal results.

1 Introduction

Three social constructs and perspectives came into play when Camfield Estates, a low-income housing development in the Roxbury section of Boston established the Neighborhood Technology Center (NTC) for computer access. This empirical study examines the components for establishing technology access in a low-income community. This study was done over a two-month period with interviews, direct observation and review of historical documentation. The statistical data revealed obvious and not so obvious patterns of use. At this housing development there were three primary players involved in establishing and sustaining the NTC; the director of public safety at Massachusetts Housing Finance Agency (MHFA), the President of the Camfield Tenants Association (CTA) and the owner and CEO of Williams Consulting. At this particular NTC a number of subtle and not so subtle issues come into play when establishing technology access. A qualitative analysis of interviews highlights the need for a social component and support system for a NTC in low-income communities. Each of the stakeholders initially had divergent visions (structurationist[1], social constructivist, functionalist) of what establishing technology access meant for Camfield. The center has been established for two years and the reality has presented a different but clearer picture of what technology access requires. The vision of the stakeholders for future technology access at the NTC at Camfield began to converge, emerging with a clearly social perspective. Finally, an informal and unplanned discussion with

1. Structurationist is a term used in social perspectives of organizational science and technology research.

a young user sheds light on why the considerations observed in this study are so important. These findings provide an empirical basis for including a social context and expanding the public discourse about what technology access means and entails for low-income communities. Using social constructs to analyze what is necessary when establishing technology access in low-income communities is a particularly useful strategy for including noticeable and not so noticeable issues germane and particular to this environment.

2 Background

The Neighborhood Technology Center (NTC) is a partnership between Camfield Estates Housing Development, Academy Homes II Housing Development and the Massachusetts Housing Finance Agency (MHFA)[2]. The primary goal of the NTC is to provide residents of both housing developments with access to state of the art computer technology in a safe, nurturing environment. In addition to access, the NTC is also committed to the enhancement and development of technology-related skills of participants, which will enable them to compete in the labor market. Through collaboration with existing institutions and agencies in the community, NTC seeks to develop linkages and partnerships to facilitate greater technology access and training. The future hope of residents of Camfield Estates and MHFA is to be able to expand access to technology by replicating the Camfield NTC model at other housing developments.

Community technology centers (CTC) are the most common approach for offering low-income communities access to state of the art computer technology. The difficulty for CTCs is in defining what access means in terms of accessibility, availability, usability, and affordability. Early models of community computing access were established with electronic networks, usually with second hand or third hand computer equipment. The software applications were often antiquated. The goal for the NTC and CTCs is to introduce its user to the latest in computer technology and software applications.

Studies show that CTCs are an attractive model for a number of reasons (Bishop et. al., 1999). First, they are cost-effective when compared to placing computers into resident's homes. Second,

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2. The Camfield Estates and Academy Homes II are participants in the Housing and Urban Developments (HUD) $200 million Demonstration Disposition Project. In theory ownership of those selected developments, that are rehabilitated, will be turned over to the residents. For Camfield Estates that is inclusive of the NTC facility.

responsibility for maintaining computer resources is assumed by an external agent. Third, knowledgeable staff members are present to offer technical support and training. Fourth, peers and other community members are present, creating a pleasant social atmosphere. For more than two decades, significant public and private funds have been invested in the development of CTCs nationwide (CTCNet 1998, Resnick et. al., 1998). CTCs have been the focus of numerous studies relating to computer access, use and effectiveness; have been well researched and documented (Beamish, 1995, Beamish 1999, Ellis et. al., 1998, Mark et. al., 1997, Melchoir et. al., 1998).

This article will show that technology access for low-income communities is much more than just availability and access to hardware. A multitude of social issues, challenges and concerns (adequate security, adequate schools, adequate housing, day care services, jobs, job training programs, adequate health care facilities, etc.) must be taken into consideration when establishing community technology centers. As Roberts argues, in his issue-defining article "Empowering Communities of Color through Computer Technology", the issue of access is complex. The *Merriam-Webster Dictionary* defines access as: a) permission, liberty, or ability to enter, approach, communicate with, or pass to and from; b) freedom or ability to obtain or make use of; c) a way or means of access; d) the act or an instance of accessing. Access to information technology is not just having the availability of equipment but also the ability to gain literacy and proficiency in its use.

Finally, this article investigates the different perspectives of the primary stakeholders (Camfield Tenants Association, Massachusetts Housing Finance Agency, Williams Consulting) and how they fit into the conceptual frameworks of structurationist, social constructivist and functionalist. Specifically, how has their perspective changed since the beginning of the NTC and what vision do they have individually and together for the future of NTC?
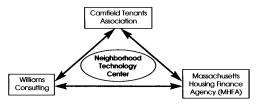
3 Camfield Estates Neighborhood Technology Center

The Camfield Estates Neighborhood Technology Center was ideal for studying and evaluating the process of establishing technology access because of the ratio of the number of computers (15) to the number of residents (400). With a high 27 to 1 ratio, it is representative of the high ratio many

neighborhood technology centers experience. It has a T1 line for 24 hour Internet access. Although Camfield is considered a low- and very low-income development by United States Department of Housing and Urban Development (HUD) standards, it is stable because there is very low resident turnover. The NTC is publicly available and accessible to all residents.

The NTC has a unique support structure around it. Although Massachusetts Housing Finance Agency (MHFA) is the primary funding agency, representing the interests of the deed holder[3] they developed a community-based process in deciding what happens with the center. The Camfield Tenants Association (CTA), in existence more than 25 years, has played a significant role in decisions made in relation to the NTC. The technology contractor and consultant, Williams Consulting, works very closely with both MHFA and the CTA to ensure resident involvement in structuring and maintaining the NTC programs and curriculum. Regular formal and informal meetings are consistently scheduled and participated in by each. The MHFA representative, the President of the CTA and the owner and CEO of William's consulting have developed a unique formal and informal approach to addressing issues around the NTC and ensuring that the center remains accessible. They comfortably share conversations during office hours as well during non-office hours from home, cell phone voicemail system and/or e-mail.
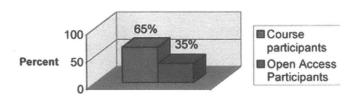
CHART 1: NTC SUPPORT NETWORK

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              ┌──────────────────┐
              │ Camfield Tenants │
              │   Association    │
              └──────────────────┘
                  ↗          ↖
            ┌─────────────────────┐
            │    Neighborhood     │
            │     Technology      │
            │       Center        │
            └─────────────────────┘
         ↙                          ↘
┌──────────────┐            ┌──────────────────┐
│   Williams   │ ◄────────► │  Massachusetts   │
│  Consulting  │            │ Housing Finance  │
└──────────────┘            │   Agency (MHFA)  │
                            └──────────────────┘
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Analyzing Hours of Access and Whom is Accessing
In addition to Camfield residents using the NTC, the Lenox Street and Academy Homes Housing developments as well as the Mattahunt, YMCA and Cooper Community centers also use it. There are a total of 560 registered users at the NTC yielding a ratio of 37 users per computer. Since January 2000 the NTC is used primarily for structured training although 35% of the users prefer the open access times (Figure 2).

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3. The United States Department of Housing and Urban Development.

Figure 2:

Course vs Open Access Usage Since
1/2000

There are a total of 39 hours of operation per week at the NTC. There are 13.5 hours of structured access with 2 hours dedicated to Camfield Residents. There are 23.5 hours of open access available. Structured usage makes up 34.6% of the access time; open access usage makes up 60.3% of the access time and time dedicated to Camfield residents makes up 5.1% of the time. Observing each day during the week shows that open access clearly makes up most of the access time with time dedicated to Camfield residents making up the least (Figure 3).

Figure 3:

NTC Structured and Open Access

Although the least amount of access time is dedicated to Camfield residents, Camfield residents make up most of the registered users at the NTC (Figure 4) Gender usage shows overall usage by males is more common than usage by females. However, since January 2000 usage by females exceeded usage by males by 9.4% (Figure 5).

Figure 4:

Camfield vs Non-Camfield Usage
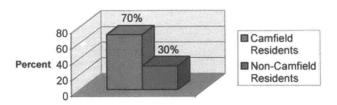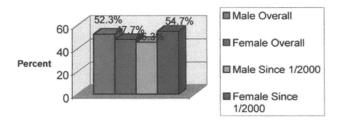
Figure 5:

Gender Usage of NTC

The highest usage by age group is among youths 11 to 15 years of age. However, since January 2000 there is a significant increase in use among users older than 17 years of age (Charts 6 & 7).

Figure 6:

Age Usage of NTC Overall
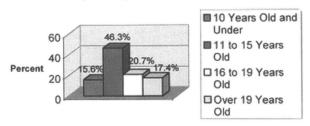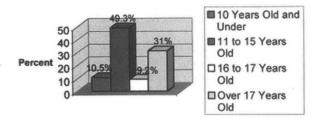
Figure 7:

Age Usage of NTC since 1/2000

Access during Open Access Times
The average number of users per week is 125, yielding a ratio of 8 users per computer. With 35% of open access for users, the average number of users during the open access period is 44 yielding a ratio of 2.9 users per computer. Users are allotted time on the computer in one hour increments. Typically, when users have to wait, they go home or use the playground outside of the center and come back. When users are at the playground they return periodically, knock on the glass door and ask if it is their turn yet. Center staff uses their discretion in deciding when to have a user removed from a computer at the end of their hour of usage. If users are doing homework or research they will first see if there are other users just playing games, music or watching videos and ask them for their computer as opposed to removing someone that is engaged in productive use of the computer.

NTC staff often find themselves addressing issues that are very much social as opposed to technical or computer related. As one staff person shared, they find themselves sometimes going out to the playground to break up disputes or to make sure the youth are not engaging in destructive activities. According to MHFA's director of public safety when the center first opened there were turf issues with some of the gangs in the area. With the institution of 24-hour security that continually walks the property, more structured activities and the door buzzing system, the NTC seems to have minimized turf issues.

Because most of the users during open access are youth, the center staff often find themselves helping users work through personal issues that may be occurring at home, school or in the community. Many of the youth come to the NTC because it is perceived as a clean, safe environment to spend time during after

school hours. There are also situations where youth have issues with one another and the NTC staff has to moderate situations that might otherwise escalate into a more difficult situation. Sometime personal disputes and/or disagreements spill into the NTC from the neighborhood requiring intervention.

Finally NTC staff found that many of the users have educational challenges. In addition to having difficulties with school many of the users have learning challenges that affect their ability to get the most out of their experience of using the computers. Reading and writing are challenges that NTC staff on some occasions has to help users work through.

The Vision of Access from the Structurationist Perspective
From the perspective of the MHFA the structure of the environment is of primary importance. Through the Demonstration Disposition Program, funded by HUD, MHFA is rehabilitating old dilapidated housing developments[4]. In addition to funding the rehabilitation of Camfield Estates in general, MHFA is the primary funder of the development of the Neighborhood Technology Center.

Structuration is posited as a social process that involves the reciprocal interaction of human actors and structural features of organizations (Orlikowski, 1992). The theory of structuration recognizes that human actions are enabled and constrained by structures, yet that these structures are the result of previous actions (Orlikowski, 1992). In accord with structuration theory, the human agents use structures everyday that are created by human agents. For MHFA it is important that the NTC plays a significant role in the development of a stable structure and environment for the residents of Camfield at the newly rehabilitated property. From criminology theory, giving youth between the ages of 13 to 21 structured programs and activities to be involved in helps reduce the possibility that they will engage in crime and/or vandalism. In addition, the NTC (from MHFAs perspective) is seen as a function of the development that will help to enable the residents to pursue opportunities to increase computer technology skills and access.

Interestingly then, the director of public safety for MHFA is the principal representative in the development and maintenance of

4. Ibid.

the NTC. In addition to his primary function (public safety) he also has a personal interest in computer information technology. He was the one to initiate and setup the NTC. The project startup was and continues to be funded out of MHFAs public safety budget. The public safety director had, as a vision for the NTC, the opportunity for Camfield residents to get more than housing out of their new development. In addition to seeing the NTC as a crime and vandalism prevention tool he saw it as an opportunity for residents to enhance their skills increasing their employability and opportunities for job advancement. Fundamentally he sees crime prevention as a better investment than law enforcement. Creating a positive structure and environment enables residents to realize opportunities that may not otherwise be achieved.

The Vision of Access from the Social Constructivist Perspective
Because a number of the residents have been at Camfield for a significant amount of time -20 to 25 years-, many remember their experiences before the current rehabilitation of the development. That understanding and experience helped considerably to inform their perspective for how they envisioned the new Camfield Estates and the need for the NTC. Their experience also informed what they saw as needs for hardware and software technology. The President of the CTA stated that they saw the center as being first and foremost for the youth, with state of the art technology. They saw an immediate need to support youth with homework assistance and Internet access, which was lacking at their schools. They knew, from having had experience with older technology, that at the NTC they wanted new computers.

The basis of the social constructivist paradigm assumes that everything is socially constructed from past learning and experience. From this perspective the social factors and experience play a significant role in the construction of this vision. For the residents of Camfield, the lack of academic performance of the youth and lack of support by the public school system helped construct a vision of the need for augmented educational support. They foresaw the NTC taking on a life of its own once it was up and running. They also saw it as an opportunity to create a place within the development that could address social issues that plagued the youth in particular. This vision initially made it difficult working with the owner and CEO of Williams Consulting who had a very bureaucratic functionalist perspective.

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The Vision of Access from the Functionalist Perspective
The owner and CEO of Williams consulting approached the establishment of computer information technology access from the traditional functionalist perspective. The vision was that setting up of the technology and establishing a competent technical support staff would be sufficient. The availability of technology and support would be the determinant of whether or not users engaged with the computers. In other words, by simply setting up a structured ordered computer center, the technology would determine users' relationship and engagement with the technology as opposed to their experience, understanding and personal situations. He saw the possibility of supercomputing with self-guided utilities for the youth to take up personal interests and develop their own skills.

The functionalist perspective assumes that the social world is composed of relatively concrete empirical artifacts and relationships, which can be identified, studied and measured through approaches derived from the natural sciences (Burrell & Morgan, 1979). Its goal, from an objectivist perspective, is to understand, conceptualize, articulate and frame relationships in the social world from the natural science approach and methodology. The assumption is that technology will determine the frame of reference with which users will approach it.

The owner and CEO of Williams consulting had from his own admission a vision that was very deterministic from the technological perspective. His usual approach to establishing a technology center did not include considering social issues that could plague the environment and the users. The reality of the environment and users quickly became apparent and required a shift in paradigm. He recognized the need for a social component requiring social service staff, which he hired to assist in this regard. The social service staff is present to help keep the environment stable and safe for all the users as well as assist in working out any social issues that may arise.

The Merging of the Stakeholders' Visions
Once the Neighborhood Technology Center opened at Camfield Estates each of the stakeholder's views of what was needed for technology access began to come together. The director of security for MHFA recognized that there were many more youth than adults using the center, presenting a need for special programs targeted at adults only. To a large degree the adults felt trepidation because they were unfamiliar with computers. He

recognized the need for more educational games, training on how to do research, reading programs, and a social curriculum to assist residents in developing a sense of ownership and pride in the center to help prevent vandalism in the long-term. He felt that only part of his original vision was being fulfilled because the center was being used significantly more by youth than adults.

The President of the Camfield Tenants Association board sees the center as currently being a safe place for youth to hang-out and receive social support. She sees a need for more structured programs and support for addressing social issues. She sees the lack of adult users occurring because many own computers at home and may only use the center for Internet access. Because the owner and CEO of Williams consulting began to shift his paradigm to include sensitivity to social and community issues, their working relationship has improved.

The owner and CEO of Williams consulting recognized that the center staff was coming in contact with a majority of users that lack social preparation, reading skills and critical thinking. He saw that many of the users, youth in particular, were terribly unprepared with regard to basic skills needed to get the most out their experience with the computers. However, he also recognizes the fact that the youth have considerable drive, ambition and energy that would help them overcome their lack of skills and academic abilities. His original vision broadened to include an understanding that the technology center required a social component and certain segment of his staff with social skills to help the users in their accessing of the technology.

The Shared Vision for the Future of the NTC
Over time the three main stakeholders in establishing technology access at Camfield Estates began to share a common vision for the future. They each see the center continuing to have cutting edge technology for the residents. There is recognition by each that there is considerable potential for the NTC. Now that the center has opened it has revealed a number of issues that go beyond the technological, and the stakeholders share ideas about strategies to ensure longevity and stability for the community. The director of public safety for MHFA and the President of CTA see the center becoming an independent entity raising its own funding and support. The owner and CEO of Williams consulting, in addition to seeing it become an independent entity, also sees it being an educational institute with possible credit generating course work. They all see it as an opportunity

to enhance the academic skills of the youth and improve performances in school and on standardized tests. The vision for the future of technology access represents an inclusion of the social as well as the technical. They all see the center as playing a role in continuing to improve the quality of life for residents at Camfield Estates.

4 Discussion

This study has explored a number of societal issues, rather than technical, for consideration when establishing access to technology in low-income communities.

The data was not surprising, however, since January 2000 the usage rate for females and adults over 17 years of age are both increasing. The female usage rate has actually surpassed the male rate of usage of the center. There is a significant dichotomy between structured usage times and open access (unstructured) usage times. Although there is more time allotted for open access use most of the registered users use the center during the structured times. This would suggest that more structured times are preferred for usage. However, this can be misleading because the open space time would appear to get more repeat users where structured times could get different users each time depending on the course.

Assumptions that changed as a result of this study were in regard to gender use. The "digital divide" study showed higher usage overall among males as opposed to females. However, at the NTC overall male usage was slightly higher than female usage but since January 2000 female usage has passed male usage. Explanations put forth by NTC staff suggest that because most of the users are young, the males get involved in other outdoor activities where the females do not.

Age usage at the NTC, although lower overall for adult age users, usage increases for users older than 17 years of age since January 2000. Even though the overall age usage statistic is from 19 years of age and older and since January 2000 age usage statistics is 17 years of age and older, the percentages are more widely distributed up to age 75 since January 2000.

Interviews with the stakeholders were by far the most interesting and insightful portion of this evaluation. Worthy of note is the great personal interest the director of public safety for MHFA, the President of CTA and the owner and CEO of Williams Consulting took individually and collectively in ensuring access

to computer information technology in a safe, clean and adequately equipped center. As time went on their once different visions and frames of reference became similar. Their visions for the future also appear to be congruent in the effort to allow residents and users to have an opportunity to gain valuable skills for helping to improve their lives. They all seem to see the full experience (social, intellectual, technical) of the user as utmost importance in ensuring a quality access to computer information technology.

In closing the discussion section an interaction occurred which is worth including. Although this was an observational study and not a participatory research study a situation required investigation in a participatory manner. One of the center's staff was in the process of counseling one of the youth center participants on things happening at his home and at school. A discussion ensued. Interviewing users directly was intentionally avoided because most of the users during this study were under the age of 18 years of age presenting permission concerns and requirements. What emerged from the discussion was an understanding that this particular user clearly comes to the center because of the social and personal interest the center staff takes in him and what is happening in his life. To a question asked about what are his most common reasons for coming to the NTC he replied, "to talk with other youth and this particular staff person." He also replied that he likes to "check his email and surf the web". It is clear that without the social component that this user would be less likely to use the NTC. This discussion makes the strongest case for a social component in establishing access to technology in low-income communities.

5 Conclusion and Implications

President Clinton stated that the "Digital Divide is the number one civil rights issue of the 21st century". Policy makers are grappling over the best approach for technology access for low-income communities. Technology centers are quickly emerging to be the preferred approach. Unfortunately the public discourse has been limited to access. Without an expansion of the discourse there is a risk of technology centers in low-income communities being ineffective. Historically, community development falls into two areas: place-based or people-based approaches. This article has argued that when establishing neighborhood technology centers in low-income communities, a place-based approach - (establishing a physical center), combined with a people-based approach (establishing a social component) is essential for long-term effectiveness.

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This study has presented a case for a broader approach to establishing access to technology in low-income communities. With the national dialogue surrounding the "Digital Divide" it is timely to expand the discussion to ensure that the focus does not continue to be solely on the availability and access of computer hardware but to include a broader perspective inclusive of social concerns. Establishing access to computer technology in low-income communities is complex. Engaging users requires a consideration of what issues they may have impacting their lives and trying to create an environment sensitive to these issues.

The NTC at Camfield Estates has shown the need for strong supporting entities working together to ensure community technology access. They have a strong cohort of housing developments, programs and community centers that use the center in addition to Camfield residents. For the future of the NTC it appears that increasing the number of computers available per user is necessary to prevent the NTC at Camfield from getting overwhelmed by the number of users.

Because Camfield Tenants Association is represented at every point in the process of decision-making the residents maintain a consistent level of involvement and an avenue to express concerns. As public policy makers press forward with policies for ensuring, as President Clinton said, "access for all Americans", and if technology centers are the preferred approach for access, then structuring a strong social and technical support network involving residents and/or users around the establishment of a center is critical. [P]

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Community Technology and Community Building: Sociocultural Constructionism and an Asset-Based Approach in a Low-Income Community

Randal Pinkett

This article establishes the theory of sociocultural constructionism - a synthesis of the theories of social constructionism (Shaw, 1995) and cultural constructionism (Hooper, 1998), that is rooted in the theory of constructionism (Papert, 1993). Sociocultural constructionism, a theoretical framework that can inform efforts to engage populations traditionally underserved by technology, argues that individual and community development are reciprocally enhanced by independent and shared constructive activity that is resonant with both the social setting that encompasses a community of learners, as well as the cultural identity of the learners themselves. To explicate a methodology for operationalizing this approach, the literature on community building and the practice of asset-based community development (Kretzmann & McKnight, 1993) are drawn upon. Sociocultural constructionism and an asset-based approach to community technology and community building involve participants as active change agents rather than passive beneficiaries or clients, and as the active producers of information and content, rather than passive consumers or recipients. Finally, this article describes research that is underway at Camfield Estates, a predominantly African-American, low-income housing development in Roxbury, Massachusetts, in collaboration with the MIT Media Laboratory and the MIT Department of Urban Studies and Planning, to investigate the effectiveness of this approach in achieving social and cultural resonance and bridging the digital divide.

1 Introduction

Most efforts to engage urban residents with technology have addressed these populations as monolithic entities. Programs targeted at "low-income" and "inner-city" communities reflect this approach. Not surprisingly, "low-income" and "inner-city" communities constitute an extremely diverse population that can include African-Americans, Hispanics, Whites, and others, each with a range of individual possesses their own interests and needs. Research indicates that there are marked differences in computer access and use across socioeconomic and racial groups (NTIA, 1994, 1997 & 1999; Nielsen Media Research, 1997; Novak & Hoffman, 1998). While these studies provide a clear picture of the gap in computer access and use, they do not explain what can be done to address it.

Many are inclined to believe that the "digital divide" (NTIA, 1994, 1997, 1999) can be explained purely by economic factors, to the exclusion of social or cultural considerations. They argue that disparities in the buying power of minorities and Whites or between low-income communities and middle-class communities are at the root of the problem, and that providing access alone will ensure a level playing field. Studies have found that while the gender gap in computer and Internet use is closing over time, the socioeconomic and racial gap is growing (NTIA, 1994, 1997, 1999; Abrams 1997). While we can certainly expect the numbers of minorities and residents of low-income communities who buy computers to rise as equipment prices drop, the idea that cost is the only prohibitive measure is a gross oversimplification. According to the National Telecommunications Information Administration (NTIA) (1994, 1997, 1999), minorities lag behind Whites in computer ownership, even at the same level of income. This would seem to refute the argument that cost is the only barrier to access, but at the same time raises the question: what other factors contribute to this divide? This article argues that social and cultural considerations must be taken into account when searching for answers to this question. People must be able to see the relevance of technology in order to fully embrace it. At the same time, since access does not imply use, and use does not imply meaningful

use, it is also necessary to consider the nature of engagement that is to be promoted.

The article establishes the theory of sociocultural constructionism - a synthesis of the theories of social constructionism (Shaw, 1995) and cultural constructionism (Hooper, 1998), that is rooted in the theory of constructionism (Papert, 1993). Sociocultural constructionism is a theory about individual and community development that can inform efforts to engage populations traditionally underserved by technology. To explicate a methodology for operationalizing this approach, this study draws upon the literature on community building and the practice of asset-based community development (Kretzmann & McKnight, 1993). Sociocultural constructionism and an asset-based approach to community technology and community building involve participants as active change agents rather than passive beneficiaries or clients, and as the active producers of information and content, rather than passive consumers or recipients.

Finally, this article describes research that is underway at Camfield Estates, a predominantly African-American, low-income housing development in Roxbury, Massachusetts, in collaboration with the MIT Media Laboratory and the MIT Department of Urban Studies and Planning, to investigate the effectiveness of this approach in achieving social and cultural resonance and bridging the digital divide. This project also involves a database-backed web system, the Creating Community Connections (C3) system (Turner & Pinkett, 2000), that is being developed by the author to specifically to create connections in the community between residents, local associations and institutions (e.g., libraries, schools, etc.), and neighborhood businesses.

2 Social and Cultural Resonance

A social setting is defined as an environment in which numerous forces, particularly those stemming from an individual's relationship to others, act upon people who are located in that setting (James & Nahl, 1979). Culture refers to the values, beliefs, and practices that influence the way an individual interprets the world (Gee & Green, 1998; Lee & Smagorinsky, 2000). Culture manifests itself in a variety of social settings (i.e. home, school, and community). Research shows that culture plays a significant role in an individual's level of engagement with technology (Hooper, 1998), and that the social setting plays a

significant role in how a community makes use of technology (Shaw, 1995).

Achieving a certain level of social and cultural resonance is critically important to any effort that seeks to engage populations with computers and the Internet that have not traditionally enjoyed the benefits of these technologies. Minority and low-income communities certainly are not suffering from "technophobia," as evidenced by the high penetration of modern communications technologies such as pagers and mobile telephones. Notice, however, that these technologies immediately suggest specific benefits and uses. They address certain social needs, such as the desire to communicate with others, and they adhere to certain cultural practices in that they are valued (and often perceived as symbols of status). On the other hand, computer technology, given its inherently flexible nature, does not immediately suggest a particular benefit or use, because it can support a variety of aims. Therefore, when searching for effective strategies to diffuse computer and Internet technology, it is incumbent upon designers and planners to ensure that the infrastructure is well suited to the interests of end-users. Computers and the Internet can achieve even greater levels of penetration, and associated patterns of meaningful use, when sociocultural considerations are carefully taken into account. In other words, when people can readily see the benefits of these technologies toward improving their life, their family, and their community, they will be much more likely to embrace them, thus achieving some measure of resonance with their social and cultural milieu.

Consequently, this article advocates a holistic approach to individual and community engagement with technology, one that seeks to identify their interests first, and then determine how technology can support those interests. It is an approach that not only involves individuals as residents, but also the surrounding community in the form of local associations and institutions (e.g., schools, libraries, etc.) and neighborhood businesses. It is an approach that is rooted in the theories of social constructionism (Shaw, 1995) and cultural constructionism (Hooper, 1998), as well as the practice of asset-based community development (Kretzmann & McKnight, 1993). This approach combines the best practices of community technology with the best practices of community building, as a means toward achieving social and cultural resonance. The following sections describe the theoretical foundation for sociocultural constructionism and

asset-based community development, as well as their relationship to community technology and community building.

3 Sociocultural Constructionism and Community Technology

Sociocultural constructionism is a synthesis of the theories of social constructionism (Shaw, 1995) and cultural constructionism (Hooper, 1998), both of which are rooted in Papert's (1993) theory of constructionism.

3.1 Constructionism

Constructionism is a theory about learning, and argues that people learn best when they are active participants in design activities (Papert, 1993), and that these activities give them a greater sense of control over (and personal involvement in) the learning process (Resnick, Bruckman & Martin, 1996). There has long been debate about whether learning is best characterized as an individual cognitive process, or as a process of acculturation into an existing community (Cobb, 1994). These seemingly contradictory perspectives have been argued by constructivists such as Piaget (1954) and von Glaserfeld (1994), and sociocultural theorists such as Vygotsky (1978) and Rogoff (1990), respectively. Constructivists believe that the individual learns by actively constructing and reconstructing her conceptual model of the world, given a social and cultural context. The explanatory construct of knowledge is the student's cognitive self-organization. On the other hand, sociocultural theorists believe that the individual learns via participation in socially and culturally organized practices. Here, the explanatory construct of knowledge is the process of acculturation experienced by the learner.

In many ways, constructionism synthesizes both of these perspectives by asserting that individual development is enhanced by shared social activity. The vision of a constructionist learning environment is one that gives the individual the freedom to explore their natural interests, with the support of a community of learners, both expert and novice, that can facilitate deeper understanding. A constructionist learning environment is characterized by a rich exchange of ideas between individuals that is mediated by their interaction with each other as well as their shared physical and virtual constructions. A constructionist learning environment places emphasis on a learner's individual cognitive development, as well as the role that community and

the surrounding human context play in enhancing this development. Both social and cultural constructionism represent extensions to the constructionist paradigm.

3.2 Social Constructionism

Shaw's (1995) theory of social constructionism states that "individual developmental cycles are enhanced by shared constructive activity in the social setting, and the social setting is also enhanced by the developmental activity of the individual." Shared constructive activity refers to the creation of "social constructions," of which there are five types: 1) social relationships, 2) social events, 3) shared physical artifacts, 4) shared social goals and projects, and 5) shared cultural norms and traditions. Social constructionism is a useful framework for advancing the interests of a community. It is also relevant to the role that technology can play in supporting these interests. A tool that is consistent with this paradigm is one that supports the creation of the aforementioned social constructions, thus enhancing the developmental cycle of the individual and the community.

In 1994, Shaw designed the Multi-User Sessions in Community (MUSIC) system to demonstrate how technology could be shaped around social constructionist principles. MUSIC is a community intranet that facilitates community communication and information exchange. It includes the following features: send/receive e-mail messages, community bulletin board, community announcements, community calendar of events, community chat room, and more. MUSIC was deployed in Dorchester, Massachusetts, and Newark, New Jersey, and proved to be particularly effective in supporting social relationships, social events, and shared social goals and projects. Shaw describes the social constructionist paradigm as part of a three-part synergy.

> The social setting presents a context of social relations and cultural materials which set the stage for sociocultural activities and processes through which developmental internalized and externalized constructs can be formed. These constructs can further influence the setting by adding new artifacts and processes to the setting, causing it to evolve by changing existing relationships, adding or altering cultural materials, activities and processes, and by fostering new cognitive and social developments. (Shaw, 1995).

While Shaw makes reference to the need for internalized and externalized constructs in relation to the social setting, he makes

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no explicit claim as to the kind of internalized and externalized constructs that are most effective in engaging a community of learners, from a cultural perspective. It is here that Hooper's theory of cultural constructionism becomes especially useful.

3.3 Cultural Constructionism

Cultural constructionism argues that "individuals learn particularly well through creating objects in the world that express their cultural identity and have shared meaning within their home cultures" (Hooper, 1998). A cultural construction could be a drawing, collage, personal website, electronic community newsletter, or any other project that is an expression of cultural identity, and at the same time facilitates an engagement with new knowledge. Cultural constructionism is a useful framework for advancing the interests of an individual. In similar fashion to social constructionism, it is also relevant to the role that technology can play in supporting these interests. A tool that is consistent with this paradigm fosters the expression of ones cultural heritage, thus enhancing the developmental cycle of the individual and the community.

From 1992 to 1996, Hooper performed a longitudinal study of one student, Keanna, which involved her use of Microworld's Logo. The study took place at Paige Academy, an alternative African-centered school in an urban community in Massachusetts. Hooper observed how Keanna's programming projects, or constructions, mediated her understanding of computational ideas with her cultural identity. These projects proved to be effective in fostering Keanna's technological fluency, and facilitated her understanding of various computational themes such as modularity, parallelism, and evaluation. Hooper recognizes three layers of the cultural constructionist perspective on learning.

Constructivism captures the idea that children construct their own knowledge. Constructionism adds that they do this particularly well in the course of constructing things in the world. Finally, learning stories depicting Keanna's work on programming projects reveal constructionist learning that occurred particularly well in the context of concurrent exploration of her cultural identity and context and this leads to the extension of constructionism to cultural constructionism. (Hooper, 1998).

While Hooper argues for a particular cultural context, she makes no explicit claim as to the social context that is best suited for

engaging an individual learner with respect to the construction of knowledge. It is here that Shaw's theory of social constructionism becomes especially useful. In concert, social constructionism and cultural constructionism demonstrate how a learning environment can address the needs of individuals, both independently and as members of a broader community.

3.4 Sociocultural Constructionism

Sociocultural constructionism argues that individual and community development are reciprocally enhanced by independent and shared constructive activity that is resonant with both the social setting that encompasses a community of learners, as well as the cultural identity of the learners themselves. Sociocultural constructionism is a framework that addresses the interests of both an individual and a community. In the same fashion as social and cultural constructionism, it is also relevant to the role that technology can play in supporting these interests. A tool that is consistent with this paradigm empowers residents to increase their social capital (Coleman, 1988; Putnam, 1993; Putnam, 1995) and activate their cultural capital (Bourdieu & Passeron, 1977; Lamont & Lareau, 1988; Zweigenhaft, 1993), thus enhancing the developmental cycle of the individual and the community.

The Computer Clubhouse, organized by the Computer Museum (now part of the Museum of Science) in collaboration with the MIT Media Laboratory, is an example of a successful effort to foster an environment that is socially and culturally resonant with a youth population (Resnick, Rusk & Cooke, 1998). Fifteen stand-alone Clubhouses have been established to-date, including two overseas, and there are plans to expand the Clubhouse network considerably in the future.

At the Clubhouse, young people are able to pursue their interests by creating physical and virtual artifacts that reflect their cultural identity, within the context of a community of peers and mentors. The Clubhouse is a community technology center (CTC) that serves inner-city youth, and represents a particular approach to learning within a CTC that is rooted in constructionist tradition.

At many CTCs the goal is to teach youth basic computer skills and applications. At the Clubhouse the goal is for youth to learn how to express themselves fluently with technology (Papert & Resnick, 1995). This is demonstrated by their ability to transform ideas into technological projects.

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> At the Clubhouse, young people become designers and creators - not just consumers - of computer-based products. Participants use leading-edge software to create their own artwork, animations, simulations, multimedia presentations, virtual worlds, music creations, Web sites, and robotic constructions. (Resnick, Rusk & Cooke, 1998).

It is possible that such an environment can be fostered beyond the walls of a CTC, and incorporated into an effort to promote community engagement with technology.

3.5 Community Technology

Community technology has been referred to as "a process to serve the local geographic community - to respond to the needs of that community and build solutions to its problems" (Morino, 1994), and defined as "using the technology to support and meet the goals of a community" (Beamish, 1999). Community technology has gradually evolved to encompass three models of community involvement with technology (Beamish, 1999). The first model is community networks, or community-based electronic network services, provided at little or no cost to users. The second model is community computing centers or community technology centers (CTCs), publicly accessible facilities that provide computer access for people who can't afford a computer, as well as technical instruction and support. The third model is community content, or the availability of material that is relevant and interesting to some target audience (e.g., low-income residents) to encourage and motivate the use of technology. These approaches can be classified according to what they provide: hardware, software, and training, infrastructure, online access, or content. They can also be classified according to the groups they target: individuals, schools, youth, community organizations, and the general public, or specific groups such as a neighborhood, racial or ethnic minorities, the homeless, and the elderly (Beamish, 1999).

Any effort that seeks to operationalize the sociocultural constructionist approach to individual and community engagement with technology, must first identify the interests of various community constituencies, such as residents, local associations and institutions (e.g., schools, libraries, etc.), and neighborhood businesses, and then determine how technology can support those interests. The challenge thereafter is to provide socioculturally constructive tools, or cultural materials, that are supported by socioculturally constructive activities in the social setting. To explicate such an approach, this article draws from the

literature surrounding resident and community involvement in efforts to revitalize neighborhoods, or community building. More specifically, the writings of Kretzmann and McKnight (1993), and the practice of asset-based community development are the primary sources.

4 Asset-Based Community Development and Community Building

There are three primary approaches to community revitalization. Community organizing is an approach to community revitalization that enlists residents to take on powerful institutions in their community through direct, public confrontation and action (Alinsky, 1971; Delgado, 1986, 1994; Khan, 1991; Hess, 1999). Community development is an approach to community revitalization whereby freestanding, non-profit, community-based organizations coordinate the construction and rehabilitation of a discrete geographic area's physical infrastructure (Schorr, 1997). Community building is an approach to community revitalization that is focused on "strengthening the capacity of residents, associations, and organizations to work, individually and collectively, to foster and sustain positive neighborhood change" (Aspen Roundtable, 1997).

4.1 Community Building

The genesis of community building can be found in three sources (Hess, 1997). First, there are the critiques of traditional advocacy and social service delivery by self-help reformists such as Thomas Dewar. These critics believed that true community improvement could never be achieved by systems based on dependence and a flawed model of professionals "serving" clients. Second, the writings of Kretzmann and McKnight at Northwestern University's Asset-Based Community Development (ABCD) Institute, popularized in their book *Building Communities from the Inside Out: A Path Toward Finding and Mobilizing a Community's Assets* (1993). The ABCD approach is described in greater detail below. Third, the emphasis by feminist organizers on the infinite power that can be achieved through building relationships within small informal groups, in contrast with past techniques that targeted widespread participation and were grounded in conflict and confrontation (Bradshaw, Soifer & Guiterrez, 1994; O'Donnell & Schumer, 1996; Stall & Stoeker, 1997). Feminist organizing advocates a voluntary, communal response to community problems and places professionals in the

redefined role of coach or co-learner. A fourth contributing factor to the community building movement is the epistemological concepts of "learning webs" and "communities of learners" espoused by progressive educators such as Ivan Illich (1970). These models for self-motivated learning focused on a restructuring of the student-teacher relationship by providing the learner with "new links to [their community] and the world" (Illich, 1970).

Community building has a social and cultural orientation as its foundation. Socially, community builders believe that relationships among community members represent the basic building blocks for strengthening distressed neighborhoods. Culturally, community builders seek to ensure that the values, beliefs, and practices of community members are consistent with the strategies that are undertaken. Successful community building cultivates leadership (Gilbert, Specht & Terrell, 1993). These initiatives are typically organized by a relatively small group of committed individuals that serve the larger community. Their focus is on increasing social capital by expanding connections within the community and improving the ability of community members to work together effectively. Community building conceives the public interest in a community as communal (Gilbert, Specht & Terrell, 1993). In other words, the community is seen as a set of individuals working together on common interests, with an emphasis on voluntary action that will naturally coalesce around important issues. It is an approach that adheres to an agenda planning form of power and encourages residents to develop their own vision for the community that can be translated into an agenda that reflects their interests (Gaventa, 1980; Lukes, 1974). Finally, the nature of civic involvement among residents in a community building initiative is that of engaged citizenry (Sviridoff & Ryan, 1996). As engaged citizens, residents are enlisted in wide numbers in a broad set of roles toward building "networks, contacts, trust, and standards fl all essential to the community's problem-solving capacity" (Sviridoff & Ryan, 1996). Residents are directly involved in establishing social ties to each other, as well as other community members, including associations, businesses, and institutions. Asset-based community development represents a particular model, or technique, for building community.

4.2 Asset-Based Community Development

Asset-based community development is a process for "mapping" a community's assets and mobilizing these assets to address

community-defined issues and solve community-defined problems. Kretzmann and McKnight (1993) identify three characteristics of asset-based community development:

1.   Asset-based - Community building begins with what is present in the community, as opposed to what is absent or problematic in the community. It is focused on indigenous assets as opposed to perceived needs. These assets represent resources that can, and must be utilized in order to achieve positive and sustainable change.

2.   Internally focused - Community building calls upon community members to identify their interests and build upon their capacity to solve problems. One of the distinguishing characteristics of community building is its heavy emphasis on leveraging that is in the community first, before looking to outside entities and/or resources.

3.   Relationship driven - Community building has also been defined as "any identifiable set of activities pursued by a community in order to increase the social capacity of its members" (Mattesich & Monsey, 1997). This requires the ongoing establishment of productive relationships among community members, as well as the associated trust and norms necessary to maintain and strengthen these relationships.

For these reasons, asset-based community development can be an appropriate methodology for harnessing the individual and collective talents of the members of a community. Not only does this have direct applications to community engagement with neighborhood revitalization, but also community engagement with technology. The asset-based nature can ensure broad participation including residents, associations, businesses, and institutions (e.g., libraries, schools, etc.) when designing strategies to deploy a community technology initiative. The internal focus can ensure that their voices are heard and act as a guiding force in the conceptualization and implementation of an initiative. The emphasis on relationships can increase the capacity of community members to communicate more frequently, exchange information and resources more efficiently, and work together more effectively, as it relates to an initiative.

Kretzmann and McKnight (1993) identify five steps toward whole community mobilization:

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1. Asset-mapping - Mapping completely the capacities and assets of individuals, citizens' associations and local institutions,

2. Building internal relationships - Building relationships among local assets for mutually beneficial problem solving within the community,

3. Asset-mobilization - Mobilizing the community's assets fully for economic development and information sharing purposes,

4. Building a vision - Convening as broadly representative a group as possible for the purposes of building a community vision and plan, and,

5. Establishing external connections - Leveraging activities, investments and resources from outside the community to support asset-based, locally defined development.

These steps can also be applied to community engagement with technology. Asset-mapping can identify the community resources that are relevant to the community technology initiative. This includes assets that could benefit from, or contribute to the initiative such as the skills and abilities of residents, the products and services of neighborhood businesses, the social services and programs offered by local associations, and the resources found in local institutions such as schools and libraries. As mentioned earlier, building internal relationships can increase the community's capacity to work together effectively to coordinate the initiative. Asset mobilization can be partially mediated online, particularly given how well the Internet and the World Wide Web are suited to information sharing purposes. While e-mail and listservs could easily perform this function, more sophisticated tools could be developed to facilitate this exchange in new and innovative ways. Building a vision can help leaders in understanding how the various community constituencies can benefit from the initiative - as seen from their point of view. Finally, establishing external connections can involve institutions in the initiative that lie outside the community, such as universities (i.e. research and evaluation) and philanthropic groups (i.e. funding). Links to these and other entities can greatly contribute to the initiative's long-term sustainability.

These steps have proven effective in a variety of community revitalization efforts, including: mapping and mobilizing local business assets to create a job-matching network (Kretzmann, McKnight, & Puntenney, 1996a), mapping and mobilizing the

economic capacities of local residents to create a cooperative buying arrangement (Kretzmann, McKnight, & Puntenney, 1996b), mapping and mobilizing consumer expenditures to identify opportunities for local entrepreneurship (Kretzmann, McKnight, & Puntenney, 1996c), mapping and mobilizing the associations in a local neighborhood to establish a "council of associations" (Kretzmann, McKnight, & Turner, 1999), and creating a neighborhood information exchange that connects local skills and knowledge (Kretzmann, McKnight, & Puntenney, 1998). Most importantly, an asset-based approach to community technology and community building can be equally effective in achieving a social and cultural resonance that truly taps into the interests of residents and their community.

5 Community Technology and Community Building

The intersection between community building and community technology holds tremendous possibilities. Each of these domains seeks to empower individuals and families, and improve their overall environment. Surprisingly, approaches that combine these areas have received very little attention. In response to the "digital divide", the challenge in many minority and low-income communities has been to identify strategies for engaging residents with technology, providing economical access to technology, and encouraging meaningful use of technology. These efforts have largely, and justifiably, focused on establishing infrastructure and providing training. As computers and the Internet continue to penetrate these communities, it begs the question of what can be done to truly leverage a given technological base. From among the three models of community involvement with technology - community computing centers, community networks, and community content (Beamish, 1999) - there are a limited number of examples where technology has been used to promote community building by regarding residents and other community members as key stakeholders in the process. Conversely, from among the multitude of models for community revitalization, such as community organizing, community development, and community building (Hess, 1999), we are only beginning to witness the benefits that are afforded by incorporating technology into these approaches in a meaningful way.

The best practices of community building see community members as active change agents. ABCD is an asset-based approach to community building that sees community members

as active change agents rather than passive beneficiaries or clients. The best practices of community technology see community members as the active producers of community information and content. Sociocultural constructionism is an asset-based approach to community technology that sees community members as the active producers of community information and content rather than passive consumers or recipients. With anticipated increases in funding for large-scale community building and community technology projects (The White House, 1999), there is a great deal to be learned regarding how community building and community technology can be mutually supportive, rather than mutually exclusive. The final section of this paper briefly describes an approach to integrate community technology and community building based on the principles of sociocultural constructionism and asset-based community development.

6 Fostering Social and Cultural Resonance

To investigate the effectiveness of an asset-based approach to community technology and community building in fostering social and cultural resonance, we are working with the residents at Camfield Estates, a predominantly African-American, low-income, housing development in Roxbury, Massachusetts, and the community members in its surrounding environs. The project represents a collaborative effort between the Camfield Tenants Association (CTA), the MIT Media Laboratory, and the MIT Department of Urban Studies and Planning. Our approach to community building and community technology relies heavily on resident involvement and broad community participation in mapping and mobilizing assets, and also involves a database-backed web system currently undergoing development at MIT, the Creating Community Connections System (C3), that is consistent with the sociocultural constructionist framework. The research site, research plan for resident involvement and community participation, and the C3 system, are described in greater detail in the following sections.

6.1 Research Site

Camfield Estates, formerly Camfield Gardens, is a recently renovated, 102-unit development consisting of several town houses rather than low- to medium-rise apartments. There are approximately 400 residents at Camfield Estates with an average age of 27. Unlike some housing developments where residents are transient, Camfield Estates is a stable environment with relatively low turnover. The property is equipped with a T1

communications line that connects the Camfield Neighborhood Technology Center (NTC), a community technology center located on the Camfield property, to the Internet. Furthermore, a community technological infrastructure is being established at Camfield Estates consisting of a computer and a high-speed Internet connection in each unit. CTA has expressed a strong interest and enthusiasm about the project, and has formed a committee to oversee the project's implementation. This committee includes Camfield residents, representatives of CTA, the NTC director, and researchers from MIT.

6.2 Research Plan

A preliminary survey will be administered prior to the beginning of the project. A series of initial meetings will also take place with residents and other community members to solicit their input and participation in the planning process. The preliminary survey and initial meetings, in many ways, represent the most important aspect of the project since they will dictate the project's direction thereafter. The preliminary survey and initial meetings will seek to identify the community's interests and how technology can support their interests. It will also help to identify which community assets will need to be mapped and mobilized in order to advance the project. How could a computer improve their lives? What are the issues that they would like to see addressed that could be supported by technology? Health care? Safety? Education? Employment?

After the preliminary survey has been fully assessed by the committee, two parallel initiatives will be undertaken. The first initiative will focus largely on community building, and will involve residents in mapping and mobilizing community assets. The second initiative will focus largely on community technology, and will involve training residents (and local associations and institutions) in computer use, leading up to the deployment of a computer and a high-speed Internet connection in each unit. Both of these initiatives are described in greater detail in the following subsections.

6.2.1 Community Building: Mapping and Mobilizing Community Assets
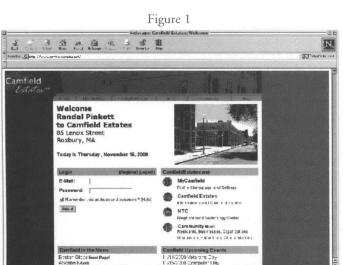
Camfield Estates' residents and other community members will be invited and encouraged to join the various working committees that will be formed to oversee the project's implementation. A team of residents will also be actively involved in the asset-mapping process, acting as project coordinators,

resident interviewers, and field surveyors. The residents that fill these positions will be trained in how to identify community assets and gather the requisite data. Training residents to conduct the fieldwork is important for two reasons. First, it teaches them how to identify and map their own local assets. This is a valuable skill that could be leveraged in the future should the community decide to extend the asset-mapping initiative. Second, it creates an awareness among residents of the resources that exist in their community. In the past, residents involved with similar projects have been pleasantly surprised to find community assets they were previously unaware of (Turner, 1999). In summary, as the residents catalog the community's capacity, they are increasing the community's capacity.

The asset-mapping team will gather information about the capacities of other residents, local associations and institutions, and neighborhood businesses. Once again, the nature of the data to be collected will be heavily informed by the results of the preliminary survey and initial meetings. To conduct the asset-mapping process, the following instruments will be employed:

> · Resident Capacity Survey - Captures information about residents regarding their abilities and interests in a variety of skill areas (e.g., creative skills, computer skills, etc.). Also captures information regarding their education, training, and employment experience. This is based on resident capacity surveys developed by Kretzmann and McKnight (1997), and Turner (1999).

> · Association and Institution Capacity Survey - Captures information about local associations (e.g., non-profit organizations) and institutions (e.g., libraries and schools) regarding their targeted needs (e.g., basic subsistence, education, health care, etc.), targeted members (e.g., high school dropouts, senior citizens, etc.), assets needed/shared, projects and activities, and partnerships in the community. This is based on association and institution capacity surveys developed by Kretzmann, McKnight, and Turner (1999), and Bishop (1999).

> · Business Capacity Survey - Captures information about neighborhood businesses regarding their products and goods purchased/sold, as well as their hiring needs. This is based on business capacity surveys developed by Kretzmann, McKnight, and Puntenney (1996a).

Camfield residents will be asked to provide this information on a voluntary basis. All of the associations, institutions, and businesses within an approximately 15-block radius of Camfield Estates will also be solicited to complete a survey.

To support community building via technology, the Creating Community Connections (C3) system will be made available through the Camfield Estates website. C3 was first prototyped as part of an ongoing pilot study at a federally-assisted, affordable housing development, Northwest Tower, in Chicago, Illinois, in collaboration with Nicol Turner at the Asset Based Community Development (ABCD) Institute at Northwestern University (Turner & Pinkett, 2000), as shown in Figure 1.

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Figure 1

C3 will serve two primary functions. First, C3 is a community intranet that facilitates community communication and information exchange. In this regard, C3 offers the following features: e-mail, community listserves, community bulletin boards, community calendar of events, community chat rooms, community announcements, and more. Second, C3 is a community extranet (portal) and community building tool that facilitates resource exchange, asset-mapping, and asset mobilization among community residents, associations, institutions, and businesses. To support this use, C3 includes the following features: job opportunity postings, volunteer opportunity postings, automatic generation of an online resume

for residents, personalized web portals for residents, the ability for residents, associations, and institutions to create a home page, full browse/search/update capabilities of asset (resource) records online, and security restrictions. The resident social service coordinator will also be involved in mobilizing community assets based on the needs of community members.

6.2.2 Community Technology: Training and Deployment

Training will be offered to residents, associations, institutions, and businesses, at NTC. Camfield residents will receive comprehensive training that is theme-based (e.g., how to find jobs) and project-based (e.g., creating a personal website), as opposed to skill-based (e.g., how to use a mouse or a keyboard). They will also learn how to use the C3 system. After residents have completed a mandatory basic training course, they will be able to take their computer home and connect to the network (note that residents will not be required to complete the resident capacity survey to participate in training and receive a computer). Thereafter, residents will be able to attend training sessions offered at NTC on additional topics such as website design, desktop publishing, and animation.

Similarly, local associations, institutions, and businesses will be invited to participate in training sessions specifically designed to demonstrate how they can benefit from a presence online, as well as how to access and update their asset record on the C3 system. Thereafter, space will also be made available on the C3 server for associations and businesses to build their own websites.

Once these two parallel initiatives have been completed, the final investigation will begin as to how community technology and community building can work in concert.

7 Conclusion

This article has described the theory of sociocultural constructionism - a synthesis of the theories of social constructionism and cultural constructionism, which is rooted in the theory of constructionism. Constructionism is a theory of about learning based on Papert's belief that "better learning will not come from finding better ways for the teacher to instruct, but from giving the learner better opportunities to construct" (Falbel, 1993). Constructionism synthesizes the constructivist and sociocultural perspectives on learning.

Sociocultural constructionism extends the constructionist paradigm, and argues that individual and community development are reciprocally enhanced by independent and shared constructive activity that is resonant with both the social setting that encompasses a community of learners, as well as the cultural identity of the learners themselves. Social constructionism can inform efforts to engage individuals and communities with technology in a way that achieves social and cultural resonance.

Drawing upon the literature on community building and the practice of asset-based community development, this article has explicated a methodology for operationalizing this approach. Asset-based community development assumes that neighborhood revitalization starts with what is already present in the community - not only the capacities of residents as individuals, but also the existing commercial, associational and institutional foundation. It is a technique that is internally focused and seeks to identify the core interests of various community constituencies. It is also an approach that is relationship driven, and endeavors to increase the community's social capacity toward positive and sustainable change. An asset-based approach to community technology and community building can be effective in achieving a social and cultural resonance that truly addresses the needs of residents and the broader community. Such an approach promotes community members as active, rather than passive, participants in the process.

Finally, this article has described a research project that is currently underway at a predominantly African-American, low-income, housing development in Roxbury, Massachusetts, in collaboration with the MIT Media Laboratory and the MIT Department of Urban Studies and Planning, to investigate the effectiveness of this approach in achieving social and cultural resonance. It is expected that the sociocultural constructionist framework, coupled with an asset-based approach to community technology and community building, will be successful in guiding present and future efforts to bridge the "digital divide." P

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Central Square Conversations. . .
A Civic Dialogue Project
Ginny Berkowitz
Susan Fleischmann
Natasha Freidus
Duke Guthrie

Look at the Central Square Conversations interactive
website at:
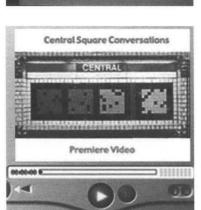
http://web.mit.edu/gsb/www

Mural by David Fichter

The Central Square Conversations project uses digital and Internet technology as a community organizing tool to create a dialogue about revitalization of the Central Square neighborhood. The project includes face to face forums, an interactive website, digital storytelling, and a monthly television program. Central Square Conversations was developed and launched in 1999, when Cambridge Community Television's Executive director Susan Fleischmann and Director of Development Ginny Berkowitz were appointed Fellows at MIT's Center for Reflective Community Practice. Current project coordinators are Natasha Freidus, a DUSP intern, and Duke Guthrie, a B.U. School of Social Work intern. The project has been designed and promoted to solicit civic and community leaders' feedback on their concerns about Central Square.

Identified issues of concern thus far include affordable housing, affordable space for non-profits, safety, care for the homeless, and support for small businesses. Local artists' work is included on the website and it is currently be expanded to include video streaming and digital stories.

Central Square Conversations offers a unique example of a community using technology to encourage democratic participation in working to solve community problems. [P]

The Virtues of the Virtual: New Directions for Urban Design
Francisca Rojas

As a future-oriented practice, urban design compels us to imagine, anticipate, design and plan our cities of tomorrow. Twentieth century urban planning has generated a number of influential visions of urban futures - from Howard, LeCorbusier, and Wright, to Fuller, Archigram, and Soleri. Yet for more than twenty years, urban planning has exhibited a conspicuous lack of critical projection about the future of urban life and form. This lack of futurist vision is remarkable considering the rapid advancements in information technology (IT) that have begun to reshape a wide range of interactions at the various scales of urban life. Of particular interest to urban planning and design is how IT transforms social and spatial relationships. This article explores the way that IT is expressing itself in the city, both physically and virtually, and proposes three principles inspired by cyberspace: connectivity, flexibility and imageability - that urban design can adopt as guides towards facilitating the integration of our physical-urban and virtual-information selves.

1 Physical + Virtual

Until recently, there co-existed two separate realms strictly brought together by the active effort of people - physical space and virtual space, which met at the desktop personal computer (PC). The Internet's seemingly boundless digital field opened up opportunities for better, faster and frictionless information, commerce, and interaction that the physical world ostensibly could not provide. In the course of the previous half century, urban space had become a placeless, mass produced, aloof environment where extreme differences between rich and poor, preservation and decay, control and subversion were endemic. The great opportunities promised by the virtual allegedly provided a space to transcend these unfavorable urban conditions.

Cyberpunk literature, a subset of science fiction that emerged in the mid-1980s, extrapolated current urban phenomena and developments in information technology (IT) to expose cautionary visions of cities in the near-future. Future urban lifestyles were presented as dystopias of fragmented and degraded urban environments where virtual realities become gripping and welcomed retreats. This retreat from "meatspace" into cyberspace is significant in that cyberpunk's design of virtual spaces follows the canons of physical urban layouts to symbolically supplant physical space. Information and technology jointly erode urbanity. Notably, William Gibson's Matrix and Neal Stephenson's Metaverse, the two quintessential cyberspaces, also find it necessary to adopt the traits of urban space as a means to conceptually understand the aspatial digital realm.

It is clear that neither the Cyberpunks nor utopian futurists like Marshall McLuhan and Alvin Toffler were accurate in predicting the end of urban life with the advent of IT. During the 1990s, many cities regained their vibrancy and allure, thus reversing some of the negative consequences of the suburban and rebellion-inspired urban decline that had sheathed (particularly American) cities in the previous thirty years. Moreover, urban life is increasingly influenced by the rapid development and

deployment of information technologies that bring the virtual realm away from the PC and out onto the streets. Cell phones and Personal Digital Assistants (PDAs) are currently the most widely adopted contemporary manifestations of digital mobility. Buzz words such as "ubiquitous computing", "sentient computing" and "symbiotic computing" point to creating an "intelligent infrastructure" that will support " the data-rich, mobile future" that lies beyond the PC (Buderi 2001, p.54). As John Seely Brown states, "Structural matter (atoms) and computing (bits) [will become] inseparable" (p.86).

This wherever, wireless reality presents urban designers and planners great opportunities in harnessing positive synergies between virtual and physical activities in the city. This article proposes adopting and adapting three "virtues of the virtual" in approaching the urban realm and presents two models through which these can manifest themselves in our daily lives. As the future of computing promises pervasiveness, awareness and personalization, so should urban environments provide connectivity, flexibility and imageability to inhabitants to facilitate enriched, place-making experiences and to allow for seamless flows throughout our daily activities.

2 Identifying the Virtues of the Virtual

"Urban space and cyberspace become reciprocal metaphors - each enables an understanding and negotiation of the other." (Bukatman, 1993: 145).

Cities such as Los Angeles, Sao Paolo, and Jakarta manifest common contemporary urban development trends marked by physically and socially dispersed and fragmented landscapes dotted with fortress-like elements such as gated communities or corporate campuses and placeless locales like mega-malls and highways. Life in these 21st century urban systems is often an isolated, predictable and homogeneous experience.

Virtual space, conversely, features an opposite effect: cyberspace is a frictionless distribution system that has the remarkable capacity to connect and concentrate far-flung information and disparate social spaces. It would be a fascinating exercise to apply the qualities of cyberspace that make it such an attractive medium to physical, built form as a means of re-connecting the city fabric and its attendant activities.

What qualities, then, can we draw from virtual space to improve built space? What is unique to cyberspace that can be adaptable

to urban space? Three characteristics specific to the virtual realm
can be applied to urban space.

First, cyberspace has a unique spatial order where physical
distance is immaterial and accessibility depends largely on
"topological linkage" (Shiode, 1997). This first "virtue of the
virtual" is connectivity. As in Gibson's Matrix, cyberspace is
everywhere and nowhere at once; its information and social
spaces are accessible (albeit to those who have the technological
infrastructure) regardless of their physical, geographic position.
Unlike in physical urban space, propinquity is not relevant in
cyberspace.

Second, cyberspace has a malleable spatial character where spaces
can be quickly modified, replaced, removed, or united with
relative ease by its users. This second "virtue of the virtual" is
flexibility. The elements that cyberspace contains, known as
content, are entirely controllable by its users and builders, as in
apparent in the number and variety of web pages currently in
existence. Users can expand, unite and distort spaces and places -
it is simply a matter of knowing how to handle the appropriate
interface, computer language or code. Elements in actual cities,
on the other hand, take years, even decades, to be modified,
replaced, removed or incorporated into urban space.

Third, cyberspace provides users with seemingly countless
environments where individuals have opportunities to find ideal
places that speak to them and that suit their interests and needs.
If not, individuals can also customize their own spaces according
to their own tastes. The current Internet is predominantly
considered a "...communal space in which [we] can enjoy a
social life of [our] own style; i.e. expressing ourselves, listening to
others' opinion, communicating with each other, and receiving
various visual and audio information" (Shiode, 1997). This
ability to customize and disclose personal meaning from space is
a third "virtue of the virtual" for which it is useful to use Kevin
Lynch's (1960) term, imageability.

These three virtues of the virtual - connectivity, flexibility, and
imageability - give digital space a competitive advantage over an
emerging fragmented, rigid, and placeless physical urban space.
In their purest application, connectivity, flexibility and
imageability - in other words, the ability to shun distance and
easily control and customize space - are unique to virtual space.

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Nevertheless, the physical realm undoubtedly enjoys its own competitive advantage as it engenders the sensorial, the real. The fact that emerging technologies are currently centered on developing electronics "...capable of bringing IT off the desktop and into the real world..." (*Technology Review*, 100) is testament to the power of the physical. The principles of connectivity, flexibility, and imageability are certainly applicable to physical urban space and are significant in that they can be adopted by the practice of urban design for improving and adapting the contemporary city to the information age.

3 Three Directions for Urban Design

The qualities of virtual space discussed in the preceding section provide three directions for Urban Design:

3.1 Connectivity

> Remove the boundaries between the different, and currently separated, functions or zones of the city.

This concept deals with facilitating people's daily interactions, or flows, within the city. Connectivity can be expressed in urban space by implementing a finer grain of mixed use both at the architectural and urban scales.

Approaches that are beginning to exhibit the concept of connectivity in the city can be seen at the architectural scale in live/work environments. Here there is a fluid spatial transition between working space and living space. In *City of Bits*, Bill Mitchell (1995) describes teleconferencing from a home study, for example. At the urban scale, connectivity is burgeoning through the reintroduction of "third spaces" to our urban design vocabulary. Third spaces are informal places of social interaction that can accommodate playing, learning, working, and socializing. Emerging wirelessly wired spaces such as cafés and coin-op laundromats are a good contemporary example of small-scale, though private and commercial, third spaces. Third spaces present a great opportunity for urban design to interface with the digital realm, particularly once mobile computing becomes widely adopted.

Incorporating the adequate infrastructure into the urban landscape for portable and wearable computing to able to network with places and spaces will be crucial. And this is turning out to be much simpler than it sounds: presently, the installed equipment for wireless high-speed Internet access at so-called

"access points" is generally a small transceiver and a broadband
connection (Markoff, 2001). And since mobile wireless access is
based on radio transmissions, meaning that signals carry through
walls, the equipment can be installed at nexus points and
therefore serve an area instead of just a single site.

3.2 Flexibility

> Design environments that can promptly adapt and
> respond to the changing needs of its users over time.

This concept deals with making places and structures responsive
to the rapidly shifting needs of an information-based economy
that thrives on instantaneous global exchanges. Flexibility can be
expressed in urban space through adaptable public spaces and
building shells that can accommodate a variety of interior
programs.

The demand for flexible spaces is already being expressed through
the large amount of loft-conversions in American central cities,
and in the increasing number of large tent spaces like London's
Millennium Dome. The rapid pace of tenant upfitting in the
design of interior spaces is encouraging the design of flexible
building shells, open layouts and modular architecture.

3.3 Imageability

> Design places that reflect and respond to the culture,
> characteristics and needs of locales and its people.

This concept deals with how individuals understand, experience
and customize places so that they communicate meaning on both
a personal and a community level. Imageability can be defined as
our reading of, or our communicating through and with,
physical space. Imageability can be about giving form to
information just as much as it can be about informing the built
form. The concept of imageability responds to the increasing
demands that "...public spaces be not only convivial, but also
communicative - of history and other narratives, requiring the
incorporation of media into the environment" (Frenchman,
1998).

Communicative places can be created by either directly inserting
cultural and historical narratives into the landscape through static
elements such as public art, or by activating a recursive
relationship between the city and the digital realm. The latter
can be achieved by employing wearable computing or sentient
computing on the one hand, which let people interact with the
digital realm while acting in physical space. This can also be

achieved by making the digital realm explicit in physical space, by passively exposing people to cyberspace when they are in the urban environment.

The ability for people to interact with the digital realm while acting in physical space is already widely present in urban landscapes. Ever more sophisticated cell phones and Personal Digital Assistants allow businesspeople to enjoy a high degree of mobility. Emerging technologies along these lines include location-awareness in wearable computing that, through a "heads-up" display like goggles and earphones, superimpose digital graphics and text over elements in the user's field of view to produce a so-called "augmented reality". Similarly, sentient computing uses small ultrasonic transmitters to track people and objects and their relation to each other and thus create "…zones of 'usage' and 'availability'…" around them. When a "…person's zone overlaps an object's zone, the person becomes the temporary 'owner' of the device, be it a workstation, digital camera… or anything else." (Buderi 2001, 56). This implies that objects, and by extension places, can be personalized according to whoever is in its presence at a given time.

Like in the New Times Square or Amsterdam's Internet kiosks, discussed in the next section, there are many examples today of how the urban environment is being reshaped to physically include elements of the digital realm.

4 Urban Spaces for the Future

With ubiquitous computing on the horizon, the electronically mediated urbanity so lucidly described by William Mitchell's *E-topia* (1999) is undoubtedly close at hand. Electronically mediated urban places are

> "…sites where two otherwise distinct domains - meatspace and cyberspace, as *Neuromancer* so vividly and provocatively troped it,… - are intersected, in some effective combination, to support some particular human activity. They are places…where physical actions invoke computational processes, and where computational processes manifest themselves physically" (Mitchell, 1999: 31-2).

Mitchell's definition of electronically mediated urban places necessarily assumes that "eventually, we will cease to conceive of computers as separate devices, and begin to regard machine intelligence as a property that might be associated with just about anything" (Mitchell 1999: 46). This, "just about anything"

includes elements such as smart wallpaper that can act as a
television screen, clock, art, or a camera monitor; augmented
reality where projections of three-dimensional digital
information can intersect with physical space to create a new type
of hybrid architecture; or large-scale video projections for life-
sized digital images that facilitate the interface between the
physical and the virtual (Mitchell, 1999).

We can think of how people experience the electronically
mediated environment that can be produced by implementing
the principles of connectivity, flexibility, and imageability in one
of two ways. The first, which we shall refer to as the place-making
model, provides the opportunity to challenge the framework with
which we consider places and spaces by exposing us to different
perspectives on those places. Frenchman (1998) states that,
"Within the material realm, place is created when narratives are
joined with form." Whereas space "...is physical form in the
absence of narrative." Therefore, the place-making model
describes information-enriched experiences in an electronically
mediated narrative environment.

The utility of the place-making model for electronically mediated
environments can be appreciated in Frenchman's work on the
largely invisible Jamestown Island settlement in Virginia. In
order to communicate a story about a place that does not have
much material evidence, Frenchman employs the actual
archaeological process of discovering Jamestown as the place's
narrative. Interpretive stations that house media, exhibits and a
virtual collection (accessible from anywhere via Internet or at the
Jamestown site itself) create an interpretive landscape for
Jamestown - that is, an environment that supports learning about
the process of discovering Jamestown according to each visitor's
point of view. "These stations provide a means to connect the
landscape to specific themes and stories while protecting exposed
archeological remains and ongoing excavations" (Frenchman:
19). Overall, the Jamestown example illustrates the
communicative, place-making possibilities of combining
information technology with the landscape and how IT can help
inhabitants and visitors communicate with places. Questions do
arise, however. Who decides what messages are to be
communicated by landscapes? What kinds of spaces need "place-
making" (through the interpretation of a narrative) and when do
landscapes communicate well enough on their own without the
aid of electronic mediation? Will people have a choice in whether
or not the places they inhabit are to be mediated?

The second approach to the electronically mediated environment sees digital technology as simply increasing individuals' sensitivity to the flow of urban life. This can be referred to as the frictionless-space model. For example, a wearable computer that stores its user's personal preferences and tastes, would let her know that a nearby coffee store is running a sale on her favorite triple-lattes.

The frictionless-space model provides real-time, practical and personalized information. Here, urban design does not play much of a role beyond, perhaps, integrating this technology into the urban landscape so as to make it invisible. As *Wired* magazine (6.2000) declared, "Technology, which was briefly cool, is no longer a fashion statement; now it's merely a reminder of the network that distributes identical experiences around the globe" (316). The trend in facilitating the flows of urban life through technology seems to be going towards invisibly technologized spaces (not places). Exemplary of this are two of OMA's (Rem Koolhaas' Office for Metropolitan Architecture) current projects - the Seattle Public Library and the Prada stores in Manhattan. These projects are "...designed to create an architectural experience in the context of a virtual world" (Wired: 316) as opposed to, presumably, a wired experience in a physical world.

As Mitchell asserts, recent developments in digital technology suggest that virtual space will not remain encased behind the desktop monitor but will be increasingly part of the physical environment through the future incarnations of our contemporary wireless agents (cell phones, PDAs, wearables) and through ubiquitous computing in smart homes, buildings, public spaces and neighborhoods (1999). In that sense, city dwellers will be "invisibly technologized" and therefore urban designers can stop seeing cyberspace as a competitor or substitute for physical space, its activities and functions, and begin considering the virtual realm as a complementary element to urban life. But this can only happen if physical urban space does not adopt the fragmented form of inequality, exclusion, surveillance, placelessness, and dematerialization characteristic of many contemporary urban landscapes. Bear in mind the Los Angeles Mike Davis exposed in *City of Quartz* (1990), or more recently, the so-called "Snooper Bowl" where guards employed face-recognition software to identify suspected criminals at the entrance to the 2001 Super Bowl. The "virtues of the virtual" - connectivity, flexibility, imageability - should strive to work against these trends. Simply consider, how satisfactory would an

electronically mediated experience be in under-surveilled,
secured, dispersed and placeless landscapes? What would life in
the city be like in an environment that lacks spontaneity and
freedom, the fundamental elements of being urban?

After a more than a thirty-year decline, American cities are
beginning to experience a resurgence of activity. Rising rents in
center city neighborhoods, infill development and
redevelopment projects, cultural heritage preservation efforts,
"brownfields" remediation efforts, low-income housing
initiatives, anti-sprawl acts and transit oriented developments are
just some of the interventions perceptible in urban areas in the
past decade or so. With IT as one of the most revolutionary
developments in urban life since the automobile and suburbia,
there are exciting new prospects for making cities ever more
vibrant, exciting and meaningful places to be. Incorporating the
three elements that urban design can adapt from the virtual realm
- connectivity, flexibility and imageability - and considering the
two alternatives for electronically mediated environments - the
place-making and frictionless-space models - can be a meaningful
step towards creating urban spaces for the future.

The following section shows how both realized and proposed
projects at the architectural and urban scales are already applying
the proposed directions and models for urban design discussed in
this article. As such, these projects offer a starting point for
considering the real life implications of such directions for urban
design.

5 Real-Time and Wireless, Wherever

Amsterdam Internet Kiosks
In 1997, the largest Dutch telecommunications company
installed 25 "Internet Poles" in the streets of Amsterdam. Three
years later, all major Dutch cities have similar points of access to
the Internet. Internet Poles look like phone booths but instead
contain a full-color screen, a keyboard, and a trackpad in place of
the old phone receiver to provide Internet access for information
and entertainment. This is an initial, but highly effective, method
of furnishing widespread access to information through a simple
element in the urban environment.

NASDAQ's Market Site Tower
The redevelopment of Times Square offers a likely scenario for
the future reality of mediated urban spaces. The so-called "New
Times Square" marks a perceptible shift in how culture is

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increasingly being influenced by the digital realm. Specifically, the Nasdaq MarketSite Tower (Figure 1) is tangible evidence of how the virtual realm is in time reflected in physical space.

Figure 1. NASDAQ's Tower
photo by Anthony Townsend

Until December 1999, when Nasdaq appeared at its prominent address in Times Square in the form of the world's largest video screen, known as the Tower, the only places where one could tangibly perceive of that trading market's activities were in a newspaper, on television and on the Internet. Since Nasdaq does not have a trading floor, the MarketSite now serves as the physical expression for its virtual activity through an eight-story tall LED (light emitting diode) screen, a broadcasting facility and a public interactive exhibit. As the CEO of Nasdaq stated, "Visitors from around the world will be able to experience - in a truly fascinating way - the technology and media typically viewed on their computer and television screens." (Techmall website). The physical expression of the digital serves to physically engage and image virtual activity as well as to tangibly symbolize otherwise imperceptible aspirations (it is hard to construct the grandeur in cyberspace that can be expressed through an eight-story tall screen).

Starbucks unWired
In early 2001, Starbucks Coffee Company in conjunction with Microsoft announced that by 2002-3, about 70% of its 4.000 omnipresent chain coffee stores would offer wireless Internet access. Starbucks proclaims that wireless Internet access in its coffee shops is, "dead-on with the changing lifestyle of our customers", and is thus using "...in-store wireless networks to build customer relationships and to market to visitors on premises." Microsoft will use the alliance to test its new .Net Internet strategy that will offer a series of services distributed and managed through the Internet. (*New York Times*, 1.03.01)

The collaboration of Starbucks and Microsoft takes advantage of the increasingly popular wireless data networking standard known as IEEE 802.11b, or in Apple-land as AirPort, whose commercial use has been providing roaming mobile access in airline terminals, hotels, and a few coffee shops in San Francisco (*New York Times*, 2.22.01). Most notable, however, are the user-constructed networks that allow the sharing of high-broadband Internet connections at the neighborhood scale. Free wireless web initiatives already exist in Boston, Seattle, San Francisco and London. Volunteers use relatively cheap off-the-shelf parts to create "data clouds" that are accessible to computers within 45 meters (148 feet) from the shared broadband connection, otherwise known as a network node. In London, a group is experimenting with booster antennas to extend coverage to 1 to 4 kilometers (Wired.com, 9.19.00). Ultimately, the goal is to create enough nodes so the guerrilla networks will cover the entire city and, in a sense, make the urban landscape a connected public space.

Helsinki Virtual Village
The Finnish company Digia, a wireless software developer, its corporate partners IBM, Nokia, Symbian and Sonera and the City of Helsinki are hoping to build a 5,000 inhabitant wireless community by 2005 to function as a testing ground for emerging mobile technologies. Located on an empty parking lot near Helsinki's waterfront, Digia's $1 billion virtual community covers a radius of one-kilometer and features a fiber-optic network provided by the Helsinki city council. The Virtual Village project plans to build housing for 1,000 new residents every year and provide high-tech office space, with some of its services available by the end of 2002. It is projected that within 10 years, the cluster of modern apartments and office parks to be constructed near downtown Helsinki could house up to 25,000 people.

Exemplifying the frictionless-space model of electronically mediated environments, this wireless community will feature smart homes and offices with broadband Internet connections tailored to the residents' specific needs and accessed through smart phones. Through their mobile phones, inhabitants of the Virtual Village will be able to remotely communicate with their home appliances to turn on lights and appliances at home, access local news, participate in community forums, order goods and services, and even attend a virtual chapel. Utilizing Global Positioning Systems technology, the smart phones will also act as

navigational devices, indicating location so when calling a taxi, the village network's digital map will tell the taxi where the caller is located. In essence, this project creates a life-sized laboratory in order to provide Digia and its partners a "...vision of what the mobile [enabled] future will look like." (*Financial Times*, 1.29.01).

Projects by Diller + Scofidio: the arquitectural scale
Elizabeth Diller and Ricardo Scofidio have been widely acclaimed as leading the direction of future architecture (in 1999 they were named MacArthur fellows). Their projects explore how new technologies relate to space and in doing so, they attempt to expose the values, norms and social conditions of the moment by making these visible, readable and tangible in their architecture. Through their use of unconventional materials - such as video, monitors, liquid crystal, electro-luminescent panels, hologram-like elements, and even water vapor - Diller + Scofidio reject the staid principles of mainstream brick-and-mortar architecture and instead embrace a morphing, flexible, real-time approach to design and look to capitalize on the power of imageability presented by new technologies (Scanlon, 2000). The following projects employ different manifestations of information technology to apply, however indirectly, the place-making model of electronic mediation.
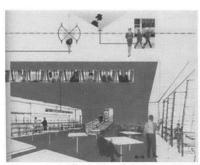
Figure 2. Diller + Scofidio's renovation of The Brasserie.
Wired 2.2000

Diller and Scofidio's first completed project (in January 2000) is a renovation of The Brasserie at the Seagram's Building in Manhattan (Figure 2). The most distinguishing aspect of this project is the high-technology elements that are incorporated into the design. A 40-inch plasma panel displays live footage from an exterior camera, while 15 LCD monitors above the bar show motion-blurred freeze-frames of the last 15 people to pass through the restaurant's revolving doors. Beyond the superficial novelty factor of surveillance monitors in a restaurant, the architects, concerned with making tangible the social conditions produced by the interaction of technology and space, are explicitly commenting

on the pervasiveness of surveillance cameras, and their attendant monitors, in our urban experience.

They express a similar concept in a project proposed for the Moscone Center West in San Francisco, appropriately named Facsimile and scheduled to be completed by 2003. Facsimile is a 16- by 30-foot high-resolution LED video screen that is suspended from a track on the conference center's

Figure 3. Diller + Scofidio's
Facsimile
Wired 2.2000

roof and slides along the exterior wall of the building (Figure 3). A live video camera is fixed behind the screen that points into the building to capture footage of the scenes inside. The interior scenes of the building's activity are combined with pre-recorded video images of fictional vignettes and imagined spaces. This creates a transparent interaction between those inside the building and outside the building, between those inhabiting the private, or semi-private, and those in the public sphere. The uncensored and seemingly uncontrollable image of the events unfolding within the building's interior transforms the passive viewer into a direct eyewitness. The screen serves to outwardly project, and therefore simulate, an interior reality.

Much like Davis (1990) and Koolhaas (1995) and Cyberpunk authors such as Gibson and Stephenson have done, Diller has previously pointed out (ArchiNed, 1998) that so much in society can be observed using cameras that surveillance has become an unstated social contract in both the public and the private sphere (the omnipresence of television, surveillance, and web cameras is uncontested). Like the monitors and screen incorporated into The Brasserie in Manhattan, Facsimile exposes and therefore makes people conscious of the ubiquitous surveillance systems. But neither project resolves the contradiction between what the project does and what it says. While in effect transcending the physical boundaries between interior and exterior urban space through digital space, and exposing the pervasive social condition of surveillance, the projects nevertheless perform the act they condemn.

Travelogues, another D+S project for JFK International Airport in Queens, New York, is less ambivalent about its role in architectural space. This project communicates a narrative about four travelers through the use of lenticulars - a lens in sheet form that can produce an image with depth and motion that relies on the moving viewer to animate the images. Thirty-eight 4-by 4-foot lenticular panels, each holding a 3-second digitally animated series, are placed along a narrow passageway between terminals to create a movie theater of sorts that requires a mutual engagement between the viewer's movement and the narrative to function (Figure 4). This low-technology, yet immersive and interactive, approach acts like an evolved version of the typical passive public art pieces, such as murals and sculptures, that are conventionally used to convey meaning in cultural and historical narratives.

Figure 4. Diller + Scofidio's Travelogues

Wired 2.2000

The Diller + Scofidio projects point out the fine line between commentator, perpetrator, and negotiator of which urban designers should be conscious in applying the concepts of connectivity and imageability through the same new technologies that are conventionally used for surveillance and simulacra. On the one hand, incorporating the concepts of connectivity and imageability as place-makers into the urban landscape can act as a positive force in mitigating the ill consequences of urban fragmentation and dispersal. On the other hand, however, translating the concepts into actual urban elements - particularly ones that involve technological means to do so - presents a risk of further propagating the destructive forces we should be working to alleviate.

6 Envisioning the Urban Future

These examples illustrate how built forms at the architectural and urban scales are beginning to incorporate the "virtues of the

virtual" - connectivity, flexibility and imageability - and the place-making and frictionless-space models of electronic mediated spaces into the physical world. What do these projects say about urban design? And, what can the practices of urban design and planning learn from how these projects that combine the virtual with the physical?

First, urban designers need to consider their professional responsibility is to the urban realm. Is it, as Diller + Scofidio do, to elucidate the contradictions of the present urban condition in a clever way? Or, is it to adopt information technologies to simply facilitate the flows of urban life, as in the your favorite latte is on sale example? Or, as in the Jamestown example, is it to propose more constructive ways of using technology for more information rich experiences? Professional responsibility as urban designers, in its most comprehensive form, involves a combination of all the above examples.

Second, as this article has also illustrated, albeit more indirectly, urban design needs to re-adopt the profession's distinctive role of postulating positive, if not ideal, urban futures. The absence of a powerful vision of the future coming from the urban design and planning professions has left others to interpret the interaction between the revolutionary advances in information technologies and the culture of cities. As Bill Mitchell states, "Our job is to design the future we want, not to predict its predetermined path" (1999, 12).

It is hoped that the directions for urban design considered in this article begin to guide the urban designer in shaping a future that draws from the most positive aspects of the urban experience - be they derived from the physical or the virtual realm. $\boxed{P}$

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Enhancing Conversation through Context Output

Beatrice Witzgall
Joseph Kaye

The great advantage - and disadvantage - of digital information is that it can be received anywhere. It is therefore devoid of context. When your lunch partner receives a mobile phone call, all that you know is that the call has occurred. There is a need to create context as output from the digital information; the physical domain of interaction displays the context. The caller to a mobile phone often asks "Where are you?" "Am I disturbing you?" These questions also express the need to create context or an idea of place. Fundamentally, what is displayed must reflect the context and not the content of the message: if your dining-mate is receiving a call from their significant other, that is sufficient to know and understand; the exact details are unnecessary. This article presents an approach to restore context to digital interaction.

1 Why Digital Needs Context

A Childhood Vision

> When I was a child I had a reoccurring daydream when
> I was feeling lonely: I wished I could put on a pair of
> glasses and through them I could see where my friends
> were and what they were doing. Through these glasses,
> I would have the chance to feel with them, part of this
> community.

Information technology is beginning to make this vision come
true. Mobile phones will become location-aware in the next few
years, spurred on by the need to locate emergency calls. However,
commercial and social uses of this technology are expected to far
exceed the number of uses for emergency calls. Add that to
embedded webcams, and this vision starts to become a reality.
Through various interactive devices one can even participate in
their social gathering. Digital technology enables the ability to be
part of communities unrestrained by proximity.

Belonging
The meaning of belonging has changed, as have the locations of
being. Individuals have the freedom to share and exchange their
interests and thoughts with people all over the world. Location
becomes irrelevant, it is implied; dependence on email and
telephones implies there is no need to communicate and meet in
the physical world.

Figure 1

Digital media provide opportunity for location context.

Beatrice Witzgall
Joseph Kaye

Communities have transformed from a physical meeting into virtual meeting places. The reality people become part of is this virtual world - a virtual community! They substitute physical gatherings with friends by going online, emailing or chat-rooms. They even read newspapers online and do business there. The virtual world has started to claim a more extensive role in our life than physical contact.

The advantage of digital technology is that it conveys a feeling of belonging elsewhere than the physical realm. But it is also a world that vanishes as soon as one turns off the computer and disconnects from that network. Digital information can be received anywhere. It doesn't have a place and is therefore devoid of context.

2 The Uneasy Interaction Between Digital and Physical

Digital Information Has No Context
These new digital technologies provides the possibility of being available for more people at one given moment in time independent of our physical location. One can be part of multiple communities at one moment - in a cafe with a friend and available via mobile phone for others; via laptop and email the same persons can sit anywhere and communicate anywhere with anyone.

Physical Spaces Must Provide Context
Communication technologies divorce production from reception of conversation. As this article will illustrate, the role of place should change to incorporate the display of context of the communication. This raises a number of questions, which this work merely begins to pose:

· What kind of places can be created through information technology?

· How can we incorporate information technology into our physical space so that we create a more diverse and open community and strengthen the sense of belonging?

· How can information technology develop a physical presence?

· What is the interaction of virtual communities and interests with a physical meeting place?

· How can we merge the interaction forms of communication at a distance and physically gathering together?

As a response to these questions it is necessary to create a physical space that displays the information or the context of the virtual world. This dictates a physical environment where the digital world with its information is displayed in the periphery: context.

3 So What Is Context In This Context?

Context Exists In the Periphery
The place for context is overwhelmingly in the periphery. User interface researchers have started to conjecture about the role of the periphery in conveying information, which is known as "calm technology." The interaction itself is located in the immediacy; it cannot be overtaken by the context, such as when a phone call is drowned out by the sound of a train going by. This represents a failure to place context in the periphery.

As such, context needs to be ignorable; the interaction must remain the fundamental unit of conversation, augmented by not replaced by context. This article proposes that simplicity of context display (visual or otherwise) is key in allowing this to happen. As a metric, the display must improve the interaction; if there is an overall decrease then it has fundamentally failed.

Context Is The Output
The most drastic conceptual change proposed in this article is the idea of context as an output. A key topic in the field of human-computer interaction over the last five years has been that of context as an input, as in the phrase 'context-aware computing.' This article proposes reclaiming context as an output, to be designed and considered and actively created.

4 Scenario

A Mobile Phone Call at Lunch

Patricia and Kevin work together in the same corporate marketing firm. They're having lunch together in a café around the corner from the office when Patricia's mobile phone rings. She picks it up and starts talking. The context display shows the logo of a client company intertwined with that of theirs. Kevin's been working on the same project, and so pulls up the file on his laptop and picks up his mobile phone. Patricia nods, and Kevin joins in the conversation. He's able to supply the figures the client needs from his laptop.

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Joseph Kaye

Later, Kevin's mobile phone rings. It's his girlfriend, and his context display indicates that it's a private conversation. When he's finished, he turns back to the table, and Patricia has started talking to the woman at the next table: she noticed the logo and has been meaning to talk to the company about a marketing project for her startup. They leave with her business card: a potential client!

Why is such a display important? Mobile phones have a powerful influence on the public realm. People constantly carry their mobile phones with them, afraid to miss something or being not available for someone. Communicating with someone in another part of the world has gained more importance than attention to the real and immediate, a situation enforced with every context-free phone call. The minute someone answers a mobile phone, he/she actually separates and isolates her-/himself from the physical context and enters the digital domain of communication. The real counterparts of the physical world are being ignored and excluded.

Context as output allows the person with you to become part of your interaction with this virtual conversation by understanding its context. The feeling of integration is conveyed instead of exclusion and isolation.

New Town, New Caf
The use of context has other possibilities; our fundamental interaction with space changes when one can manipulate the context within which one is displayed. It is possible to develop scenarios wherein the context display functions as a tool for meeting new people. The physical environment itself can change and morph; a broker may want a stock ticker unobtrusively available to him as part of his context or a sports fanatic may want to have the newest football scores available as well. Some may wish to attract attention; some may want the opposite. A context display gives opportunities for both.

Figure 2

Physical spaces become a location for context display.

The space itself becomes created by the people within it, interacting with them, and changing as people come and go. This interactive and smart environment is determined by the desires, thoughts and interests of the people who inhabit it. Their being is reflected in the space and therefore the space transforms into a mirror of the people who are physically in the space. The virtual world of information enters the physical realm and provides the opportunity for a new quality of interaction and communication strengthening the sense of communities and neighborhoods. Personal interests and information can be shared in the physical public space in the similar neutral and anonymous way as on the platform of the Web.

This new physical place incorporates virtual environments, real people and makes different interactions possible that are only accessible through information technology. It brings back the quality of personal communication and interaction. In this space people act and interact in a different way with each other. It actually influences and changes people's behavior and perception of communication and acting with each other. The space and the people's behavior will change through the visual display of information in the spatial periphery.

5 When There's Just Too Much Context

This article recognizes that there is a danger in the context overwhelming the interaction. More immediately noticeable is the uneasy interaction between displaying context and respecting privacy. One vision is a future whereby holographic display all output to be personally configured for the receiver. However, in the meantime it is necessary to err on the side of caution, and minimize the amount of private information available to the outside world. It is this uneasy tension between privacy and context that will pose the greatest problems for both the social realm discussed here and commercial uses of location-enabled mobile phone technology.

6 Visions and Conclusions

This article proposes taking the exclusion of the digital world and re-projecting it in the physical as context to create a better sense of community and sharing of interests. People's attention towards the virtual communication is carried back into the physical realm. Design should substitute a focus on the computer monitor with a focus on the world around you; ambient media inherently allows for communication.. The digital world gains its presence in the periphery.

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Personal interests become accessible to others as information in the periphery without revealing intimate content. A feeling of sharing and integration is created instead of physical isolation and exclusion as soon as we get in touch with digital technology. The physical domain displays the context of the digital information and can therefore strengthen personal relationships. ⊡

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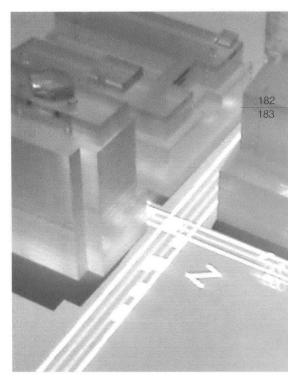
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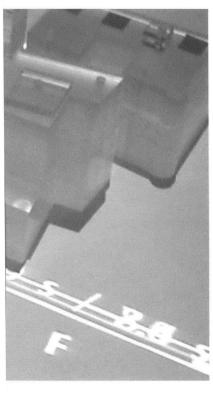
The Luminous Table:
Increasing Interactivity in Urban Design
Luke Yeung

Luminous Planning Table Team: Eran Ben-Joseph, Dan Chak, Hiroshi Ishii, Zahra Kanji, Ben Piper, Gustavo Santos, John Underkoffler, Luke Yeung

The design of buildings and cities is a complex process involving a large number of participants and their interactions. There are many digital tools currently being developed to computationally assist specific transactions within the overall design process. One approach to address the overall integration of transactions and activities within the design process is to embody physical mockups with supplementary data that can assist decision-making throughout the many stages of the process. Current Computer-Aided Design (CAD) systems, with the limitations of 2-dimensional display media, make it difficult to visualize relevant data, particularly ones that are dynamic and time-based.
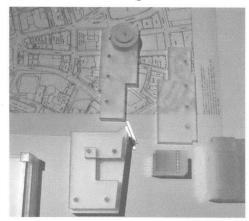
The Luminous Planning Table is a system that provides the potential for effective integration of various design techniques and workflows. The current prototype originates from the development of the Input/Output (I/O) bulb workbench invention at MIT's Media Lab. This prototype is composed of an I/O bulb hanging from above, with a camera pointing down at the surface enabling it to see changing positions of different physical objects. The attached computer computes different features associated with these objects and projects them back on the table surface, moving and changing them as the objects are moved or manipulated.

The Luminous Table attempts to address a range of environmental concerns in architectural and urban design. For example, a model of a proposed building(s) placed on the table generates projected forms such as shadows, ground wind patterns, reflective glare and view corridors. These projections are immediately changed and updated as one moves the building(s) around the table. The result is a simulation tool that
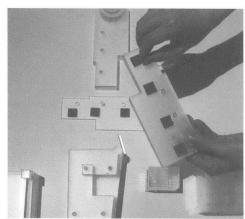
provides access to a full efficacy of computational resources in a manner that is comfortable and intuitive, particularly for geometric and spatial inquiries within the design project.

In its current form, the Luminous Table allows for collaborative interactions due to its physical design and its combination of physical and digital representations of scaled models. Having developed the underlying technology for the system platform, the goal for the project is to further define the various levels of interaction demanded in the design process. This article visually documents some of the interactions that the Luminous Table currently supports. These functions were tested by graduate students in a recent workshop organized by Professor Eran Ben-Joseph in the Department of Urban Studies and Planning.

Design Workflow 1
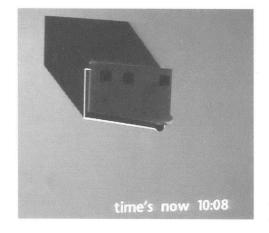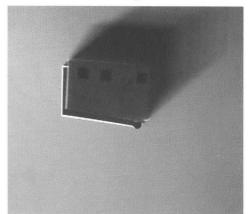
COLLECTION OF
SITE AND DESIGN
DATA
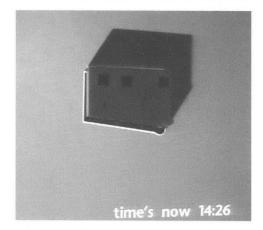
CONSTRUCTION
OF SKETCH
MODELS

DYNAMIC
SHADOW
STUDIES 1

time's now 10:08

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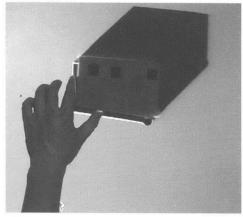
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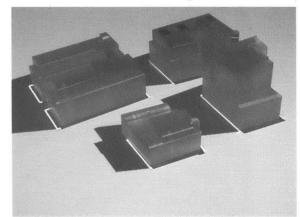
DYNAMIC
SHADOW
STUDIES 2

DYNAMIC
SHADOW
STUDIES 3
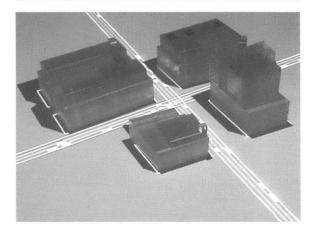
TANGIBLE
MANIPULATION

Design Workflow 2
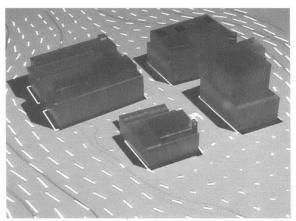
**DESIGN
IN SITE
CONTEXT**
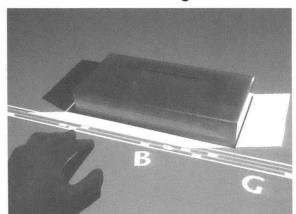
TRAFFIC FLOW

WIND FLOW

Luke Yeung

Design Workflow 2

REFLECTIONS

MODIFICATION
OF DESIGN
GOALS

projections
volume 2 spring 2001

PRESENTATION
AND
DISCUSSION

PRESENTATION
AND
DISCUSSION

Ongoing Research

Interest in the Luminous Planning Table by developers and practicing architects and the use of the tool within a professional practice context could greatly advance the refinement of the prototype. By utilizing the Luminous Table in specific design and construction projects and in particular during preliminary design and design development stages, precise workflow patterns and the qualities of collaborations can be evaluated. This will contribute in determining appropriate levels of interaction and improve the effectiveness of the design tool in the various phases of a design project.

Beyond providing assistance to the professional in the design process, the Table offers potential in shaping a plural planning process. Typically, during public planning reviews, suggestions and input can not be immediately simulated and explored, and often require repeated meetings and presentations. The Luminous Table, on the other hand, provides a seamless input/output planning and design process. Ideas, changes and suggestions as well as their resulting impacts can be seen and explored in real time allowing the public to be better informed and involved.

In addition to analytical case studies, experimental and exploratory uses of the Luminous Table are being made with the intention to develop the prototype into a new creative technology to provide more effective techniques for architects and urban planners in designing physical environments. In the broader context, this investigation aims to provide new contributions in the overlapping areas of interaction, information technology and design thinking. P

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call for papers

Each year, *Projections* devotes one issue to a specific set of policy problems. Volume 3 will focus on a variety of planning approaches to environmental justice concerns.

While environmental injustices have been documented using a variety of case study, historical, and statistical methods, less attention has been given to their root causes. State and local land use decisions as well as historical patterns of industrial location, geography, and commerce have largely contributed to the disproportionate experience of environmental harm by low-income, minority communities. The current landscape has been largely shaped by planning practices such as exclusionary and expulsive zoning, building codes that encourage development in areas with inexpensive land, and siting processes that provide inadequate notice of hearings, response to public comments, cooperation with potentially displaced communities, or consideration of project alternatives. The next generation of planners, lawyers, and policymakers must confront environmental injustices with strategies for reversing the effects of these planning practices on impacted communities. In this spirit, *Projections* will consider manuscripts that address a wide range of strategies, including regulatory approaches, pollution monitoring technologies, informational systems, participatory models, and regional planning techniques, for confronting the root causes of environmental injustices, including traditional planning practices.

Starting with Volume 3, *Projections* will begin its transition to a peer-reviewed journal, upholding high academic standards and publishing the best proposals and evaluations of planning solutions to timely problems in a visually stimulating format. Leading academics and practitioners that have worked and published in the area of environmental justice will serve on our Editorial Board and help guide the development of this important issue.

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